



Cisco IOS XR Interface and Hardware Component Command Reference for the Cisco XR 12000 Series Router

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Preface

This command reference describes the Cisco IOS XR Interfaces commands. The preface for the *Cisco IOS XR Interface and Hardware Component Command Reference for the Cisco XR 12000 Series Router* contains the following sections:

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- [Obtaining Documentation and Submitting a Service Request](#), page xvii

Changes to This Document

[Changes to This Document](#), on page xvii lists the technical changes made to this document since it was first published.

Revision	Date	Change Summary
OL-24667-01	April 30, 2011	Initial release of this document.

Obtaining Documentation and Submitting a Service Request

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ATM Commands on the Cisco IOS XR Software

This module provides command line interface (CLI) commands for configuring ATM on your router.

- [atm address-registration, page 3](#)
- [atm ilmi-config disable, page 5](#)
- [atm ilmi-keepalive, page 7](#)
- [atm ilmi-trap disable, page 9](#)
- [atm maxvpi-bits 12, page 11](#)
- [atm mcpt-timers, page 13](#)
- [atm oam flush, page 15](#)
- [cell-packing, page 17](#)
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- [encapsulation \(ATM\), page 23](#)
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atm address-registration

To enable the router to engage in address registration and callback functions with the Interim Local Management Interface (ILMI), use the **atm address-registration** command in interface configuration mode. To disable ILMI address registration functions, use the **no** form of this command.

atm address-registration

no atm address-registration

Syntax Description This command has no keywords or arguments.

Command Default If ILMI is configured on a PVC and its host ATM interface, then address registration and callback function enabled on the router by default.

If ILMI is not configured on a PVC and its host ATM interface, then address registration and callback functionality is disabled on the router and must be enabled with the **atm address-registration** command.

Command Modes Interface configuration (config-if)

Command History	Release	Modification
	Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note The **atm address-registration** command is effective only when an ILMI PVC is created under the physical ATM interface.

Task ID	Task ID	Operations
	atm	read, write

Examples The following example shows how to enable the ATM interface 0 in slot 6 to register its address:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
```

```
RP/0/0/CPU0:router(config-if)# atm address-registration
```

atm ilmi-config disable

To disable Interim Local Management Interface (ILMI) on an ATM interface, use the **atm ilmi-config disable** command in interface configuration mode. To re-enable ILMI on an ATM interface, use the **no** form of this command.

atm ilmi-config disable

no atm ilmi-config disable

Syntax Description This command has no keywords or arguments.

Command Default If an ILMI PVC is configured on the ATM interface, then ILMI is automatically enabled on the ATM interface that hosts that PVC.

If an ILMI PVC is not configured on the ATM interface, then ILMI is disabled by default on the ATM interface.

Command Modes Interface configuration (config-if)

Command History	Release	Modification
	Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note The **atm ilmi-config disable** command is effective only when an ILMI PVC is created under the physical ATM interface.

Task ID	Task ID	Operations
	atm	read, write

Examples The following example shows how to disable ILMI on an ATM interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# atm ilmi-config disable
```

The following example shows how to re-enable ILMI on an ATM interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# no atm ilmi-config disable
```

Related Commands

Command	Description
show atm ilmi-status, on page 60	Displays status information that is related to ILMI.

atm ilmi-keepalive

To enable Interim Local Management Interface (ILMI) keepalives on an ATM interface and configure keepalive polling frequency, use the **atm ilmi-keepalive** command in interface configuration mode. To disable ILMI keepalives, use the **no** form of this command.

atm ilmi-keepalive [**act-poll-freq** *frequency*] [**retries** *count*] [**inact-poll-freq** *frequency*]

no atm ilmi-keepalive [**act-poll-freq** *frequency*] [**retries** *count*] [**inact-poll-freq** *frequency*]

Syntax Description

act-poll-freq <i>frequency</i>	(Optional) Number of polling seconds between active keepalives. Range is from 1 through 65535 seconds. Default is 5 seconds.
retries <i>count</i>	(Optional) ILMI keepalive retry count. Range is from 2 through 5. Default is 4 retries.
inact-poll-freq <i>frequency</i>	(Optional) Number of polling seconds between inactive keepalives. Range is from 1 through 65535 seconds. Default is 1 second.

Command Default

act-poll-freq *frequency*: 5

retries *count*: 4

inact-poll-freq *frequency*: 1

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

The **atm ilmi-keepalive** command is effective only when an ILMI PVC is created under the physical ATM interface.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to enable ILMI keepalives for the ATM interface 0 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# atm ilmi-keepalive
```

The following example shows how to configure the ATM interface 1 in slot 6 to poll the number of inactive keepalives every 10 seconds:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/1
RP/0/0/CPU0:router(config-if)# atm ilmi-keepalive inact-poll-freq 10
```

The following example shows how to disable ILMI keepalives for the ATM interface 0 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# no atm ilmi-keepalive
```

Related Commands

Command	Description
show atm ilmi-status, on page 60	Displays status information that is related to ILMI.

atm ilmi-trap disable

To disable Interim Local Management Interface (ILMI) trap generation on an ATM interface, use the **atm ilmi-trap disable** command in interface configuration mode. To reenable ILMI trap generation, use the **no** form of this command.

atm ilmi-trap disable

no atm ilmi-trap disable

Syntax Description This command has no keywords or arguments.

Command Default Support for ATM ILMI trap generation is enabled.

Command Modes Interface configuration (config-if)

Release	Modification
Release 3.5.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Operations
atm	read, write

Examples The following example shows how to disable ILMI trap generation on the ATM interface 0 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# atm ilmi-trap disable
```

The following example shows how to reenable ILMI trap generation on the ATM interface 0 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/1
RP/0/0/CPU0:router(config-if)# no atm ilmi-trap disable
```

Related Commands

Command	Description
show atm interface atm, on page 63	Displays ATM-specific information about an ATM interface.

atm maxvpi-bits 12

To enable support for the 12-bits virtual path identifier (VPI) Network-Node Interface (NNI) cell format, use the **atm maxvpi-bits 12** command in interface configuration mode. To disable support for the 12-bits VPI NNI cell format, use the **no** form of this command.

atm maxvpi-bits 12

no atm maxvpi-bits 12

Syntax Description This command has no keywords or arguments.

Command Default Support for the 12-bits VPI NNI cell format is disabled.

Command Modes Interface configuration (config-if)

Command History	Release	Modification
	Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

Out of the twelve bits, four bits in the ATM UNI cell header are reserved for local standardized generic flow control (GFC).

Task ID	Task ID	Operations
	atm	read, write

Examples The following example shows how to enable support for the 12-bits VPI NNI cell format on the ATM interface 0 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# atm maxvpi-bits 12
```

The following example shows how to disable support for the 12-bits VPI NNI cell format on the ATM interface 1 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/1
RP/0/0/CPU0:router(config-if)# no atm maxvpi-bits 12
```

Related Commands

Command	Description
show atm interface atm, on page 63	Displays ATM-specific information about an ATM interface.

atm mcpt-timers

To define the three Maximum Cell Packing Timeout (MCPT) timers under a main ATM interface, use the **atm mcpt-timers** command in interface configuration mode. To return the three timers to the default configuration, use the **no** form of this command.

atm mcpt-timers *timer-1 timer-2 timer-3*

no atm mcpt-timers

Syntax Description

timer-1	Maximum number of microseconds to wait to complete cell packing on a single packet before that packet is transmitted. Range is from 50 through 4095. Note To associate this timer with an interface, use the cell-packing command and replace the <i>timer</i> argument 1 .
timer-2	Maximum number of microseconds to wait to complete cell packing on a single packet before that packet is transmitted. Range is from 50 through 4095. Note To associate this timer with an interface, use the cell-packing command and replace the <i>timer</i> argument 2 .
timer-3	Maximum number of microseconds to wait to complete cell packing on a single packet before that packet is transmitted. Range is from 50 through 4095. Note To associate this timer with an interface, use the cell-packing command and replace the <i>timer</i> argument 3 .

Command Default

timer-1 : 50

timer-2 : 50

timer-3 : 50

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Release 3.4.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **cell-packing** command to attach one of the three MCPT timers to an individual L2VPN port, PVC, or PVP. If the associated MCPT timer expires before the maximum number of cells that can be packed is reached, then the packet is transmitted with the number of cells that have been packed thus far.

**Note**

We recommend configuring a low, medium, and high value for the three MCPT timers to accommodate the different ATM traffic classes. Low-latency CBR traffic typically uses a low MCPT timer value, while high-latency UBR traffic typically requires a high MCPT timer value. VBR-rt and VBR-nrt traffic typically use a median MCPT timer value.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to configure the three MCPT timers and then apply one of them to an interface with the **cell-packing** command:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# atm mcpt-timers 50 100 200
RP/0/0/CPU0:router(config-if)# l2transport
RP/0/0/CPU0:router(config-if-l2)# cell-packing 6 1
```

Related Commands

Command	Description
cell-packing, on page 17	Configures the maximum number of cells allowed per packet, and specifies a MCPT timer for cell packing.
show atm interface atm, on page 63	Displays ATM-specific information about an ATM interface.

atm oam flush

To drop all current and future Operation, Administration, and Maintenance (OAM) cells received on an ATM interface, use the **atm oam flush** command in interface configuration mode. To receive OAM cells on an ATM interface, use the **no** form of this command.

atm oam flush

no atm oam flush

Syntax Description This command has no keywords or arguments.

Command Default The dropping of OAM cells is disabled.

Command Modes Interface configuration (config-if)

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Operations
atm	read, write

Examples The following example shows how to enable the dropping of all current and future OAM cells received on the ATM interface 0 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# atm oam flush
```

The following example shows how to disable the dropping of all current and future OAM cells received on the ATM interface 1 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# no atm oam flush
```

Related Commands

Command	Description
show atm interface atm, on page 63	Displays ATM-specific information about an ATM interface.
show atm class-link, on page 56	Displays configuration information for the parameters on a VC class that is associated with a particular PVC.
show atm vc-class, on page 84	Displays information about all ATM VC classes on the router or for a specific ATM VC-class.
show atm vp-tunnel, on page 88	Displays VP tunnel information for the entire router or for a specific interface.

cell-packing

To configure the maximum number of cells allowed per packet, and specify a Maximum Cell Packing Timeout (MCPT) timer for cell packing, use the **cell-packing** command in the appropriate mode. To return the interface to the default cell packing configuration, use the **no** form of this command.

cell-packing *cells timer*

no cell-packing

Syntax Description

cells	Maximum number of cells to use per packet. Range is from 2 through 86.
timer	Indicates the appropriate MCPT timer to use for cell packing. Can be 1 , 2 , or 3 .
Note	You can configure up to three different MCPT values for a single main interface with the atm mcpt-timers command.

Command Default

If you do not configure the maximum number of cells allowed per packet, only one cell is carried per packet.

Command Modes

ATM layer 2 transport interface configuration (config-if-l2)

ATM layer 2 transport PVC configuration (config-atm-l2transport-pvc)

ATM layer 2 transport PVP configuration (config-atm-l2transport-pvp)

Command History

Release	Modification
Release 3.4.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the [atm mcpt-timers, on page 13](#) command to configure the three MCPT timers under the main ATM interface.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to configure cell packing parameters on an ATM interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# l2transport
RP/0/0/CPU0:router(config-if-l2)# cell-packing 6 3
```

Related Commands

Command	Description
atm mcpt-timers, on page 13	Defines the three MCPT timers under a main ATM interface.
show atm cell-packing, on page 54	Displays cell packing information for the Layer 2 attachment circuits (ACs) configured on your system.
show atm interface atm, on page 63	Displays ATM-specific information about an ATM interface.
show atm pvc, on page 70	Displays ATM PVC and traffic information for the entire router.
show atm pvp, on page 78	Displays ATM PVP and traffic information for the entire router, or a specific VPI or ATM interface.

class-int

To assign a virtual circuit (VC) class to an ATM main interface, use the **class-int** command in interface configuration mode. To remove a VC-class, use the **no** form of this command.

class-int *vc-class-name*

no class-int *vc-class-name*

Syntax Description

vc-class-name	Name of the VC-class you are assigning to your ATM main interface or subinterface.

Command Default

No VC-class is assigned to an ATM main interface or subinterface.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you create a VC-class for an ATM main interface or subinterface, you can use the **shape** and **encapsulation** commands to define your parameters.

Parameters that are applied to an individual VC supersede interface- and subinterface-level parameters. Parameters that are configured for a VC through discrete commands entered in interface-ATM-VC configuration mode supersede VC-class parameters assigned to an ATM main interface or subinterface by the **class-int** command.



Note

This command is not available for Layer 2 interfaces.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to create a class called “classA” and then apply that class to ATM main interface 1 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)#vc-class atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# shape cbr 40000
RP/0/0/CPU0:router(config-vc-class-atm)# encapsulation aal5snap
RP/0/0/CPU0:router(config-vc-class-atm)# oam-pvc manage 300
RP/0/0/CPU0:router(config-vc-class-atm)# commit
RP/0/0/CPU0:router(config-vc-class-atm)# exit
RP/0/0/CPU0:router(config)# interface atm 0/6/0/1
RP/0/0/CPU0:router(config-if)# class-int classA
RP/0/0/CPU0:router(config-if)#
```

Related Commands

Command	Description
show atm class-link, on page 56	Displays configuration information for the parameters on a VC class that is associated with a particular PVC.
show atm vc-class, on page 84	Displays information about all ATM VC classes on the router or for a specific ATM VC-class.

class-vc

To attach a virtual circuit (VC) class to an ATM permanent virtual circuit (PVC), use the **class-vc** command in ATM PVC configuration mode for a PVC that is configured on an ATM subinterface. To remove a VC-class from a PVC, use the **no** form of this command.

class-vc *vc-class-name*

no class-vc *vc-class-name*

Syntax Description

vc-class-name	Name of the VC-class you are assigning to your ATM PVC.

Command Default

No VC-class is assigned to an ATM PVC.

Command Modes

ATM PVC configuration (config-atm-vc)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you create a VC-class for an ATM subinterface PVC, you can use the **shape** and **encapsulation** commands to define your parameters.

Parameters that are applied to an individual VC supersede PVC-level parameters. Parameters that are configured for a VC through discrete commands entered in interface-ATM-VC configuration mode supersede VC-class parameters assigned to a PVC by the **class-vc** command.



Note

The **class-vc** command is available in ATM PVC configuration mode for a PVC that is configured on an ATM subinterface only. This command is not available in ATM PVC configuration mode for an ATM main interface.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to create a class called “classA” and then apply that class to the subinterface 1 on the ATM main interface 1 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# vc atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# shape cbr 40000
RP/0/0/CPU0:router(config-vc-class-atm)# commit
RP/0/0/CPU0:router(config-vc-class-atm)# exit
RP/0/0/CPU0:router(config)# interface atm 0/6/0/1.1 point-to-point
RP/0/0/CPU0:router(config-if)# pvc 10/100
RP/0/0/CPU0:router(config-atm-vc)# class-vc classA
RP/0/0/CPU0:router(config-atm-vc)#
```

Related Commands

Command	Description
show atm class-link, on page 56	Displays configuration information for the parameters on a VC class that is associated with a particular PVC.
show atm vc-class, on page 84	Displays information about all ATM VC classes on the router or for a specific ATM VC-class.

encapsulation (ATM)

To configure the ATM adaptation layer (AAL) and encapsulation type for a virtual circuit (VC) class, ATM permanent virtual circuit (PVC), or ATM permanent virtual path (PVP), use the **encapsulation** command in the appropriate configuration mode. To remove an encapsulation type, use the **no** form of this command.

For point-to-point ATM PVCs and vc-classes:

encapsulation {aal5mux ipv4| aal5nlpid| aal5snap}

no encapsulation {aal5mux ipv4| aal5nlpid| aal5snap}

For ATM Layer 2 PVCs:

encapsulation {aal0| aal5}

no encapsulation {aal0| aal5}

Syntax Description

aal5mux ipv4	Specifies IPv4 encapsulation for multiplex (MUX)-type VCs. Note The aal5mux ipv4 keywords are available in ATM PVC configuration and ATM VC-class configuration modes only.
aal5nlpid	Specifies the AAL and encapsulation type that allows ATM interfaces to interoperate with High-Speed Serial Interfaces (HSSIs), which are using an ATM data service unit (ADSU) and running ATM-Data Exchange Interface (DXI). Supported on ATM PVCs only. Note The aal5nlpid keyword is available in ATM PVC configuration and ATM VC-class configuration modes only.
aal5snap	Specifies the AAL encapsulation type that supports Inverse ARP. Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) precedes the protocol datagram. Note The aal5snap keyword is available in ATM PVC configuration and ATM VC-class configuration modes only.
aal0	Specifies the AAL encapsulation type that contains 48 bytes of data within an ATM cell. AAL0 cells are also referred to as “raw cells.” The payload consists of 48 bytes. Note The aal0 keyword is available in the ATM Layer 2 transport PVC configuration mode only.
aal5	Specifies the AAL encapsulation type that carries higher-layer datagrams while enhancing the link layer with services available through ATM. AAL5 is defined in the ITU standard I.363.5, and is typically used to carry IP datagrams over ATM. Note The aal5 keyword is available in the ATM Layer 2 transport PVC configuration mode only.

Command Default

For point-to-point PVCs, the default encapsulation type is **aal5snap**.

For Layer 2 PVCs, the default encapsulation type is **aal5**.

Command Modes

ATM PVC configuration (config-atm-vc)
 ATM VC-class configuration (config-vc-class-atm)
 ATM layer 2 transport PVC configuration (config-atm-l2transport-pvc)

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	To support Layer 2 VPN ACs, the encapsulation command was updated to include the aal0 and aal5 keywords in ATM Layer 2 transport PVC configuration mode.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **aal5mux ipv4** encapsulation option to dedicate the specified PVC to a single protocol; use the **aal5snap** encapsulation option to multiplex two or more protocols over the same PVC. Whether you select **aal5mux ipv4** or **aal5snap** encapsulation depends on the type of network you are configuring, and the pricing offered by that network. If the pricing of the network depends on the number of PVCs set up, we recommend **aal5snap** encapsulation. If pricing depends on the number of bytes transmitted, we recommend **aal5mux ipv4** encapsulation because it has less overhead than **aal5snap** and **aal5mux ipv4** encapsulation.

If you configure VC-class parameters for a PVC after that PVC is configured, you must enter the **shutdown** command followed by the **no shutdown** command on the ATM subinterface that hosts the PVC. This action restarts the interface, causing the newly configured VC-class parameters to take effect on that interface.

Unless specifically configured otherwise, a PVC automatically inherits the encapsulation type of the VC-class that is assigned to the main interface or subinterface that hosts the PVC. If no VC-class is assigned, then the PVC inherits the encapsulation type of the main interface or subinterface that hosts the PVC. If no encapsulation is configured of the main interface or subinterface, then the PVC inherits the default **aal5snap** encapsulation.

Use the **encapsulation** command in ATM PVC configuration mode to modify the inherited or default encapsulation assigned to a PVC. You can modify the encapsulation for each individual PVC to be different from the encapsulation configured for the VC-class that is assigned to the ATM main interface or subinterface that hosts the PVC.

If you do not use the **encapsulation** command to configure the encapsulation type for a new ATM PVC, then the PVC inherits the one of the following default configurations (listed in order of precedence from lowest to highest):

- The encapsulation assigned to the VC-class that is assigned to the PVC itself.
- The encapsulation assigned to the VC-class that is assigned to the ATM subinterface that hosts the PVC.
- The encapsulation assigned to the VC-class that is assigned to the ATM main interface that hosts the PVC
- The default **aal5snap** encapsulation

When configuring a PVC range or an individual PVC within a PVC range, the following encapsulation types are supported:

- **encapsulation aal5mux ipv4**
- **encapsulation aal5snap**

**Note**

For Layer 2 PVCs, the default encapsulation type is **aal5**, and the encapsulation type is not inherited from the VC-class.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to configure a VC-class with **aal5snap** encapsulation:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# vc atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# encapsulation aal5snap
```

The following example shows how to configure an individual PVC with **aal5mux** encapsulation:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 10/100
RP/0/0/CPU0:router(config-atm-vc)# encapsulation aal5mux
```

The following example shows how to remove **aal5mux ipv4** encapsulation from a VC-class:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# vc atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# no encapsulation aal5mux ipv4
```

The following example shows how to configure an individual Layer 2 PVC with **aal0** encapsulation:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/1.10 l2transport
RP/0/0/CPU0:router(config-if)# pvc 30/300
RP/0/0/CPU0:router(config-atm-l2transport-pvc)# encapsulation aal0
```

Related Commands

Command	Description
show atm pvc, on page 70	Displays ATM PVC and traffic information for the entire router.
show atm vc-class, on page 84	Displays information about all ATM VC classes on the router or for a specific ATM VC-class.

f4oam disable

To disable the F4 Operations Administration and Maintenance (OAM) packets for a VP-tunnel, enter the **f4oam disable** command in ATM VP-tunnel configuration mode. To re-enable F4 OAM packets for a VP-tunnel, enter the **no** form of this command.

f4oam disable

no f4oam disable

Syntax Description This command has no keywords or arguments.

Command Default F4 OAM is enabled by default.

Command Modes ATM Vp-tunnel configuration

Command History	Release	Modification
	Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Task ID	Operations
	atm	read, write

Examples The following example shows how to restrict a VP from passing OAM packets:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router (config)# interface atm 0/6/0/0
RRP/0/0/CPU0:router(config-if)# vp-tunnel 10
RP/0/0/CPU0:router(config-atm-vp-tunnel)# f4oam disable
```

The following example shows how to re-enable the passing of OAM packets on a VP:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router (config)# interface atm 0/6/0/0
RRP/0/0/CPU0:router(config-if)# vp-tunnel 10
RP/0/0/CPU0:router(config-atm-vp-tunnel)# no f4oam disable
```

Related Commands

Command	Description
show atm interface atm, on page 63	Displays ATM-specific information about an ATM interface.
show atm class-link, on page 56	Displays configuration information for the parameters on a VC class that is associated with a particular PVC.
show atm vc-class, on page 84	Displays information about all ATM VC classes on the router or for a specific ATM VC-class.
show atm vp-tunnel, on page 88	Displays VP tunnel information for the entire router or for a specific interface.

interface atm

To configure an ATM interface and enter ATM interface configuration mode, use the **interface atm** command in global configuration mode. To delete the interface configuration, use the **no** form of this command.

interface atm *interface-path-id* [. *subinterface*][**point-to-point**|**l2transport**]

no interface atm *interface-path-id* [. *subinterface*]

Syntax Description

<i>interface-path-id</i> . [<i>subinterface</i>]	Physical interface or virtual interface followed by the optional subinterface path ID. Naming notation is <i>interface-path-id.subinterface</i> . The period in front of the subinterface value is required as part of the notation. For more information about the syntax for the router, use the question mark (?) online help function.
point-to-point	Interface functions as one endpoint of a point-to-point link.
l2transport	Interface functions as one endpoint on an Layer 2 link.

Command Default

No interfaces are configured.

Command Modes

Global configuration (config)

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	To support Layer 2 VPN ATM ACs, this command was updated to include the l2transport keyword.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **interface** command enters interface configuration mode to allow you to configure interfaces. If a virtual interface is configured, then the interface is created if it did not already exist.

When you issue the **interface atm** command in global configuration mode, the CLI prompt changes to “config-if,” indicating that you have entered interface configuration submenu for an ATM interface.

**Note**

Although the CLI prompt looks the same in the interface configuration mode for an ATM main interface and for an ATM subinterface, the commands that are available under each interface type vary.

In the following sample output, the question mark (?) online help function displays all the commands available under the interface configuration submode for a ATM main interface:

```
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0
RP/0/0/CPU0:router(config-if)#?

affinity      Affinity to include/exclude
atm           Global ATM interface configuration subcommands
bandwidth     Set the bandwidth of an interface
cdp           Enable CDP on an interface
class-int     Apply a VC class
commit        Commit the configuration changes to running
crypto        Set crypto parameters
dampening     configure state dampening on the given interface
describe      Describe a command without taking real actions
description   Set description for this interface
do            Run an exec command
exit          Exit from this submode
flow          Netflow configuration
frame-relay   Frame Relay interface configuration commands
ipv4          IPv4 interface subcommands
ipv6          IPv6 interface subcommands
l2transport   Enable Layer 2 transport and enter its configuration submode
load-interval Specify interval for load calculation for an interface
mpls          MPLS interface subcommands
mtu           Set the MTU on an interface
no            Negate a command or set its defaults
pvc           Configure a pvc on this interface
root          Exit to the global configuration mode
show          Show contents of configuration
--More--
```

In the following sample output, the question mark (?) online help function displays all the commands available under the interface configuration submode for a point-to-point ATM subinterface:

```
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-if)# ?

affinity      Affinity to include/exclude
bandwidth     Set the bandwidth of an interface
cdp           Enable CDP on an interface
class-int     Apply a VC class
commit        Commit the configuration changes to running
crypto        Set crypto parameters
dampening     configure state dampening on the given interface
describe      Describe a command without taking real actions
description   Set description for this interface
do            Run an exec command
exit          Exit from this submode
flow          Netflow configuration
frame-relay   Frame Relay interface configuration commands
ipv4          IPv4 interface subcommands
ipv6          IPv6 interface subcommands
load-interval Specify interval for load calculation for an interface
logging       Per-interface logging configuration
mpls          MPLS interface subcommands
mtu           Set the MTU on an interface
no            Negate a command or set its defaults
pvc           Configure a pvc on this interface
root          Exit to the global configuration mode
show          Show contents of configuration
shutdown      shutdown the given interface
```

--More--

In the following sample output, the question mark (?) online help function displays all the commands available under the interface configuration submode for an ATM Layer 2 subinterface:

```
RP/0/0/CPU0:router(config)#interface atm 0/2/0/0.1 l2transport
RP/0/0/CPU0:router(config-if)#?
```

bandwidth	Set the bandwidth of an interface
cdp	Enable CDP on an interface
commit	Commit the configuration changes to running
crypto	Set crypto parameters
dampening	Configure state dampening on the given interface
describe	Describe a command without taking real actions
description	Set description for this interface
do	Run an exec command
exit	Exit from this submode
firewall	Configure a Virtual Firewall on this Interface
flow	Netflow configuration
frame-relay	Frame Relay interface configuration commands
ipv4	IPv4 interface subcommands
ipv6	IPv6 interface subcommands
load-interval	Specify interval for load calculation for an interface
logging	Per-interface logging configuration
mpls	MPLS interface subcommands
mtu	Set the MTU on an interface
no	Negate a command or set its defaults
pvc	Configure a pvc on this interface
pvp	Configure a pvp on this interface
pwd	Commands used to reach current submode
root	Exit to the global configuration mode
show	Show contents of configuration

Cisco IOS XR software supports bulk removal of subinterfaces. To remove several subinterfaces with a single command enter, replace the *subinterface* argument with an asterisk (*), as shown in the following example:

```
RP/0/0/CPU0:router(config)# no interface atm 0/6/0/1.*
```



Note

Before you can perform a bulk removal of several subinterfaces, OAM F5 loopback cell generation must be enabled on the PVCs that are configured under the subinterfaces you want to remove. To enable OAM F5 loopback cell generation on a PVC, use the [oam-pvc manage](#), on page 36 command.



Note

The **l2transport** keyword is mutually exclusive with any Layer 3 interface configuration.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to enter interface configuration mode for the ATM main interface 1 in slot 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/1
```



```
RP/0/0/CPU0:router(config-if)#
```

The following example shows how to enter ATM interface configuration mode for a point-to-point subinterface. In this example, the user adds a subinterface to the ATM main interface 0 in slot 2:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-if)#
```

The following example shows how to enter ATM interface configuration mode for a Layer 2 subinterface. In this example, the user adds a subinterface to the ATM main interface 0 in slot 2:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 l2transport
RP/0/0/CPU0:router(config-if)#
```

Related Commands

Command	Description
show atm interface atm, on page 63	Displays ATM-specific information about an ATM interface.

I2transport (ATM)

To enable Layer 2 transport port mode on an ATM interface and enter Layer 2 transport configuration mode, use the **I2transport** command in interface configuration mode. To disable Layer 2 transport port mode on an ATM interface, use the **no** form of this command.

I2transport

no I2transport

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes Interface configuration (config-if)

Release	Modification
Release 3.4.1	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you issue the **I2transport** command in interface configuration mode, the CLI prompt changes to “config-if-l2,” indicating that you have entered the Layer 2 transport configuration submode. In the following sample output, the question mark (?) online help function displays all the commands available under Layer 2 transport configuration submode for an ATM interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0
RP/0/0/CPU0:router(config-if)# I2transport
RP/0/0/CPU0:router(config-if-l2)# ?

cell-packing    Configure L2VPN cell packing parameters
commit          Commit the configuration changes to running
describe        Describe a command without taking real actions
do              Run an exec command
exit            Exit from this submode
no              Negate a command or set its defaults
pwd             Commands used to reach current submode
root            Exit to the global configuration mode
service-policy  Configure QoS Service policy
show            Show contents of configuration

RP/0/0/CPU0:router(config-if-l2)#
```

**Note**

The **l2transport** command is mutually exclusive with any Layer 3 interface configuration.

Task ID

Task ID	Operations
l2vpn	read, write

Examples

The following example shows how to enable Layer 2 transport port mode on an ATM interface and enter Layer 2 transport configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface ATM 0/2/0/0
RP/0/0/CPU0:router(config-if)# l2transport
RP/0/0/CPU0:router(config-if-l2)#
```

Related Commands

Command	Description
show l2vpn xconnect	Displays brief information on configured xconnects.

oam ais-rdi

To configure the behavior of an ATM permanent virtual circuit (PVC) when it receives Operation, Administration, and Maintenance (OAM) alarm indication signal and remote defect indication (AIS/RDI) cells, use the **oam ais-rdi** command in ATM PVC configuration or ATM VC-class configuration mode. To return the PVC to the default behavior, use the **no** form of this command.

oam ais-rdi [*down-count* [*up-count*]]

no oam ais-rdi [*down-count* [*up-count*]]

Syntax Description

down-count	(Optional) Number of consecutive OAM AIS/RDI cells received on a PVC before that PVC is brought down. Range is from 1 through 60. The default is 1.
up-count	(Optional) Number of seconds after which a down PVC is brought up if no OAM AIS/RDI cells are received. Range is from 3 through 60. The default is 3. The specified <i>up-count</i> applies under the following conditions only: • OAM F5 loopback cell generation must be enabled on the PVC. • The PVC is in a down state because it received AIS/RDI cells. Note To enable OAM F5 loopback cell generation on a PVC, use the oam-pvc manage, on page 36 command.

Command Default

down-count: 1
up-count: 3

Command Modes

ATM VC-class configuration (config-vc-class-atm)
ATM PVC configuration (config-atm-vc)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **oam ais-rdi** command to configure the following:

- the maximum number of Operation, Administration, and Maintenance (OAM) alarm indication signals and remote defect indication (AIS/RDI) cells that can be received on a PVC before it is brought down.

- the interval after which a downed PVC comes back up if no OAM AIS/RDI cells have been received.

Use the **oam ais-rdi** command in ATM PVC configuration mode to configure the OAM AIS/RDI down count and up count for a specific PVC.

Use the **oam ais-rdi** command in ATM VC-class configuration mode to configure the OAM AIS/RDI down count and up count for all PVCs that are associated with the specified class map.

Keep the following in mind when configuring the OAM AIS/RDI down count and up count:

- Unless specifically configured otherwise, a PVC automatically inherits the OAM AIS/RDI down count and up count of the VC-class that is assigned to the main interface or subinterface that hosts the PVC.
- If the OAM AIS/RDI down count and up count is not configured for the VC-class, or if no VC-class is assigned to the main interface or subinterface that hosts the PVC, or to the PVC itself, then the PVC inherits the default OAM AIS/RDI down count and up count.

The default values for the OAM AIS/RDI down count and up count are used in the following situations:

- If the **oam ais-rdi** command has not been entered
- If the **oam ais-rdi** command is entered without the *up-count* or *down-count* argument
- If the **no oam ais-rdi** command is entered

If the **oam ais-rdi** command is entered without the *up-count* or *down-count* argument, the command does not appear in the **show running-config** command output.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to bring down a PVC after 25 consecutive OAM AIS/RDI cells have been received on the PVC. The PVC is brought up when no OAM AIS/RDI cells have been received for 5 seconds.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 50/100
RP/0/0/CPU0:router(config-atm-vc)# oam ais-rdi 25 5
```

The following example shows how to configure the OAM AIS/RDI down count and up count for a VC-class. In this example, all PVCs that are associated with the VC-class called “classA” inherit an OAM AIS/RDI down count of 30 and up count of 10:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# vc atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# oam ais-rdi 30 10
```

Related Commands

Command	Description
show atm class-link , on page 56	Displays configuration information for the parameters on a VC class that is associated with a particular PVC.
show atm pvc , on page 70	Displays ATM PVC and traffic information for the entire router.

oam-pvc manage

To enable ATM Operation, Administration, and Maintenance (OAM) F5 loopback cell generation and configure continuity check (CC) management for an ATM permanent virtual circuit (PVC), use the **oam-pvc manage** command in ATM PVC configuration or ATM VC-class configuration mode. To disable OAM F5 continuity checking on a PVC, use the **no** form of this command.

In ATM PVC configuration mode:

oam-pvc manage [*f* frequency] [**disable**] [**keep-vc-up** [**seg-aisrdi-failure**]]

no oam-pvc manage [frequency] [**disable**] [**keep-vc-up** [**seg-aisrdi-failure**]]

In ATM VC class configuration mode:

oam-pvc manage [frequency]

no oam-pvc manage [frequency]

Syntax Description

frequency	(Optional) Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted. Range is from 0 through 600.
disable	(Optional) Disables OAM management on the specified PVC. Note The disable keyword is available in ATM PVC configuration mode only.
keep-vc-up	(Optional) Specifies that PVC remains in the UP state when CC cells detect connectivity failure. Note The keep-vc-up keyword is available in ATM PVC configuration mode only.
seg-aisrdi-failure	(Optional) Specifies that if segment AIS/RDI cells are received, the VC will not be brought down because of end CC failure or loopback failure. Note The seg-aisrdi-failure keyword is available in ATM PVC configuration mode only.

Command Default

frequency: 10 seconds

Command Modes

ATM PVC configuration (config-atm-vc)

ATM VC class configuration (config-vc-class-atm)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Keep the following in mind when configuring the OAM F5 loopback cell generation and CC management for an ATM PVC:

- Unless specifically configured otherwise, a PVC automatically inherits the OAM F5 loopback cell management configuration from the VC-class that is assigned to the main interface or subinterface that hosts the PVC.
- If OAM F5 loopback cell generation is not enabled for the assigned VC-class, or if no VC-class is assigned to the PVC itself, or to main interface or subinterface that hosts the PVC, then OAM F5 loopback cell generation is disabled on that PVC. To enable OAM F5 loopback cell generation on that PVC, you need to use the **oam-pvc manage** command in ATM PVC configuration mode.
- VC-classes support the configuration of the *seconds* argument only; the **keep-vc-up**, **disable**, and **seg-aisr-di-failure** keywords are available in ATM PVC configuration mode only and are configured directly on each individual PVC.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to enable OAMF5 loopback cell generation on a PVC, and configure the PVC to remain up when CC cells detect connectivity failure:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 10/100
RP/0/0/CPU0:router(config-atm-vc)# oam-pvc manage 200 keep-vc-up
```

The following example shows how to disable OAMF5 loopback cell generation on a PVC:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 10/100
RP/0/0/CPU0:router(config-atm-vc)# oam-pvc manage disable
```

The following example shows how to configure the OAM F5 loopback frequency for a VC-class. In this example, all PVCs associated with the VC-class called “classA” transmit end-to-end F5 OAM loopback cells every 300 seconds:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# vc atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# oam-pvc manage 300
```

The following example shows how to remove the configured ATM OAM F5 loopback frequency from a VC-class:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# vc atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# no oam-pvc manage
```

Related Commands

Command	Description
show atm class-link, on page 56	Displays configuration information for the parameters on a VC class that is associated with a particular PVC.
show atm pvc, on page 70	Displays ATM PVC and traffic information for the entire router.

oam retry

To configure the number of F5 Operation, Administration, and Maintenance (OAM) loopback cells that need to be successfully transmitted by a down ATM permanent virtual circuit (PVC) before it is brought up, use the **oam retry** command in ATM PVC configuration or ATM VC-class configuration mode. To return the PVC to the default behavior, use the **no** form of this command

oam retry [*up-count* [*down-count* [*retry-frequency*]]]

no oam retry [*up-count* [*down-count* [*retry-frequency*]]]

Syntax Description

retry-count	(Optional) Number of consecutive end-to-end F5 OAM loopback cell responses that must be received to change a connection state to up.
down-count	(Optional) Number of consecutive unreceived end-to-end F5 OAM loopback cells allowed on a PVC before its state changes to down.
retry-frequency	(Optional) Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted when a change in the up or down state is being verified. For example, if a PVC is up and a loopback cell response is not received after the frequency (in seconds) is specified using the oam-pvc manage command, loopback cells are sent at the retry frequency to verify whether the PVC is down.

Command Default

up-count: 3

down-count: 5

retry-frequency: 1 second

Command Modes

ATM PVC configuration (config-atm-vc)

ATM VC-class configuration (config-vc-class-atm)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Keep the following in mind when configuring the OAM AIS/RDI down count and up count:

- Unless specifically configured otherwise, a PVC automatically inherits the OAM AIS/RDI down count and up count of the VC-class that is assigned to the main interface or subinterface that hosts the PVC.

- If no encapsulation is configured for the VC-class, or if no VC-class is assigned to the main interface or subinterface that hosts the PVC, or to the PVC itself, then the PVC inherits the default OAM AIS/RDI down count and up count.

Keep the following in mind when configuring the F5 OAM loopback cell up count, down count, and retry frequency:

- Unless specifically configured otherwise, a PVC automatically inherits the F5 OAM loopback cell up count, down count, and retry frequency of the VC-class that is assigned to the main interface or subinterface that hosts the PVC.
- If the F5 OAM loopback cell up count, down count, and retry frequency are not configured for the VC-class, or if no VC-class is assigned to the PVC itself, or to the main interface or subinterface that hosts the PVC, then the PVC inherits the default F5 OAM loopback cell up count, down count, and retry frequency.

In other words, if the **oam retry** command is not explicitly configured on an individual PVC, then that PVC inherits the following default configuration (listed in order of precedence):

- F5 OAM loopback cell up count, down count, and retry frequency configured for the VC-class that is assigned to the PVC itself
- F5 OAM loopback cell up count, down count, and retry frequency configured for VC-class assigned to the ATM subinterface that hosts the PVC
- F5 OAM loopback cell up count, down count, and retry frequency configured for the VC-class assigned to the ATM main interface that hosts the PVC



Note

For the defaults, it is assumed that OAM loopback cell generation is enabled on the PCV. To enable OAM F5 loopback cell generation, use the **oam-pvc manage** command.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to OAM management parameters for an ATM PVC. In this example, the PVC is brought down after five consecutive OAM AIS/RDI cells are received and then brought back up when no OAM AIS/RDI cells are received for 10 seconds. End-to-end F5 OAM loopback cells are transmitted every five seconds if a change in the up or down state is verified.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 10/100
RP/0/0/CPU0:router(config-atm-vc)# oam retry 5 10 5
```

The following example shows how to configure OAM management parameters for a VC-class. In this example, all PVCs that are associated with the VC-class called “classA” inherit an OAM up-count of 3, down-count of 5, and retry-frequency of 10:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# vc atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# oam retry 10 20 10
```

Related Commands

Command	Description
show atm class-link, on page 56	Displays configuration information for the parameters on a VC class that is associated with a particular PVC.
show atm pvc, on page 70	Displays ATM PVC and traffic information for the entire router.

ping atm interface atm

To verify connectivity between two ATM connection endpoints through a permanent virtual circuit (PVC) or VP-tunnel, use the **ping atm interface atm** command in EXEC mode.

ping atm interface atm *interface-path-id* [. *subinterface*] [*vpi/vci*] [**end-loopback** *packets*| **seg-loopback** *packets*] [**timeout** *seconds*]

Syntax Description

<i>interface-path-id</i> [. <i>subinterface</i>]	Physical interface or virtual interface followed by the optional subinterface path ID. Naming notation is <i>interface-path-id.subinterface</i> . The period in front of the subinterface value is required as part of the notation. For more information about the syntax for the router, use the question mark (?) online help function.
<i>vpi/vci</i>	(Optional) ATM virtual path identifier (VPI) and virtual channel identifier (VCI) numbers. The absence of the slash (/) and a <i>vpi</i> value defaults the <i>vpi</i> value to 0. Note A VPI of 0 is not applicable to VP-tunnels or Layer 2 PVPs.
end-loopback <i>packets</i>	(Optional) Sends a specified number of end-to-end OAM loopback packets over the connection. Replace <i>packets</i> with the number of end-to-end OAM loopback packets you want to send over the ATM interface.
seg-loopback <i>packets</i>	(Optional) Sends a specified number of segmented OAM loopback packets over the connection. Replace <i>packets</i> with the number of OAM loopback packets you want to send over the ATM interface.
timeout <i>seconds</i>	Predetermined time during which the destination can send an OAM loopback response cell back to the source. Replace <i>seconds</i> with number of seconds to wait for an OAM loopback response before the ping times out. The default value of the timeout is 2 seconds on Cisco routers.

Command Default

seconds: 2

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The following guidelines apply to PVCs and VC-classes.

The **ping atm interface atm** command sends an OAM packet to verify ATM PVC connectivity. The status of the PVC is displayed when a response to the OAM packet is received. This is a common method for testing the accessibility of the devices.

The **ping atm interface atm** command is used to determine the following:

- Whether a remote host is active or inactive.
- The round-trip delay in communicating with the host.
- Packet loss.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
 - *rack*: Chassis number of the rack.
 - *slot*: Physical slot number of the line card.
 - *module*: Module number. A physical layer interface module (PLIM) is always 0.
 - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

Include the **end-loopback packets** keyword argument with the **ping atm interface atm** command to verify end-to-end PVC integrity.

Include the **seg-loopback packets** keyword argument with the **ping atm interface atm** command to verify PVC integrity to the immediate neighboring ATM device.



Note

The **ping** command is not available for Layer 2 ACs.

Task ID

Task ID	Operations
basic-services	execute
atm	read

Examples

The following example shows how verify connectivity between two ATM connection endpoints through a PVC with a VPI of 10 and a VCI of 100.

```
RP/0/0/CPU0:router# ping atm interface atm 0/2/0/0.10 10/100
```

Related Commands

Command	Description
show atm interface atm, on page 63	Displays ATM-specific information about an ATM interface.

pvc (ATM)

To create an ATM permanent virtual circuit (PVC) with Interim Local Management Interface (ILMI) encapsulation and enter ATM virtual circuit configuration mode, use the **pvc** command in interface configuration mode or subinterface configuration mode. To remove an ATM PVC from an interface, use the **no** form of this command.

In interface configuration mode for a point-to-point ATM main interface:

pvc *vpi/vci* **ilmi**

no pvc *vpi/vci* **ilmi**

In interface configuration mode for an ATM subinterface:

pvc *vpi/vci*

no pvc *vpi/vci*

Syntax Description

vpi/	ATM network virtual path identifier (VPI) for this PVC. If support for the 12-bits VPI Network-Node Interface (NNI) cell format is enabled on the ATM main interface that hosts this PVC, then the range is from 0 through 4095. If support for the 12-bits VPI NNI cell format is not enabled on the host ATM main interface, then the range is from 0 through 255. Note To enable support for the 12-bits VPI NNI cell format on the main ATM interface hosting the specified PVC, use the atm maxvpi-bits 12 command.
vci	ATM network virtual channel identifier (VCI) for this PVC. Range is from 1 through 65535. The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only. Note Typically, lower values from 1 through 18 are reserved for specific traffic (for example, F4 OAM, ILMI, and so on), and should not be used. Note The <i>vpi</i> and <i>vci</i> arguments cannot both be set to 0; if one is 0, the other cannot be 0.
ilmi	Sets up communication with the Interim Local Management Interface (ILMI). The associated VPI is 0, and VCI the associated VCI is any VCI. Note VCI 16 is typically used for ILMI. Note The ilmi keyword is available for point-to-point ATM interfaces only.

Command Default

No PVC is defined.

Command Modes

Interface configuration (config-if)

Subinterface configuration (config-subif)

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	This command was supported in subinterface configuration mode for ATM subinterface attachment circuits (ACs).

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **pvc** command creates a PVC and attaches it to the specified VPI and VCI. Both the *vpi* and *vci* arguments cannot be simultaneously specified as 0; if one is 0, the other cannot be 0.

Cisco IOS XR software dynamically creates rate queues as necessary to satisfy the requests of the PVC commands.

When you issue the **pvc** command in interface or subinterface configuration mode for a point-to-point ATM main interface, the CLI prompt changes to “config-atm-vc,” indicating that you have entered the ATM virtual circuit configuration submode.



Note

Although the CLI prompt looks the same for the ATM virtual circuit configuration submode under the ATM main interface and the ATM subinterface in point-to-point configurations, the commands that are available under each interface type vary.

When you issue the **pvc** command in subinterface configuration mode for an ATM AC, the CLI prompt changes to “config-atm-l2transport-pvc,” indicating that you have entered the ATM layer 2 transport PVC configuration submode.



Note

For the 4-Port OC-3 and 4-Port OC-12 line cards, the VCI range is 19 through 65535.

In the following sample output, the question mark (?) online help function displays all the commands available under the ATM virtual circuit configuration submode for the main ATM interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-if)# pvc 10/100
RP/0/0/CPU0:router(config-atm-vc ?

  commit      Commit the configuration changes to running
  describe    Describe a command without taking real actions
  do           Run an exec command
  exit        Exit from this submode
  no          Negate a command or set its defaults
  root        Exit to the global configuration mode

RP/0/0/CPU0:router(config-atm-vc)#
```


In the following sample output, the question mark (?) online help function displays all the commands available under the ATM virtual circuit configuration submode for the ATM subinterface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config-if)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 20/200
RP/0/0/CPU0:router(config-atm-vc)# ?

class-vc      Configure vc-class
commit        Commit the configuration changes to running
describe      Describe a command without taking real actions
do            Run an exec command
encapsulation Configure encapsulation on this PVC
exit          Exit from this submode
no            Negate a command or set its defaults
oam           Configure ATM OAM VC commands
oam-pvc       Enter OAM to generate OAM cells
root          Exit to the global configuration mode
service-policy Configure QoS Service policy
shape         ATM Traffic Shaping
show          Show contents of configuration
```

```
RP/0/0/CPU0:router(config-atm-vc)#
```

In the following sample output, the question mark (?) online help function displays all the commands available under the ATM layer 2 transport PVC configuration submode for the ATM interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config-if)# interface atm 0/2/0/0.1 l2transport
RP/0/0/CPU0:router(config-subif)# pvc 20/200
RP/0/0/CPU0:router(config-atm-l2transport-pvc)# ?

cell-packing  Configure L2VPN cell packing parameters
class-vc      Configure vc-class
commit        Commit the configuration changes to running
describe      Describe a command without taking real actions
do            Run an exec command
encapsulation Configure encapsulation on this PVC
exit          Exit from this submode
no            Negate a command or set its defaults
oam           Configure ATM OAM VC commands
oam-ac        Configure L2VPN OAM parameters
oam-pvc       Enter OAM to generate OAM cells
pwd           Commands used to reach current submode
root          Exit to the global configuration mode
service-policy Configure QoS Service policy
shape         ATM Traffic Shaping
show          Show contents of configuration
```

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to create an ATM PVC with ILMI encapsulation on an ATM main interface, and enter ATM virtual circuit configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/6/0/1
RP/0/0/CPU0:router(config-if)# pvc 5/100 ilmi
```

```
RP/0/0/CPU0:router(config-atm-vc)#
```

The following example shows how to create an ATM PVC on a point-to-point ATM subinterface and enter ATM virtual circuit configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config-if)# interface atm 0/2/0/0.1 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 20/200
RP/0/0/CPU0:router(config-atm-vc)#
```

The following example shows how to create an ATM PVC on an ATM layer 2 subinterface and enter ATM layer 2 transport PVC configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config-if)# interface atm 0/2/0/0.1 l2transport
RP/0/0/CPU0:router(config-subif)# pvc 20/200
RP/0/0/CPU0:router(config-atm-l2transport-pvc)#
```

Related Commands

Command	Description
show atm class-link , on page 56	Displays configuration information for the parameters on a VC class that is associated with a particular PVC.
show atm pvc , on page 70	Displays ATM PVC and traffic information for the entire router.

pvp (ATM)

To create an ATM permanent virtual path (PVP) and enter ATM layer 2 transport PVP configuration mode, use the **pvp** command in subinterface configuration mode. To remove an ATM PVP from an interface, use the **no** form of this command.

pvp *vpi*

no pvp *vpi*

Syntax Description

<i>vpi</i>	ATM network virtual path identifier (VPI) for this PVC. If support for the 12-bit VPI Network-Node Interface (NNI) cell format is enabled on the ATM main interface that hosts this PVP, then the range is from 1 through 4095. If support for the 12-bit VPI NNI cell format is not enabled on the host ATM main interface, then the range is from 1 through 255. Note To enable support for the 12-bits VPI NNI cell format on the main ATM interface hosting the specified PVP, use the atm maxvpi-bits 12 command.

Command Default

No PVC is defined.

Command Modes

Subinterface configuration (config-subif)

Command History

Release	Modification
Release 3.4.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **pvp** command creates a PVP and attaches it to the specified VPI.

Cisco IOS XR software dynamically creates rate queues as necessary to satisfy the requests of the PVP commands.

When you issue the **pvp** command in subinterface configuration mode, the CLI prompt changes to “config-atm-l2transport-pvp,” indicating that you have entered the ATM layer 2 transport PVP configuration submode.



Note

The **pvp** command is available for layer 2 subinterfaces only.

**Note**

PVPs do not support a VPI of 0.

In the following sample output, the question mark (?) online help function displays all the commands available under the ATM layer 2 transport PVP configuration submode for the ATM subinterface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config-if)# interface atm 0/2/0/0.1 l2transport
RP/0/0/CPU0:router(config-subif)# pvp 20
RP/0/0/CPU0:router(config-atm-l2transport-pvp)# ?

cell-packing    Configure L2VPN cell packing parameters
commit          Commit the configuration changes to running
describe        Describe a command without taking real actions
do              Run an exec command
exit            Exit from this submode
no              Negate a command or set its defaults
pwd             Commands used to reach current submode
root            Exit to the global configuration mode
shape           ATM Traffic Shaping
show            Show contents of configuration
```

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to create an ATM PVP on an ATM subinterface, and enter ATM layer 2 transport PVP configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config-if)# interface atm 0/2/0/0.1 l2transport
RP/0/0/CPU0:router(config-subif)# pvp 20
RP/0/0/CPU0:router(config-atm-l2transport-pvp)#
```

Related Commands

Command	Description
show atm pvp , on page 78	Displays ATM PVP and traffic information for the entire router, or a specific VPI or ATM interface.

shape

To configure ATM traffic shaping for a PVC, use the **shape** command in the appropriate command mode. To remove the configured ATM traffic shaping and return the PVC to using the default constant bit rate (CBR) traffic shaping, use the **no** form of this command.

```
shape {cbr peak_output_rate| ubr peak_output_rate| vbr-nrt peak_output_rate sustained_output_rate
burst_size| vbr-rt peak_output_rate sustained_output_rate burst_size}
```

```
no shape
```

Syntax Description

cbr	Configures the service class for the VC or VP-tunnel to be CBR. Range is from 38 through 622000 kbps. This is the default service class.
ubr	Configures the service class for the VC or VP-tunnel to be unspecified bit rate (UBR). UBR is intended for non-real-time applications that do not require any maximum bound on the transfer delay or on the cell loss ratio. Ranges follow: • OC12—from 38 through 622000 • OC3—from 38 through 155000
vbr-nrt	Configures the service class for the VC or VP-tunnel to be variable Bit Rate-Non Real Time (VBR-nrt).
vbr-rt	Configures the service class for the VC or VP-tunnel to be variable bit rate-real time (VBR-rt).
<i>peak_output_rate</i>	Peak output rate for the bit rate. Replace the <i>peak_output_rate</i> argument with the peak output rate in kbps. For VP-tunnels, the ranges follow: • OC12—84 through 622000 • OC3—84 through 155000 For VCs, the ranges follow: • OC12—38 through 622000 • OC3—38 through 155000 Note The <i>peak_output_rate</i> must be to be greater than <i>sustained_output_rate</i> .

sustained_output_rate Sustained output rate for the bit rate. Replace the *sustained_output_rate* argument with the sustained output rate in kbps.

For VP-tunnels, the ranges follow:

- OC12—84 through 622000
- OC3—84 through 155000

For VCs, the ranges follow:

- OC12—38 through 622000
- OC3—38 through 155000

Note The *sustained_output_rate* must be to be less than *peak_output_rate*.

burst_size Burst cell size for the bit rate. Replace the *sustained_output_rate* argument with the burst size. Range is from 1 through 8192.

Command Default

The default service class for the VC is **cbr**.

Command Modes

ATM PVC configuration (config-atm-vc)
 ATM VC-class configuration (config-vc-class-atm)
 ATM Layer 2 transport PVC configuration (config-atm-l2transport-pvc)
 ATM Layer 2 transport PVP configuration (config-atm-l2transport-pvp)
 ATM VP tunnel configuration mode (config-atm-vp-tunnel)

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	This command was supported in ATM layer 2 transport PVC configuration mode and ATM layer 2 transport PVP configuration mode.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to configure the service class for a PVC to be UBR, with a peak output of 150,000 kbps:

```
RP/0/0/CPU0:router#config
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0.2 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 20/200
RP/0/0/CPU0:router(config-atm-vc)# shape ubr 150000
```

The following example shows how to configure the service class for a VP-tunnel to be CBR, with a peak output of 150,000 kbps:

```
RP/0/0/CPU0:router#config
RP/0/0/CPU0:router(config)# interface atm 0/6/0/0
RP/0/0/CPU0:router(config-if)# vp-tunnel 10
RP/0/0/CPU0:router(config-atm-vp-tunnel)# shape cbr 150000
```

The following example shows how to configure the service class for a VC to be VBR-nrt:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# vc-class atm class1
RP/0/0/CPU0:router(config-vc-class-atm)# shape vbr-nrt 100000 100000 8000
RP/0/0/CPU0:router(config-vc-class-atm)# exit
RP/0/0/CPU0:router(config)# exit
Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:y
RP/0/0/CPU0:router#
```

Related Commands

Command	Description
show atm pvc, on page 70	Displays ATM PVC and traffic information for the entire router.
show atm pvp, on page 78	Displays ATM PVP and traffic information for the entire router, or a specific VPI or ATM interface.
show atm vp-tunnel, on page 88	Displays VP tunnel information for the entire router or for a specific interface.

show atm cell-packing

To display cell packing information for the Layer 2 attachment circuits (ACs) configured on your system, use the **show atm cell-packing** command in EXEC mode.

show atm cell-packing

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes EXEC (#)

Command History	Release	Modification
	Release 3.4.1	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Task ID	Operations
	atm	read

Examples The following sample output is from the **show atm cell-packing** command:

```
RP/0/0/CPU0:router# show atm cell-packing
```

Circuit Type		local MNCP	avg # cells/pkt rcvd	negotiated MNCP	avg # cells/pkt sent	MCPT (us)
ATM0/2/0/1.200	vc 1/200	1	0	1	0	50
ATM0/2/0/1.300	vc 1/300	1	0	1	0	50

Table 1: show atm cell-packing Field Descriptions

Field	Description
Circuit Type	AC instance and virtual channel identifier. • The AC instance is expressed in the <i>rack/slot/module/port.subinterface</i> format. • The virtual channel identifier is expressed in the <i>subinterface/vci</i> format.
Local MNCP	Maximum number of cells that can be packed on the local AC.
AVG cells/pkt rcvd	Average number of cells in a packed cell received from the peer, or the average number of cells packed by the peer.
negotiated MNCP	Negotiated maximum number of cells that can be packed on a psuedowire between PE routers.
AVG cells/pkt sent	Maximum number of cells that can be packed on the peer AC.
MCPT	Maximum number of cells allowed per packet configured on the local MCPT.

show atm class-link

To display configuration information for the parameters on a virtual circuit (VC) class that is associated with a particular PVC, use the **show atm class-link** command in privileged EXEC mode.

show atm class-link *vpi/vci*

Syntax Description

<i>vpi/vci</i>	ATM VPI and VCI numbers. The absence of the slash (/) and a <i>vpi</i> value defaults the <i>vpi</i> value to 0.
Note	A VPI of 0 is not applicable to VP-tunnels.

Command Default

The absence of the slash (/) and a *vpi* value defaults the *vpi* value to 0.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	The show atm class-link command output was modified to include Layer 2 VPN parameters when appropriate.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

If a PVC or its host interface is associated with a VC-class, then that PVC inherits all the values configured for that VC-class. If no VC-class is configured for a PVC or its host interface, then the command output displays a message that says “VC class not supported on this VC.”

Task ID

Task ID	Operations
atm	read

Examples

The following sample output is from the **show atm class-link** command:

```
RP/0/0/CPU0:router# show atm class-link 10/100

ATM0/2/0/0.1: VPI: 10 VCI: 100
shape : cbr 100000 (VC-class configured on VC)
encapsulation : aal5snap (VC-class configured on VC)
oam-pvc : manage 300 (VC-class configured on VC)
oam retry : 3 5 1 (Default value)
oam ais-rdi : 1 3 (Default value)
```

[Table 2: show atm class-link Field Descriptions, on page 57](#) describes the significant fields shown in the display.

Table 2: show atm class-link Field Descriptions

Field	Description
ATM <i>rack/slot/module/port</i>	Interface instance, expressed in the <i>rack/slot/module/port</i> format.
VPI	Virtual path identifier.
VCI	Virtual channel identifier.
shape	Service class for the VC or VP-tunnel and the peak output rate for the bit rate. Possible service classes follow: • cbr • ubr • vbr-nrt • vbr-rt
encapsulation	Encapsulation type for this VC.
oam-pvc	Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted on this PVC. Range is from 0 through 600. Note Use the oam-pvc manage command to modify the current configuration for this field.

Field	Description
oam retry	Displays the following F5 OAM loopback cell retry count, down count, and retry frequency that has been configured on the VC-class that is associated with the specified PVC: • Number of consecutive end-to-end F5 OAM loopback cell responses that must be received to change a connection state to up. (Retry count) • Number of consecutive unreceived end-to-end F5 OAM loopback cells allowed on a PVC before its state changes to down. (down count) • Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted when a change in the up or down state is being verified. (retry frequency) Note Use the oam retry command to modify the current configuration for this field. Note If the F5 OAM loopback cell retry count, down count, or retry frequency was not configured on the VC-class map that is associated with the specified PVC, then the command output does not display information for the oam retry field.
oam ais-rdi	Displays the following OAM AIS/RDI-related information for the PVC: • the maximum number of OAM AIS/RDI cells that can be received on a PVC before it is brought down. • the interval after which a downed PVC comes back up if no OAM AIS/RDI cells have been received. Note Use the oam ais-rdi command in to modify the current configuration for this field.

The following sample output is from the **show atm class-link** command when there is no VC-class associated with the specified PVC:

```
RP/0/0/CPU0:router# show atm class-link 0/50

Detailed display of VC(s) with VPI/VCI = 0/50

Class link for VC 0/50
ATM0/2/0/2: VPI: 0 VCI: 50
ILMI VC (VC class not supported on this VC)
```

Related Commands

Command	Description
class-int , on page 19	Assigns a VC class to an ATM main interface.
vc-class atm , on page 98	Creates a VC class for an ATM PVC or an ATM interface and enters VC-class configuration mode.

show atm ilmi-status

To display status information that is related to Interim Local Management Interface (ILMI), use the **show atm ilmi-status** command in EXEC mode.

```
show atm ilmi-status[atm interface-path-id[.subinterface ]]
```

Syntax Description

atm	(Optional) ATM interface for which you want to display information. Use the <i>interface-path-id</i> argument to specify the ATM interface.
interface-path-id[.subinterface]	Physical interface or virtual interface followed by the optional subinterface path ID. Naming notation is <i>interface-path-id.subinterface</i> . The period in front of the subinterface value is required as part of the notation. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

Entering the **show atm ilmi-status** command without specifying an interface displays ILMI-related status information for all ATM interfaces.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
atm	read

Examples

The following sample output is from the **show atm ilmi-status** command:

```
RP/0/0/CPU0:router# show atm ilmi-status
Interface : ATM0/2/0/1 Interface Type : Private UNI (User-side)
```

```

ILMI VCC : (20, 30)
ILMI Keepalive : Disabled
ILMI State:      WaitDevType
Peer IP Addr : 0.0.0.0      Peer IF Name : ATM1/2
Active Prefix(s) :

```

The following sample output is from the **show atm ilmi-status** command with the **atm instance** keyword and argument:

```
RP/0/0/CPU0:router# show atm ilmi-status atm 0/2/0/2
```

```

Interface : ATM0/2/0/2 Interface Type : Private UNI (User-side)
ILMI VCC : (0, 16) ILMI Keepalive : Disabled
ILMI State:      UpAndNormal
Peer IP Addr:    0.0.0.0      Peer IF Name:      ATM1/2
Active Prefix(s) :

```

Table 3: show atm ilmi-status Field Descriptions

Field	Description
Interface	Interface type and instance. The instance is displayed in the <i>rack/slot/module/port</i> format.
Interface Type	ATM interface type (Private or Public), and the communication protocol used by this interface. Note Currently, Cisco IOS XR software supports UNI only.
ILMI VCC	The virtual channel connection associated with this interface.
ILMI Keepalive	ILMI keepalives polling frequency configured on this interface. To modify the ILMI keepalives polling frequency, use the atm ilmi-keepalive command.

Field	Description
ILMI State	Status of ILMI for this interface. Possible ILMI states are: • Link failing • Establishing connection • Configuring peer information • Retrieving network prefix from peer • Registering network prefix to peer • Retrieving ATM network addresses from peer • Registering ATM network addresses to peer • Verifying configuration and ATM network addresses • WaitDevType — ILMI process is initialized and in the process of sending ILMI packets to a neighbor. In this case, the ILMI PVC is not yet established. • UpAndNormal — ILMI traps are received by the neighbors, and the PVC is established.
Peer IP Addr	IP address for the remote (neighbor) end point of the connection.
Peer IF Name	Identifies the interface at the remote (neighbor) end point of the connection.
Active Prefix(s)	Network prefix that is registered from the switch side and is active and valid.

Related Commands

Command	Description
atm ilmi-config disable, on page 5	Disables ILMI on an ATM interface.
atm ilmi-keepalive, on page 7	Enables ILMI keepalives on an ATM interface and configure keepalive polling frequency.

show atm interface atm

To display ATM-specific information about an ATM interface, use the **show atm interface atm** command in EXEC mode.

show atm interface atm *interface-path-id*

Syntax Description

interface-path-id

Physical interface or virtual interface.

Note Use the **show interfaces** command to see a list of all interfaces currently configured on the router.
For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	The show atm interface atm command output was modified to include Layer 2 VPN parameters when appropriate.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
atm	read

Examples

The following sample output is from the **show atm interface atm** command:

```
RP/0/0/CPU0:router# show atm interface atm 0/2/0/3
Interface                : ATM0/2/0/3
AAL Enabled              : AAL5
Max-VP                   : 254
```

show atm interface atm

```

Max-VC                               : 2046
Configured L2 PVPs                   : 0
Configured L2 PVCs                   : 0
Configured L3 VP-Tunnels             : 0
Configured L3 PVCs                   : 1
L2 PVPs in Down State                : 0
L2 PVCs in Down State                : 0
L3 VP-Tunnels in Down State          : 0
L3 PVCs in Down State                : 0
Cell packing count                   : 0

Received Side Statistics:
  Received Cells                     : 0
  Received Bytes                     : 0
  Received AAL Packets               : 0

Receive Side Cells Dropped:
  Unrecognized VPI/VCI               : 0

Receive Side AAL5 Packets Dropped:
  Unavailable SAR Buffer              : 0
  Non-Resource Exhaustion            : 0
  Reassembly Timeout                 : 0
  Zero Length                        : 0
  Unavailable Host Buffer             : 0
  Packet size exceeds MPS            : 0
  AAL5 Trailer Length Errors         : 0

Transmit Side Statistics:
  Transmitted Cells                  : 1899716067
  Transmitted Bytes                  : 0
  Transmitted AAL Packets            : 0

Transmit Side Cells Dropped:
  Unrecognized VPI/VCI               : 0

Transmit Side AAL5 Packets Dropped:
  Unavailable SAR Buffer              : 0
  Non-Resource Exhaustion            : 0
  WRED Threshold                     : 0
  WRED Random                        : 0

```

Table 4: show atm interface atm Field Descriptions

Field	Description
Interface	Interface type and instance. The instance is displayed in the <i>rack/slot/module/port</i> format.
Layer2 Transport Port Mode	Displays whether Layer 2 transport mode is enabled or disabled on this interface.
Cell Packing Data Unavailable	Displays whether cell packing is enabled or disabled on this interface.

Field	Description
Received Side Statistics	Displays the following statistical information for the receiving end of this interface: • Received Cells—Total number of cells received from the remote end. • Received Bytes—Total number of bytes received from the remote end. • Received AAL5 Packets—Total number of AAL5 packets received from the remote end.
Receive Side Cells Dropped	Displays the following information about AAL5 packets received from the remote end that were dropped by this end of the interface: • Unavailable SAR Buffer—Total number of AAL5 packets received from the remote end that were dropped because the Segmentation and Reassembly (SAR) buffer was unavailable. • Non-Resource Exhaustion—Total number of packets received from the remote end that were discarded due to events other than resource exhaustion, including raw or non AAL5 cells. • Reassembly Timeout—Number of AAL5 packets received from the remote end that were dropped because the reassembly of those packets took too long and the system timed-out. • CRC-32 Errors—Number of AAL5 packets received from the remote end that were dropped due to CRC-32 errors. • Zero Length—Number of AAL5 packets received from the remote end that were dropped due to • Unavailable Host Buffer—Number of AAL5 packets received from the remote end that were dropped because the host buffer was unavailable. • Packet size exceeds MPS—Number of AAL5 packets received from the remote end that were dropped due to a mismatch between the actual packet length and the reassembled packet length. • AAL5 Trailer Length Errors—Number of AAL5 packets received from the remote end that were dropped because their packet length was bigger than the AAL5 trailer.

Field	Description
Receive Side AAL5 Packets Dropped	Displays the number of received AAL5 packet drops that occurred on this interface due to the following errors: • Unavailable SAR Buffer—Number of AAL5 packets that were dropped because the SAR buffer was unavailable. • Non-Resource Exhaustion— • Reassembly Timeout— • CRC-32 Errors— • Zero Length— • Unavailable Host Buffer— • Packet size exceeds MPS— • AAL5 Trailer Length Errors—
Receive Side Cells Dropped	Number of unrecognized VPI and VCI cells received from the remote end that were dropped.

Field	Description
Receive side AAL5 Packets Dropped:	Displays the following information about AAL5 packets received from the remote end that were dropped by this end of the interface: • Unavailable SAR Buffer—Total number of AAL5 packets received from the remote end that were dropped because the Segmentation and Reassembly (SAR) buffer was unavailable. • Non-Resource Exhaustion—Total number of packets received from the remote end that were discarded due to events other than resource exhaustion, including raw or non AAL5 cells. • Reassembly Timeout—Number of AAL5 packets received from the remote end that were dropped because the reassembly of those packets took too long and the system timed-out. • CRC-32 Errors—Number of AAL5 packets received from the remote end that were dropped due to CRC-32 errors. • Zero Length—Number of AAL5 packets received from the remote end that were dropped due to • Unavailable Host Buffer—Number of AAL5 packets received from the remote end that were dropped because the host buffer was unavailable. • Packet size exceeds MPS—Number of AAL5 packets received from the remote end that were dropped due to a mismatch between the actual packet length and the reassembled packet length. • AAL5 Trailer Length Errors—Number of AAL5 packets received from the remote end that were dropped because their packet length was bigger than the AAL5 trailer.

Field	Description
Transmit Side Statistics	Displays the following statistical information for the transmit side of this interface: • Transmitted Cells—Total number of cells that were transmitted to the remote end. • Transmitted Bytes—Total number of bytes that were transmitted to the remote end. • Transmitted AAL5 Packets—Total number of AAL5 packets that were transmitted to the remote end.
Transmit side Cells Dropped	Number of VPI and VCI cells transmitted to the remote end that were dropped because they were not recognized by the remote end.
Transmit Side AAL5 Packets Dropped	Displays the following information about transmitted AAL5 packets that were dropped by the remote end: • Unavailable SAR Buffer—Number of transmitted AAL5 packets that were dropped by the remote end because the Segmentation and Reassembly (SAR) buffer was unavailable. • Non-Resource Exhaustion—Total number of packets dropped by the remote end due to events other than resource exhaustion, including raw or non AAL5 cells. • WRED Threshold—Gives the value of the packets dropped by WRED QoS mechanism. It is dropped when queue length exceeds the configured WRED max-threshold value. • WRED Random—Gives the value of the early dropped packets by WRED QoS mechanism. It is early dropped when queue length is between WRED min-threshold and max-threshold.
Cell-packing statistics	Displays the following cell packing statistics for the specified interface: • Average number of cells sent—Average number of cells in a packed cell that were packed on this interface. • Average number of cells received—Average number of cells in a packed cell that were received by this interface.

Related Commands

Command	Description
interface atm , on page 28	Configures an ATM interface and enters ATM interface configuration mode.

show atm pvc

To display ATM permanent virtual circuit (PVC) and traffic information for the entire router, or a specific VPI/VCI or ATM interface, use the **show atm pvc** command in EXEC mode.

show atm pvc [*vpi/vci*] **interface atm** **interface-path-id**

Syntax Description

<i>vpi/vci</i>	(Optional) ATM virtual path identifier (VPI) and virtual channel identifier (VCI) numbers. The absence of the slash (/) and a <i>vpi</i> value defaults the <i>vpi</i> value to 0. Note A VPI of 0 is not applicable to VP-tunnels.
interface atm	(Optional) ATM interface for which you want to display information. Use the <i>interface-path-id</i> argument to specify the ATM interface.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

Entering the **show atm pvc** command without specifying the *vpi/vci* argument or **interface atm** *instance* keyword argument displays ATM PVC and traffic information for the entire router.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	The show atm pvc command output was modified to include Layer 2 VPN parameters when appropriate.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
atm	read

Examples

The following sample output is from the **show atm pvc** command:

```
RP/0/0/CPU0:router# show atm pvc
```

Interface	VPI	VCI	Type	Encaps	SC	Peak Kbps	Avg/Min Kbps	Burst Cells	Sts
ATM0/1/0/0.230	15	230	PVC	AAL0	UBR	622000	N/A	N/A	UP
ATM0/1/0/3.19	17	19	PVC	SNAP	UBR	622000	N/A	N/A	UP

Table 5: show pvc (all PVCs) Field Descriptions

Field	Description
Interface	Interface type and instance. The instance is displayed in the <i>rack/slot/module/port</i> format.
VPI	ATM network virtual path identifier (VPI) associated with the specified interface.
VCI	ATM network virtual channel identifier (VCI) associated with the specified interface.
Type	Type of VPI/VCI associated with the specified interface. In this release, only PVCs are supported.

Field	Description
Encaps	Encapsulation type that configured on the specified interface. Possible encapsulation types follow: • ILMI—Interim Local Management Interface. ILMI encapsulation is available for point-to-point PVCs only. • MUX—aal5mux ipv4; IPv4 encapsulation for multiplex (MUX)-type VCs. MUX encapsulation is available for point-to-point PVCs only. • NLPID—aal5nlpid; AAL and encapsulation type that allows ATM interfaces to interoperate with High-Speed Serial Interfaces (HSSIs), which are using an ATM data service unit (ADSU) and running ATM-Data Exchange Interface (DXI). Supported on ATM PVCs only. NLPID encapsulation is available for point-to-point PVCs only. • SNAP—aal5snap; AAL and encapsulation type that supports Inverse ARP. Logical Link Control/Subnetwork Access Protocol precedes the protocol datagram. SNAP encapsulation is available for point-to-point PVCs only. • AAL0— • AAL5— Note To disable ILMI on a point-to-point ATM interface, use the atm ilmi-config disable command in interface configuration mode for an ATM interface. To configure aal5mux, aal5nlpid, or aal5snap encapsulation on an ATM interface, use the encapsulation command in ATM VC-class configuration mode, and then assign that VC-class to the appropriate ATM main interface.

Field	Description
SC	Service class that is assigned to the specified ATM interface. Possible service classes follow: • cbr • ubr • vbr-nrt • vbr-rt Note To modify a configured ATM service class, use the shape command in the appropriate command mode.
Peak Kbps	Peak output rate for the bit rate in kbps. Note To modify the Peak output rate, use the shape command.
Avg/Min Kbps	Number of kilobits per second sent at the average (sustained) rate. Note To modify the average (or sustained) rate, use the shape command.
Burst cells	Identifies the burst cell size in terms of number of cells. This number is the maximum number of ATM cells the VC can send at the peak rate. Note To modify the burst cell size, use the shape command.
Sts	Status of the PVC. Can be “UP” or “DOWN.”

The following sample output is from the **show atm pvc** command with the *vpi/vci* argument included:

```
RP/0/0/CPU0:router# show atm pvc 10/100

Detailed display of VC(s) with VPI/VCI = 10/100

ATM0/2/0/3.100: VPI: 10 VCI: 100
UBR, PeakRate: 622000 Kbps
AAL5-LLC/SNAP
OAM frequency: 10 second(s), OAM retry frequency: 1 second(s),
OAM up retry count: 3, OAM down retry count: 5,
OAM Keep-vc-up: False, OAM AIS-RDI failure: None,
OAM AIS-RDI down count: 1, OAM AIS-RDI up time: 3 second(s),
OAM Loopback status: No loopback enabled,
OAM VC state: Loopback Not verified,
VC is not managed by OAM,

OAM cells received: 0,
F5 InEndLoop: 0, F5 InSegLoop: 0,
F5 InEndAIS: 0, F5 InSegAIS: 0,
F5 InEndRDI: 0, F5 InSegRDI: 0,
OAM cells sent: 0,
F5 OutEndLoop: 0, F5 OutSegLoop: 0,
F5 OutEndAIS: 0, F5 OutSegAIS: 0,
```

```

F5 OutEndRDI: 0,   F5 OutSegRDI: 0,
OAM cells drops: 0

InPkts: 0           OutPkts: 0
InBytes: 0          OutBytes: 0
WRED pkt drop: 0
Non WRED pkt drop: 0

Internal state: READY
Status: UP

```

Table 6: show atm pvc Field Descriptions

Field	Description
Detailed display of VC(s) with VPI/VCI	Displays the following general information for the specified PVC: • VPI and VCI in the <i>VPI/VCI</i> format • associated interface type and instance in the <i>type rack/slot/module/port</i> format. • associated VPI • associated VCI • Service class that is assigned to the specified ATM interface. Possible service classes follow: ◦ cbr ◦ ubr ◦ vbr-nrt ◦ vbr-rt • Peak line rate (bandwidth) required for the specified ATM interface, in kilobits per second. • Whether ILMI is enabled on the interface. Note To modify a configured ATM service class, use the shape command in the appropriate command mode. Note To modify the bandwidth required for an ATM interface (peak line rate), use the shape command in interface configuration mode.
OAM frequency	Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted when a change in the up or down state of a PVC is being verified. Note To modify the OAM frequency, use the oam-pvc manage command in ATM virtual circuit (VC) class configuration mode.

Field	Description
OAM retry frequency	Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted when a change in the up or down state is being verified. Note To modify the OAM retry frequency, use the oam retry command in the appropriate command mode.
OAM up retry count	Number of consecutive end-to-end F5 OAM loopback cell responses that must be received in order to modify a PVC state to up.
OAM down retry count	Number of consecutive unreceived end-to-end F5 OAM loopback cell responses allowed before a PVC state changes to down.
OAM AIS-RDI down count:	Number of OAM AIS/RDI cells received on a PVC before it is brought down. Note To modify the OAM AIS-RDI down count, use the oam ais-rdi command in ATM VC-class configuration mode
OAM AIS-RDI up time	Interval after which a PVC is brought up if it has not received any OAM AIS/RDI cells. Note To modify the OAM AIS-RDI uptime, use the oam ais-rdi command in ATM VC-class configuration mode
OAM Loopback status	Status of end-to-end F5 OAM loopback cell generation for this VC. Possible value follow: • No loopback enabled—No loopback is enabled on this interface. • OAM Disabled—End-to-end F5 OAM loopback cell generation is disabled. • OAM Sent—OAM cell was sent. • OAM Received—OAM cell was received. • OAM Failed—OAM reply was not received within the frequency period or contained bad correlation tag.

Field	Description
OAM VC state	Current state of the specified VC. Possible VC states follow: • AIS/RDI—The VC received AIS/RDI cells. End-to-end F5 OAM loopback cells are not sent in this state. • Down Retry—An OAM loopback failed. End-to-end F5 OAM loopback cells are sent at retry frequency to verify that the VC is really down. After down-count unsuccessful retries, the VC goes to the Not Verified state. • Loopback Not Managed—VC is not being managed by OAM. • Loopback Not Verified—VC has not been verified by end-to-end F5 OAM loopback cells. AIS and RDI conditions are cleared. • Up Retry—An OAM loopback was successful. End-to-end F5 OAM loopback cells are sent at retry frequency to verify the VC is really up. After up-count successive and successful loopback retries, the VC goes to the Verified state. • Loopback Verified—Loopbacks are successful. AIS/RDI cell was not received.
OAM cells received	Number of OAM cells that have been received by this interface.
F5 InEndLoop:	Number of end-to-end F5 OAM loopback cells received by this interface.
F5 InSegLoop	Number of segment F4 OAM loopback cells received by this interface.
F5 InAIS	Number of F4 OAM AIS cells received by this interface.
F5 InRDI	Number of F4 OAM RDI cells received by this interface.
OAM cells sent	Total number of OAM cells sent on this VC.
F5 OutEndLoop	Number of end-to-end F5 OAM loopback cells sent from this interface.

Field	Description
F5 OutSegLoop	Number of segment F5 OAM loopback cells sent from this interface.
F5 OutAIS	Number of F5 OAM AIS cells sent from this interface.
F5 OutRDI	Number of F5 OAM RDI cells sent from this interface.
OAM cells drops	Number of OAM cells dropped (or flushed) by this interface.
InPkts	Total number of packets received on this VC. This number includes all fast-switched and process-switched packets.
OutPkts	Total number of packets sent on this VC. This number includes all fast-switched and process-switched packets.
InBytes	Total number of bytes received on this VC. This number includes all fast-switched and process-switched bytes.
OutBytes	Total number of bytes sent on this VC. This number includes all fast-switched and process-switched bytes.
WRED pkt drop	Total number of AAL5 packets that were dropped by this interface because their size exceeded the maximum threshold set for Weighted Random Early Discard (WRED).
Non WRED pkt drop	Total number of dropped AAL5 packets that did not exceed the maximum threshold set for Weighted Random Early Discard (WRED).
Internal state	Internal PVC state.
Status	Current status of this PVC. Can be “Up” or “Down.”

Related Commands

Command	Description
pvc (ATM), on page 45	Creates an ATM PVC with ILMI encapsulation and enters ATM virtual circuit configuration mode.

show atm pvp

To display ATM PVP and traffic information for the entire router, or a specific VPI or ATM interface, use the **show atm pvp** command in EXEC mode.

show atm pvp [*vpi*] **interface atm instance**

Syntax Description

<i>vpi</i>	(Optional) ATM virtual path identifier (VPI) number. Replace <i>vpi</i> with the VPI of the PVP whose information you want to display.
interface atm instance	(Optional) Displays all PVCs on the specified ATM interface.
Note	To determine the appropriate form of the <i>instance</i> argument, see your ATM network module, port adapter, or router documentation.

Command Default

Entering the **show atm pvp** command without specifying the *vpi* argument or **interface atm instance** keyword argument displays ATM PVP and traffic information for the entire router.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.4.1	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
atm	read

Examples

The following example shows how to display ATM PVP and traffic information for the entire router:

```
RP/0/0/CPU0:router# show atm pvp interface atm 0/3/0/1
```

Interface	VPI	SC	Peak Kbps	Avg/Min Kbps	Burst Cells	Sts
ATM0/3/0/1.100	100	UBR	155000	N/A	N/A	UP

Table 7: show pvp (all PVPs) Field Descriptions

Field	Description
Interface	Interface type and instance. The instance is displayed in the <i>rack/slot/module/port</i> format.
VPI	ATM network virtual path identifier (VPI) associated with the specified interface.
SC	Service class that is assigned to the specified ATM interface. Possible service classes follow: • cbr • ubr • vbr-nrt • vbr-rt Note To modify a configured ATM service class, use the shape command in the appropriate command mode.
Peak Kbps	Peak output rate for the bit rate in kbps. Note To modify the Peak output rate, use the shape command.
Avg/Min Kbps	Number of kilobits per second sent at the average (sustained) rate. Note To modify the average (or sustained) rate, use the shape command.
Burst cells	Identifies the burst cell size in terms of number of cells. This number is the maximum number of ATM cells the PVP can send at the peak rate. Note To modify the burst cell size, use the shape command.
Sts	Status of the PVP. Can be “UP” or “DOWN.”

The following example shows how to display ATM PVP and traffic information for the a specific VPI:

```
RP/0/0/CPU0:router# show atm pvp 100
```

```
Detailed display of L2PVP(s) with VPI = 100
```

```
ATM0/3/0/1.100: VPI: 100
UBR, PeakRate: 155000 Kbps
AAL0
OAM frequency: 10 second(s), OAM retry frequency: 1 second(s),
OAM up retry count: 3, OAM down retry count: 5,
OAM AIS-RDI down count: 1, OAM AIS-RDI up time: 3 second(s),
OAM Loopback status: No loopback enabled,
```

```

OAM L2PVP state: Unknown,
L2PVP is not managed by OAM,

OAM cells received: 0,
F4 InEndLoop: 0, F4 InSegLoop: 0,
F4 InEndAIS: 0, F4 InSegAIS: 0,
F4 InEndRDI: 0, F4 InSegRDI: 0,
OAM cells sent: 8948,
F4 OutEndLoop: 0, F4 OutSegLoop: 0,
F4 OutEndAIS: 8948, F4 OutSegAIS: 0,
F4 OutEndRDI: 0, F4 OutSegRDI: 0,
OAM cells drops: 0

InPkts: 8948                OutPkts: 0
InBytes: 465296            OutBytes: 0

Internal state: READY
Status: UP

```

Table 8: show atm pvp Field Descriptions

Field	Description
ATM0/1/0/0.30	Associated interface type and instance in the <i>type rack/slot/module/port.subinterface</i> format. • Service class that is assigned to the specified ATM interface. Possible service classes follow: ◦ cbr ◦ ubr ◦ vbr-nrt ◦ vbr-rt • Peak line rate (bandwidth) required for the specified ATM interface, in kilobits per second. Note To modify a configured ATM service class, use the shape command in the appropriate command mode. Note To modify the bandwidth required for an ATM interface (peak line rate), use the shape command in interface configuration mode.
VPI	VPI associated with the specified PVP.

Field	Description
UBR	Service class that is assigned to the specified ATM interface. The example shows that vbr-rt is assigned to the interface that hosts the specified PVP. Possible service classes are: • cbr • ubr • vbr-nrt • vbr-rt
PeakRate	Peak output rate for the bit rate in kbps. Note To modify the peak output rate, use the shape command.
AAL0	ATM adaptation layer (AAL) and encapsulation type for the PVP. Currently, only AAL0 is the only supported encapsulation type for PVPs.
OAM frequency	Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted when a change in the up or down state of a PVC is being verified. Note To modify the OAM frequency, use the oam-pvc manage command in ATM virtual circuit (VC) class configuration mode.
OAM retry frequency	Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted when a change in the up or down state is being verified. Note To modify the OAM retry frequency, use the oam retry command in the appropriate command mode.
OAM up retry count	Number of consecutive end-to-end F5 OAM loopback cell responses that must be received in order to modify a PVC state to up.
OAM down retry count	Number of consecutive unreceived end-to-end F5 OAM loopback cell responses allowed before a PVC state changes to down.
OAM AIS-RDI down count	Number of OAM AIS/RDI cells received on a PVC before it is brought down. Note To modify the OAM AIS-RDI down count, use the oam ais-rdi command in ATM VC-class configuration mode

Field	Description
OAM AIS-RDI up time	Interval after which a PVC is brought up if it has not received any OAM AIS/RDI cells. Note To modify the OAM AIS-RDI uptime, use the oam ais-rdi command in ATM VC-class configuration mode
OAM Loopback status	Status of end-to-end F5 OAM loopback cell generation for this VC. Possible value follow: • No loopback enabled—No loopback is enabled on this interface. • OAM Disabled—End-to-end F5 OAM loopback cell generation is disabled. • OAM Sent—OAM cell was sent. • OAM Received—OAM cell was received. • OAM Failed—OAM reply was not received within the frequency period or contained bad correlation tag.
OAM L2PVP state	Current state of the specified VC. Note OAM management is not supported on Layer 2 PVPs in the current release of Cisco IOS XR software.
OAM cells received	Number of OAM cells that have been received by this interface.
F4 InEndLoop:	Number of end-to-end F4 OAM loopback cells received by this interface.
F4 InSegLoop	Number of segment F4 OAM loopback cells received by this interface.
F4 InEndAIS	Number of F4 OAM AIS cells received by this interface.
F4 InSegAIS	Number of segment F4 OAM AIS cells received by this interface.
F4 InEndRDI	Number of F4 OAM RDI cells received by this interface.
F4 InSegRDI	Number of F4 segment OAM RDI cells received by this interface.

Field	Description
OAM cells drops	Number of OAM cells dropped (or flushed) by this interface.
InPkts	Total number of packets received on this VC. This number includes all fast-switched and process-switched packets.
OutPkts	Total number of packets sent on this VC. This number includes all fast-switched and process-switched packets.
InBytes	Total number of bytes received on this VC.
OutBytes	Total number of bytes sent on this VC.
Internal state	Internal PVC state.
Status	Current status of this PVC. Can be “Up” or “Down.”

Related Commands

Command	Description
pvp (ATM), on page 49	Creates an ATM PVP and enters ATM layer 2 transport PVP configuration mode.

show atm vc-class

To display information about all ATM virtual circuit (VC) classes on the router or for a specific ATM VC-class, use the **show atm vc-class** command in EXEC mode.

show atm vc-class *vc-class-name*

Syntax Description

<i>vc-class-name</i>	Name of the VC-class whose information you want to display.

Command Default

Entering the **show atm vc-class** command without specifying the *vc-class-name* argument displays ATM PVC and traffic information for the entire router.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	The show atm vc-class command output was modified to include Layer 2 VPN parameters when appropriate.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
atm	read

Examples

The following sample output is from the **show atm vc-class** command:

```
RP/0/0/CPU0:router# show atm vc-class
ATM vc-class class1
  encapsulation      - aal5mux ip
  shape              - cbr 100000
  oam ais-rdi        - 35
  oam retry          - 300
  oam-pvc            - manage 300
```

```
ATM vc-class class2
```

```

encapsulation - aal5nlpid
shape         - ubr 40000
oam ais-rdi   - 30
oam retry     - 30
oam-pvc       - manage 300

```

```
ATM vc-class class3
```

```

encapsulation - aal5snap
shape         - vbr-nrt 60000 60000 1000
oam ais-rdi   - 30
oam retry     - 30
oam-pvc       - manage 300

```

Table 9: show atm vc-class Field Descriptions

Field	Description
encapsulation	Type of ATM adaptation layer (AAL) encapsulation type that is enabled on the specified VC-class. Possible AAL encapsulation types follow: • aal5mux ipv4—IPv4 encapsulation for multiplex (MUX)-type VCs • aal5nlpid—AAL and encapsulation type that allows ATM interfaces to interoperate with High-Speed Serial Interfaces (HSSIs), which are using an ATM data service unit (ADSU) and running ATM-Data Exchange Interface (DXI). Supported on ATM PVCs only. • aal5snap—AAL and encapsulation type that supports Inverse ARP. Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) precedes the protocol datagram. Note To modify the AAL encapsulation type on an interface, use the encapsulation command in ATM VC-class configuration mode.

Field	Description
shape	Displays traffic shaping information for the service class that is assigned to the specified VC-class. Possible service classes follow: • cbr—command output shows the peak output rate for the bit rate in kbps. • ubr—command output shows the peak output rate for the bit rate in kbps. • vbr-nrt—command output shows the peak output rate, sustained output rate, and burst size for the bit rate in kbps. • vbr-rt—command output shows the peak output rate, sustained output rate, and burst size for the bit rate in kbps. Note To modify a configured ATM service class and peak output rate for the bit rate, use the shape command in the appropriate command mode.
oam ais-rdi	Displays the maximum number of OAM AIS/RDI cells that can be received on a PVC before it is brought down. Note Use the oam ais-rdi command in to modify the current configuration for this field.
oam retry	Displays the following information related to F5 OAM loopback cells, if this information was configured for the specified VC-class: • Number of consecutive end-to-end F5 OAM loopback cell responses that must be received to change a connection state to up. (Retry count) • Number of consecutive unreceived end-to-end F5 OAM loopback cells allowed on a PVC before its state changes to down. (down count) • Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted when a change in the up or down state is being verified. (retry frequency) Note Use the oam retry command to modify the current configuration for this field. Note If the oam retry command was not use to configure the F5 OAM loopback retry count, down count, or retry frequency, then this information is not displayed in the command output for the show atm vc-class command.

Field	Description
oam-pvc	Frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted on this PVC. Range is from 0 through 600. Note Use the oam-pvc manage command to modify the current configuration for this field.

The following sample output is from the **show atm vc-class** command with the *vc-class-name* argument included:

```
RP/0/0/CPU0:router# show atm vc-class class1
```

```
ATM vc-class class1
```

```
encapsulation      - aal5mux ip
shape              - cbr 100000
oam ais-rdi        - 35
oam retry          - 300
oam-pvc            - manage 300
```

Related Commands

Command	Description
class-vc, on page 21	Attaches a VC class to an ATM PVC.
vc-class atm, on page 98	Creates a VC class for an ATM PVC or an ATM interface and enters VC-class configuration mode.

show atm vp-tunnel

To display virtual path (VP) tunnel information for the entire router or for a specific interface, use the **show atm vp-tunnel** command in EXEC mode.

show atm vp-tunnel [**interface atm** *interface-path-id*]

Syntax Description

interface atm	(Optional) ATM interface for which you want to display information. Use the <i>interface-path-id</i> argument to specify the ATM interface.
interface-path-id	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

Entering the **show atm vp-tunnel** command without specifying the *instance* argument displays ATM VP-tunnel information for the entire router.

Command Modes

EXEC

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
atm	read

Examples

The following sample output is from the **show atm vp-tunnel** command:

```
RP/0/0/CPU0:router# show atm vp-tunnel
```

	Data	Peak	Avg/Min	Burst

Interface	VPI	SC	VCs	Kbps	Kbps	Cells	Status
ATM0/6/0/0	10	CBR	0	155000	N/A	N/A	DOWN
ATM0/6/0/0	20	CBR	0	155000	N/A	N/A	DOWN
ATM0/6/0/0	30	CBR	0	155000	N/A	N/A	DOWN
ATM0/6/0/0	40	CBR	0	155000	N/A	N/A	DOWN
ATM0/6/0/1	10	VBR_NRT	0	155000	155000	800	DOWN
ATM0/6/0/1	20	VBR_NRT	0	155000	155000	800	DOWN

Table 10: show atm vp-tunnel Command Field Descriptions

Field	Description
Interface	Interface type and instance. The instance is displayed in the <i>rack/slot/module/port</i> format.
VPI	ATM network virtual path identifier (VPI) associated with the specified interface.
SC	Service class that is assigned to the specified ATM interface. Possible service classes follow: • cbr • ubr • vbr-nrt • vbr-rt Note To modify a configured ATM service class, use the shape command in the appropriate command mode
Data VCs	Number of VCs that are attached to the specified VP tunnel.
Peak Kbps	Peak line rate (bandwidth) required for the specified ATM interface, in kilobits per second. Note To modify the bandwidth required for an ATM interface (peak line rate), use the shape command in interface configuration mode
Avg/Min Kbps	Number of kilobits per second sent at the average rate.
Burst Cells	Identifies the burst cell size in terms of number of cells. This number is the maximum number of ATM cells the VC can send at the peak rate. Note To modify the burst cell size, use the shape command.
Status	Current state for this interface. Possible states are “Up” or “Down.”

The following sample output is from the **show atm vp-tunnel** command with the **interface atm** *instance* keyword argument included:

```
RP/0/0/CPU0:router# show atm vp-tunnel interface atm 0/6/0/1
```

Data Interface	Peak	Avg/Min VPI	SC	Burst VCs	Kbps	Kbps	Cells	Status
ATM0/6/0/1		10 VBR_NRT		0	155000	155000	800	DOWN
ATM0/6/0/1		20 VBR_NRT		0	155000	155000	800	DOWN

[Table 10: show atm vp-tunnel Command Field Descriptions, on page 89](#) describes the significant fields shown in the display.

Related Commands

Command	Description
vp-tunnel, on page 100	Configures a VP tunnel on an interface and enters ATM VP-tunnel configuration mode.

show controllers atm

To display information about the physical status of the ATM interface, use the **show controllers atm** command in EXEC mode.

show controllers atm *interface-path-id* [**all** | **traffic** {**f4oam** | **port** | **vc** *vpi/vci* | **vp** *vpi*}]

Syntax Description

<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
f4oam	Displays information about the ATM layer f4oam traffic that is transmitted and received on the specified interface.
port	(Optional) Displays information about the ATM layer traffic that is transmitted and received by the ports associated with the specified interface.
vc <i>vpi/vci</i>	(Optional) Displays information about the ATM layer traffic carried by specific ATM VC (virtual channel). Replace <i>vpi/vci</i> with the ATM virtual path identifier (VPI) and virtual channel identifier (VCI) of the VC whose information you want to display.
vp <i>vpi</i>	(Optional) Displays information about the ATM layer traffic carried by specific ATM virtual path. Replace <i>vpi</i> with the ATM virtual path identifier (VPI) whose information you want to display.

Command Default

Entering the **show controllers atm** command without specifying the *instance* argument displays ATM controller status and configuration information for the entire router.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
interface	read

Examples

The following example shows partial output from the **show controllers atm** command:

```
RP/0/0/CPU0:router# show controllers atm 0/6/0/0
```

```
SAR Counters:
  tx_packets           :4085                tx_bytes           :212420
  tx_total_resource_errs:0                  tx_total_other_errs :0
  tx_wred_thresh_drops :0                  tx_wred_random_drops :0
  rx_packets           :0                  rx_bytes           :0
  rx_total_resource_errs:0                  rx_total_other_errs :0
  rx_buffer_exhaust_errs:0                  rx_CRC32_errors     :0
  rx_packet_abort_errs :0                  rx_trailer_len_errs :0
  rx_mps_errors        :0                  rx_reassembly_timeout:0

The following are per-SAR counters:
Reassembly SAR:
  sys_rx_unopen_vc_cls :0                  sys_tx_unopen_vc_cls :0
  sys_ecc_errors        :0                  sys_ecc_and_addr     :      0xf
  ffffffff              :      0x0
  sys_ecc_or_addr       :      0x0
Segmentation SAR:
  sys_rx_unopen_vc_cls :0                  sys_tx_unopen_vc_cls:0
  sys_ecc_errors        :0                  sys_ecc_and_addr     :      0xf
  ffffffff              :      0x0
  sys_ecc_or_addr       :      0x0
RSAR 0: (6.0.2.1c)
RSAR Build ID= E7EE
SSAR 0: (6.0.2.1c)
SSAR Build ID= 570

--More--
```

Table 11: show controllers atm Field Descriptions

Field	Description
SAR Counters	Counters that provide information about the Segmentation and Reassembly (SAR) chip.
tx_packets	Number of AAL5 packets transmitted.

Field	Description
tx_bytes	A 64-bit counter of the bytes transmitted on this interface, including OAM cells and AAL5 header encapsulations (such as AAL5SNAP). This should be approximately the total number of bytes transmitted on each of the VCs.
tx_total_resource_errs	Total number of packets that were not transmitted because of any resource exhaustion error. This does not necessarily imply an error, because this counter includes tx_wred_thresh_drops and tx_wred_random_drops, as well as packet drops due to complete buffer exhaustion on the SAR. This should be equal to the sum of the number of resource errors that occur on all the VCs.
tx_total_other_errs	Total number of packets that were not transmitted because of any error other than resource exhaustion, but not including no-vc drops. This includes malformed packets, CRC errors, and so on. This should be approximately the total number of tx_other_errors that occur on all the VCs on this interface.
tx_wred_thresh_drops	Total number of WRED maximum threshold drops on this interface. This counter is included in the tx_total_resource_errs counter.
tx_wred_random_drops	Total number of WRED random drops on this interface. This counter is included in the tx_total_resource_errs counter.
rx_packets	Total number of packets reassembled on this interface by the SAR, including OAM cells.
rx_bytes	Number of AAL5 packets received on this interface.
rx_total_resource_errs	Total number of packet reassemblies that failed due to resource exhaustion. This error should not occur if the queue thresholds are not oversubscribed. This error includes rx_buffer_exhaust_errs.
rx_total_other_errs	Total number of packet reassemblies that failed due to errors besides resource exhaustion (not including “no-vc” cells), including rx_crc32_errors, rx_packet_abort_errs, rx_trailer_len_errs, rx_mps_errors, and rx_reassembly_timeout.

Field	Description
rx_buffer_exhaust_errs	Total number of packet reassemblies that failed due to complete buffer exhaustion on the SAR. This error should not occur if the queue thresholds are not oversubscribed. This is included in rx_total_resource_errs.
sys_tx_unopen_vc_cls	Total number of packets transmitted by this endpoint that failed due to an error other than those listed in the show controllers atm command output.
Reassembly SAR	Counters that provide information specific to the reassembly chip.
sys_ecc_and_addr	Total number of single bit end and addressing errors detected on the reassembly SAR.
sys_ecc_errors	Total number of single bit errors detected on the reassembly SAR.
sys_ecc_or_addr	Total number of single bit end or addressing errors detected on the reassembly SAR.
Segmentation SAR	Counters that provide information specific to the segmentation chip.
sys_tx_unopen_vc_cls	Total number of packet reassemblies transmitted by this endpoint that failed due to errors other than those listed in the show controllers atm command output.
sys_rx_unopen_vc_cls	Total number of packet reassemblies received by this endpoint that failed due to errors other than those listed in the show controllers atm command output.
rx_CRC32_errors	Total number of packet reassemblies that failed due to an invalid AAL5 CRC32 trailer. This is included in rx_total_other_errs.
rx_packet_abort_errs	Total number of packet reassemblies that failed due to receiving a trailer length of 0. This is included in rx_total_other_errs.
rx_trailer_len_errs	Total number of packet reassemblies that failed due to a packet whose AAL5 trailer had an invalid trailer length. This is included in rx_total_other_errs.
rx_mps_errors	Total number of packet reassemblies that failed due to a packet size greater than the maximum allowed packet size. This is included in rx_total_other_errs.

Field	Description
rx_reassembly_timeout	Total number of packet reassemblies that failed due to timing out before receiving the last cell of a packet. This is included in rx_total_other_errs.
sys_rx_unopen_vc_cls	Packets received on nonexistent VC.
RSAR 0	RSAR ID.
RSAR Build ID	Unique number that identifies the RSAR build.
SSAR 0	SSAR ID.
SSAR Build ID	Unique number that identifies the SAR build.

Related Commands

Command	Description
show atm interface atm , on page 63	Displays ATM-specific information about an ATM interface.

shutdown (ATM)

To disable an ATM interface, use the **shutdown** command in interface configuration mode. To re-enable an ATM interface, use the **no** form of this command.

shutdown

no shutdown

Syntax Description This command has no keywords or arguments.

Command Default The ATM interface is up.

Command Modes Interface configuration (config-if)

Command History	Release	Modification
	Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **show interface atm** command in EXEC mode to verify that the ATM interface is administratively up or down.

Task ID	Task ID	Operations
	interface	read, write

Examples The following example shows how to bring down an ATM interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface atm 0/2/0/0
RP/0/0/CPU0:router(config-if)# shutdown
```

The following example shows how to re-enable an ATM interface that has been brought down with the **shutdown** command:

```
RP/0/0/CPU0:router# no shutdown
```

Related Commands

Command	Description
show atm interface atm , on page 63	Displays ATM-specific information about an ATM interface.

vc-class atm

To create a virtual circuit (VC) class for an ATM permanent virtual circuit (PVC) or an ATM interface and enter VC-class configuration mode, use the **vc-class atm** command in global configuration mode. To remove a VC-class, use the **no** form of this command.

vc-class atm *name*

no vc-class atm *name*

Syntax Description

<i>name</i>	Name of your VC class.

Command Default

No VC-class is defined.

Command Modes

Global configuration (config)

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you issue the **vc-class atm** command in global configuration mode, the CLI prompt changes to “config-vc-class-atm,” indicating that you have entered the VC-class configuration submode. In the following sample output, the question mark (?) online help function displays all the commands available under the VC-class configuration submode:

```
RP/0/0/CPU0:router(config)# vc-class atm classA
RP/0/0/CPU0:router(config-vc-class-atm)# ?

  commit          Commit the configuration changes to running
  describe        Describe a command without taking real actions
  do              Run an exec command
  encapsulation    Configure encapsulation
  exit            Exit from this submode
  no              Negate a command or set its defaults
  oam             Configure OAM parameters
  oam-pvc         OAM PVC management configuration
  shape           ATM Traffic Shaping
  show            Show contents of configuration

RP/0/0/CPU0:router(config-vc-class-atm)#
```

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to create a VC-class. In this example, the class is called “class1.”

```
RP/0/0/CPU0:router(config)# vc-class atm class1  
RP/0/0/CPU0:router(config-vc-class-atm)#
```

Related Commands

Command	Description
class-vc, on page 21	Attaches a VC class to an ATM PVC.
show atm vc-class, on page 84	Displays information about all ATM VC classes on the router or for a specific ATM VC-class.

vp-tunnel

To configure a virtual path (VP) tunnel on an interface and enter ATM VP-tunnel configuration mode, use the **vp-tunnel** command in interface configuration mode.

vp-tunnel *vpi*

Syntax Description

vpi	VPI for this tunnel. Range is from 0 through 4095.

Command Default

No default behavior or values

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For Vp-tunnels, a VPI of 0 is not supported on the following line cards:

- 4-port OC12
- 4-port OC3

When you issue the **vp-tunnel** command in global configuration mode, the CLI prompt changes to “config-atm-vp-tunnel,” indicating that you have entered ATM VP-tunnel configuration submode. In the following sample output, the question mark (?) online help function displays all the commands available under the ATM VP-tunnel configuration submode:

```
RP/0/0/CPU0:router(config-if)# vp-tunnel 10
RP/0/0/CPU0:router(config-atm-vp-tunnel)# ?

  commit      Commit the configuration changes to running
  describe    Describe a command without taking real actions
  do          Run an exec command
  exit        Exit from this submode
  f4oam       F4 OAM configuration
  no          Negate a command or set its defaults
  shape       ATM Traffic Shaping
  show        Show contents of configuration

RP/0/0/CPU0:router(config-atm-vp-tunnel)#
```

Task ID

Task ID	Operations
atm	read, write

Examples

The following example shows how to configure a virtual path (VP) tunnel on an interface and enter ATM VP-tunnel configuration mode:

```
RP/0/0/CPU0:router(config-if)# vp-tunnel 10  
RP/0/0/CPU0:router(config-atm-vp-tunnel)#
```

Related Commands

Command	Description
show atm vp-tunnel , on page 88	Displays VP tunnel information for the entire router or for a specific interface.



Bidirectional Forwarding Detection Commands on the Cisco IOS XR Software

This module provides command line interface (CLI) commands for configuring Bidirectional Forwarding Detection (BFD) on the Cisco XR 12000 Series Router.

- [address-family ipv4 unicast \(BFD\), page 105](#)
- [bfd, page 107](#)
- [bfd address-family ipv4 destination, page 109](#)
- [bfd address-family ipv4 fast-detect, page 111](#)
- [bfd address-family ipv4 minimum-interval, page 113](#)
- [bfd address-family ipv4 multiplier, page 116](#)
- [bfd address-family ipv4 timers, page 119](#)
- [bfd fast-detect, page 121](#)
- [bfd minimum-interval, page 124](#)
- [bfd multipath include location, page 127](#)
- [bfd multiplier, page 129](#)
- [clear bfd counters, page 132](#)
- [dampening \(BFD\), page 134](#)
- [echo disable, page 137](#)
- [echo ipv4 source, page 139](#)
- [echo latency detect, page 141](#)
- [echo startup validate, page 143](#)
- [interface \(BFD\), page 145](#)
- [multihop ttl-drop-threshold, page 147](#)
- [show bfd, page 149](#)
- [show bfd client, page 151](#)

- [show bfd counters, page 153](#)
- [show bfd mib session, page 156](#)
- [show bfd multipath, page 159](#)
- [show bfd session, page 161](#)
- [show bfd summary, page 169](#)

address-family ipv4 unicast (BFD)

To enable Bidirectional Forwarding Detection (BFD) fast-detection on a specific IPV4 unicast destination address prefix and on the forwarding next-hop address, use the **address-family ipv4 unicast** command in static route configuration mode. To return the router to the default setting, use the **no** form of this command.

address-family ipv4 unicast *address nexthop* **bfd fast-detect** [**minimum interval** *interval*] [**multiplier** *multiplier*]

no address-family ipv4 unicast *address nexthop* **bfd fast-detect** [**minimum interval** *interval*] [**multiplier** *multiplier*]

Syntax Description

<i>address</i>	Specifies the IPv4 unicast destination address and prefix on which to enable BFD fast-detection.
<i>nexthop</i>	Specifies the next-hop address on which to enable BFD fast-detection.
bfd fast-detect	Enables BFD fast-detection on the specified IPV4 unicast destination address prefix and on the forwarding next-hop address.
minimum interval <i>interval</i>	(Optional) Ensures that the next hop is assigned with the same hello interval. Replace <i>interval</i> with a number that specifies the interval in milliseconds. Range is from 10 through 10000.
multiplier <i>multiplier</i>	(Optional) Ensures that the next hop is assigned with the same detect multiplier. Replace <i>multiplier</i> with a number that specifies the detect multiplier. Range is from 1 through 10.

Command Default

interval: 100
multiplier: 3

Command Modes

Static route configuration mode

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the multiplier is changed using the **bfd multiplier** command, the new parameter is used to update all existing BFD sessions for the protocol (BGP, IS-IS, MPLS-TE, or OSPF).

Task ID

Task ID	Operations
static	read, write

Examples

The following example shows how to enable BFD on a static route. In this example, BFD sessions are established with the next-hop 3.3.3.3 when it becomes reachable.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# router static
RP/0/0/CPU0:router (config-static)# address-family ipv4 unicast 2.2.2.0/24 3.3.3.3 bfd
fast-detection
```

Related Commands

Command	Description
bfd fast-detect, on page 121	Enables BFD to detect failures in the path between adjacent forwarding engines.
show bfd, on page 149	Displays BFD information for a specific location.

bfd

To enter Bidirectional Forwarding Detection (BFD) configuration mode, use the **bfd** command in global configuration mode. To exit BFD configuration mode and return to global configuration mode, use the **no** form of this command.

bfd

no bfd

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes Global configuration

Command History	Release	Modification
	Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you issue the **bfd** command in global configuration mode, the CLI prompt changes to “config-bfd,” indicating that you have entered BFD configuration mode. In the following sample output, the question mark (?) online help function displays all the commands available under BFD configuration mode:

```
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# ?

commit      Commit the configuration changes to running
describe    Describe a command without taking real actions
do          Run an exec command
echo        Configure BFD echo parameters
exit        Exit from this submode
interface   Configure BFD on an interface
no          Negate a command or set its defaults
root        Exit to the global configuration mode
show        Show contents of configuration
```

Task ID	Task ID	Operations
	bgp	read, write
	ospf	read, write

Task ID	Operations
isis	read, write
mpls-te	read, write

Examples

The following example shows how to enter BFD configuration mode:

```
RP/0/0/CPU0:router # configure  
RP/0/0/CPU0:router(config) # bfd  
RP/0/0/CPU0:router(config-bfd) #
```

Related Commands

Command	Description
echo disable, on page 137	Disables echo mode on a router or on an individual interface or bundle.
interface (BFD), on page 145	Enters BFD interface configuration mode, where you can disable echo mode on an interface.
show bfd, on page 149	Displays BFD information for a specific location.

bfd address-family ipv4 destination

To specify the destination address for BFD sessions on bundle member links, use the **bfd address-family ipv4 destination** command in interface configuration mode. To return to the default, use the **no** form of this command.

bfd address-family ipv4 destination *ip-address*

no bfd address-family ipv4 destination *ip-address*

Syntax Description

<i>ip-address</i>	32-bit IPv4 address in dotted-decimal format (A.B.C.D).

Command Default

No destination IPv4 address is configured.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

Task ID

Task ID	Operations
bundle	read, write

Examples

The following example specifies the IPv4 address of 10.20.20.1 as the destination address for the BFD session on an Ethernet bundle interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 destination 10.20.20.1
```

The following example specifies the IPv4 address of 10.20.20.1 as the destination address for the BFD session on a POS bundle interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-POS 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 destination 10.20.20.1
```

Related Commands

Command	Description
bfd address-family ipv4 fast-detect , on page 111	Enables IPv4 BFD sessions on bundle member links.

bfd address-family ipv4 fast-detect

To enable IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 fast-detect** command in interface configuration mode. To return to the default, use the **no** form of this command.

bfd address-family ipv4 fast-detect

no bfd address-family ipv4 fast-detect

Syntax Description This command has no keywords or arguments.

Command Default BFD sessions are disabled.

Command Modes Interface configuration (config-if)

Command History	Release	Modification
	Release 4.1.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

Task ID	Task ID	Operations
	bundle	read, write

Examples The following example enables IPv4 BFD sessions on member links of an Ethernet bundle:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 fast-detect
```

The following example enables IPv4 BFD sessions on member links of a POS bundle:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-POS 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 fast-detect
```

Related Commands

Command	Description
bfd address-family ipv4 destination , on page 109	Specifies the destination address for BFD sessions on bundle member links.

bfd address-family ipv4 minimum-interval

To specify the minimum interval for asynchronous mode control packets on IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 minimum-interval** command in interface configuration mode. To return to the default, use the **no** form of this command.

bfd address-family ipv4 minimum-interval *milliseconds*

no bfd address-family ipv4 minimum-interval [*milliseconds*]

Syntax Description

milliseconds	Shortest interval between sending BFD control packets to a neighbor. The range is 15 to 30000 milliseconds.

Note

Command Default

The default is 150 ms.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

The BFD minimum interval is used with a configurable multiplier (**bfd address-family ipv4 multiplier** command) to determine the intervals and failure detection times for both control and echo packets in asynchronous mode on bundle member links.

For example, with a session interval of I and a multiplier of M , the following packet intervals and failure detection times apply for BFD asynchronous mode:

- Value of I —Minimum period between sending of BFD control packets.
- Value of $I \times M$
 - BFD control packet failure detection time. This is the maximum amount of time that can elapse without receipt of a BFD control packet before the session is declared down.
 - Minimum period between sending of BFD echo packets.

- Value of $(I \times M) \times M$ —BFD echo packet failure detection time. This is the maximum amount of time that can elapse without receipt of a BFD echo packet before the session is declared down.

When used with bundled VLANs, the following restrictions apply:

- The command specifies control packet intervals only because echo packets are not supported.
- The minimum interval is 250 ms.

The **bfd address-family ipv4 minimum-interval** command in bundle interface configuration overrides the minimum intervals specified by the **bfd minimum-interval** command in other areas of BFD configuration.



Note

When multiple applications share the same BFD session, the application with the most aggressive timer is used locally. Then, the result is negotiated with the peer router.

Keep the following router-specific rules in mind when configuring the minimum BFD interval:

- The maximum rate in packets-per-second (pps) for BFD sessions is linecard-dependent. If you have multiple linecards supporting BFD, then the maximum rate for BFD sessions per system is the supported linecard rate multiplied by the number of linecards.
- The maximum number of all BFD sessions on the router is 1024.
- The maximum number of all BFD sessions on the router is 1440.

To calculate the rate for BFD sessions on bundle members running in asynchronous mode without echo:

- Divide 1000 by the value of the minimum interval (as specified by the **bfd address-family ipv4 minimum-interval** command). This is also the base rate used per member session with echo:
Asynchronous rate per bundle member = $(1000 / \text{Min-interval})$

To calculate the rate for BFD sessions on bundle members running in asynchronous mode with echo:

- Determine the echo interval, which is the value of the minimum interval (specified by the **bfd address-family ipv4 minimum-interval** command) multiplied by the multiplier value (specified by the **bfd address-family ipv4 multiplier** command).
Echo interval = $(\text{Min-interval} \times \text{Multiplier})$
- Calculate the overall rate supported for all members on the bundle:
Ethernet bundle rate = $(1000 / \text{Echo interval}) \times 64$
POS bundle rate = $(1000 / \text{Echo interval}) \times 253$
- Add the asynchronous base rate per bundle member to find the total rate for all bundle links:
Total bundle rate = Ethernet or POS bundle rate + $(\text{Base asynchronous rate} \times \text{Number of links})$

Task ID

Task ID	Operations
bundle	read, write

Examples

The following example specifies that control packets will be sent at a minimum interval of 200 ms for IPv4 BFD sessions on member links of an Ethernet bundle:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 minimum-interval 200
```

The following example specifies that control packets will be sent at a minimum interval of 200 ms for IPv4 BFD sessions on member links of a POS bundle:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-POS 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 minimum-interval 200
```

Related Commands

Command	Description
bfd minimum-interval , on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
bfd address-family ipv4 multiplier , on page 116	Specifies a number that is used as a multiplier with the minimum interval to determine BFD control and echo packet failure detection times and echo packet transmission intervals for IPv4 BFD sessions on bundle member links.

bfd address-family ipv4 multiplier

To specify a number that is used as a multiplier with the minimum interval to determine BFD control and echo packet failure detection times and echo packet transmission intervals for IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 multiplier** command in interface configuration mode. To return to the default, use the **no** form of this command.

bfd address-family ipv4 multiplier *multiplier*

no bfd address-family ipv4 multiplier [*multiplier*]

Syntax Description

<i>multiplier</i>	Number from 2 to 50.
Note	Although the command allows you to configure a minimum of 2, the supported minimum is 3.

Command Default

The default multiplier is 3.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

The BFD multiplier is used with a configurable minimum interval (**bfd address-family ipv4 minimum-interval** command) to determine the intervals and failure detection times for both control and echo packets in asynchronous mode on bundle member links.

For example, with a session interval of *I* and a multiplier of *M*, the following packet intervals and failure detection times apply for BFD asynchronous mode:

- Value of *I*—Minimum period between sending of BFD control packets.
- Value of *I* x *M*
 - BFD control packet failure detection time. This is the maximum amount of time that can elapse without receipt of a BFD control packet before the session is declared down.
 - Minimum period between sending of BFD echo packets.

**Note**

The maximum echo packet interval for BFD on bundle member links is the minimum of either 30 seconds or the asynchronous control packet failure detection time.

- Value of $(I \times M) \times M$ —BFD echo packet failure detection time. This is the maximum amount of time that can elapse without receipt of a BFD echo packet before the session is declared down.

Keep the following router-specific rules in mind when configuring the minimum BFD interval:

- The maximum rate in packets-per-second (pps) for BFD sessions is linecard-dependent. If you have multiple linecards supporting BFD, then the maximum rate for BFD sessions per system is the supported linecard rate multiplied by the number of linecards.
- The maximum number of all BFD sessions per linecard is 1024.
- The maximum number of all BFD sessions per linecard is 1440.

To calculate the rate for BFD sessions on bundle members running in asynchronous mode without echo:

- Divide 1000 by the value of the minimum interval (as specified by the **bfd address-family ipv4 minimum-interval** command). This is also the base rate used per member session with echo:
Asynchronous rate per bundle member = $(1000 / \text{Min-interval})$

To calculate the rate for BFD sessions on bundle members running in asynchronous mode with echo:

- Determine the echo interval, which is the value of the minimum interval (specified by the **bfd address-family ipv4 minimum-interval** command) multiplied by the multiplier value (specified by the **bfd address-family ipv4 multiplier** command).
Echo interval = $(\text{Min-interval} \times \text{Multiplier})$
- Calculate the overall rate supported for all members on the bundle:
Ethernet bundle rate = $(1000 / \text{Echo interval}) \times 64$
POS bundle rate = $(1000 / \text{Echo interval}) \times 253$
- Add the asynchronous base rate per bundle member to find the total rate for all bundle links:
Total bundle rate = Ethernet or POS bundle rate + $(\text{Base asynchronous rate} \times \text{Number of links})$

Task ID

Task ID	Operations
bundle	read, write

Task ID**Examples**

The following example specifies the following packet intervals and failure detection times for IPv4 BFD sessions on member links with asynchronous echo mode on an Ethernet bundle:

- 200 ms control packet interval
- 600 ms control packet failure detection interval

- 600 ms echo packet interval
- 1800 ms echo packet failure detection interval

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 minimum-interval 200
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 multiplier 3
```

The following example specifies the same packet intervals and failure detection times for IPv4 BFD sessions on member links of a POS bundle:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-POS 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 minimum-interval 200
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 multiplier 3
```

Related Commands

Command	Description
bfd address-family ipv4 minimum-interval , on page 113	Specifies the minimum interval for asynchronous mode control packets on IPv4 BFD sessions on bundle member links.
bfd minimum-interval , on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.

bfd address-family ipv4 timers

To configure timers to allow for delays in receipt of BFD state change notifications (SCNs) from peers before declaring a link bundle BFD session down for IPv4 BFD sessions on bundle member links, use the **bfd address-family ipv4 timers** command in interface configuration mode. To return to the default, use the **no** form of this command.

bfd address-family ipv4 timers [*start*| *nbr-unconfig*] *seconds*

no bfd address-family ipv4 timers [*start*| *nbr-unconfig*] *seconds*

Syntax Description

start <i>seconds</i>	Number of seconds after startup of a BFD member link session to wait for the expected notification from the BFD peer to be received, so that the session can be declared up. If the SCN is not received after that period of time, the BFD session is declared down. The range is 60 to 3600. Note In Cisco IOS XR Releases 4.0 and 4.0.1, the available minimum is 30, but is not recommended.
nbr-unconfig <i>seconds</i>	Number of seconds to wait after receipt of notification that the BFD configuration has been removed by a BFD neighbor, so that any configuration inconsistency between the BFD peers can be fixed. If the BFD configuration issue is not resolved before the specified timer is reached, the BFD session is declared down. The range is 60 to 3600. Note In Cisco IOS XR Releases 4.0 and 4.0.1, the available minimum is 30, but is not recommended.

Command Default

No timers are configured.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command is supported on bundle interfaces only.

Task ID

Task ID	Operations
bundle	read, write

Examples

The following example configures a timer for members of the specified Ethernet bundle that allows up to 1 minute (60 seconds) after startup of a BFD member link session to wait for receipt of the expected notification from the BFD peer to declare the session up:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 timers start 60
```

The following example configures a timer for members of the specified Ethernet bundle that allows up to 1 minute (60 seconds) to wait after receipt of notification that the BFD configuration has been removed by a BFD neighbor, before declaring a BFD session down:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 timers nbr-unconfig 60
```

The following example specifies the same timers for member links of a POS bundle:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Bundle-POS 1
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 timers start 30
RP/0/0/CPU0:router(config-if)# bfd address-family ipv4 timers nbr-unconfig 60
```

bfd fast-detect

To enable Bidirectional Forwarding Detection (BFD) to detect failures in the path between adjacent forwarding engines, use the **bfd fast-detect** command in the appropriate configuration mode. To return the software to the default state in which BFD is not enabled, use the **no** form of this command.

bfd fast-detect [**disable**| **ipv4**]

no bfd fast-detect

Syntax Description

disable	Disables the detection of failures in the path between adjacent forwarding engines for a specified entity, such as a BGP neighbor or OSPF interface.
	Note The disable keyword is available in the following modes only: BGP configuration, OSPF area configuration, and OSPF area interface configuration.
ipv4	Enables Intermediate System-to-Intermediate System (IS-IS) BFD detection of failures in the path between adjacent forwarding engines.
	Note The ipv4 keyword is available in IS-IS router configuration mode only.

Command Default

BFD detection of failures in the path between adjacent forwarding engines is disabled.

Command Modes

Neighbor configuration
Session group configuration
Neighbor group configuration
Interface configuration
Interface configuration
Router configuration
Area configuration
Area interface configuration
Interface configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.4.0	The bfd fast-detect command was supported in router PIM interface configuration mode.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

**Note**

BFD can support multihop for internal and external BGP peers.

Use the **bfd fast-detect** command to provide protocol- and media-independent, short-duration failure detection of the path between adjacent forwarding engines, including the interfaces and data links.

BFD must be configured on directly connected neighbors for a BFD session to be established between the neighbors.

When MPLS-TE tunnels are protected by backup tunnels, BFD failure triggers fast reroute on affected tunnels.

In OSPF environments, the setting of the **bfd fast-detect** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you enable BFD in area interface configuration mode, it is enabled on the specified interface only.
- If you enable BFD in area configuration mode, it is enabled on all interfaces in the specified area.
- If you enable BFD in router configuration mode, it is enabled on all areas and all associated interfaces in the specified routing process.

The **disable** keyword is available in the following modes: BGP configuration, OSPF area configuration, and OSPF area interface configuration. In OSPF environments, the **disable** option enables you to override the inheritance rules described previously. For example, if you enable BFD in an OSPF area, BFD is enabled on all interfaces in that area. If you do not want BFD running on one of the interfaces in that area, you must specify the **bfd fast-detect disable** command for that interface only.

To disable BFD or return the software to the default state in which BFD is not enabled in IS-IS router configuration mode and MPLS-TE configuration mode, you must enter the **no bfd fast-detect** command.

Task ID

Task ID	Operations
bgp	read, write
isis	read, write
mpls-te	read, write
ospf	read, write
multicast	read, write

Examples

The following example shows how to configure BFD on a BGP router:

```
RP/0/0/CPU0:router# configure
```

```
RP/0/0/CPU0:router(config)# router bgp 65000  
RP/0/0/CPU0:router(config-bgp)# neighbor 192.168.70.24  
RP/0/0/CPU0:router(config-bgp-nbr)# remote-as 2  
RP/0/0/CPU0:router(config-bgp-nbr)# bfd fast-detect
```

Related Commands

Command	Description
address-family ipv4 unicast (BFD), on page 105	Enables BFD fast-detection on a specific IPV4 unicast destination address prefix and on the forwarding next-hop address.
bfd minimum-interval, on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
bfd multiplier, on page 129	Sets the BFD multiplier.
show bfd, on page 149	Displays BFD information for a specific location.

bfd minimum-interval

To specify the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope, use the **bfd minimum-interval** command in the appropriate configuration mode. To return the router to the default setting, use the **no** form of this command.

bfd minimum-interval *milliseconds*

no bfd minimum-interval [*milliseconds*]

Syntax Description

<i>milliseconds</i>	Interval between sending BFD hello packets to the neighbor. The range is 15 to 30000 milliseconds. For MPLS-TE, the range is 50 to 200 milliseconds.

Command Default

BGP *interval*: 50 milliseconds
 IS-IS *interval*: 250 milliseconds
 OSPF *interval*: 150 milliseconds
 MPLS-TE *interval*: 50 milliseconds
 PIM *interval*: 150 milliseconds

Command Modes

Router configuration
 Interface configuration
 MPLS TE configuration
 Router configuration
 Area configuration
 Area interface configuration
 Interface configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.4.0	The bfd minimum-interval command was supported in router PIM interface configuration mode.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

In OSPF environments, the setting of the **bfd minimum-interval** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you configure the minimum interval in area interface configuration mode, the updated interval affects the BFD sessions on the specified interface only.
- If you configure the minimum interval in area configuration mode, the updated interval affects the BFD sessions on all interfaces in the specified area.
- If you configure the minimum interval in router configuration mode, the updated interval affects the BFD sessions in all areas and all associated interfaces in the specified routing process.

If desired, you can override these inheritance rules by explicitly configuring the **bfd minimum-interval** command for a specific area interface or area.

**Note**

When multiple applications share the same BFD session, the application with the most aggressive timer wins locally. Then, the result is negotiated with the peer router.

Keep the following router-specific rules in mind when configuring the minimum BFD interval:

- The maximum rate in packets-per-second (pps) for BFD sessions is linecard-dependent. If you have multiple linecards supporting BFD, then the maximum rate for BFD sessions per system is the supported linecard rate multiplied by the number of linecards.
 - The maximum rate for BFD sessions per linecard is 1334 pps.
- If a session is running in asynchronous mode without echo, then PPS used for this session is $(1000 / \text{asynchronous interval in milliseconds})$.
- If a session is running in asynchronous mode with echo, then PPS used for this session is $(1000 / \text{echo interval in milliseconds})$.
This is calculated as: $1000 / \text{value of the } \textbf{bfd minimum-interval} \text{ command}$.
- The maximum number of all BFD sessions per linecard is 1024.
- The maximum number of all BFD sessions per linecard is 1440.
- When asynchronous mode is available, the minimum interval must be greater than or equal to 15 milliseconds for up to 100 sessions on the line card. If you are running the maximum of 1024 sessions, the failure detection interval must be greater than or equal to 150 milliseconds.
- When asynchronous mode is available, the minimum interval must be greater than or equal to 250 milliseconds, with a multiplier of 3 for up to 100 sessions per line card.
- When asynchronous mode is available, the minimum interval must be greater than or equal to 15 milliseconds for up to 100 sessions on the line card. If you are running the maximum of 1440 sessions, the failure detection interval must be greater than or equal to 150 milliseconds.
- When echo mode is available, the minimum interval must be greater than or equal to 15 milliseconds for up to 100 sessions on the line card. If you are running the maximum of 1024 sessions, the failure detection interval must be less than or equal to 150 milliseconds.
- When echo mode is available, the minimum interval must be 50 milliseconds with a multiplier of 3.

- When echo mode is available, the minimum interval must be greater than or equal to 15 milliseconds for up to 100 sessions on the line card. If you are running the maximum of 1440 sessions, the failure detection interval must be less than or equal to 150 milliseconds.

Task ID

Task ID	Operations
bgp	read, write
isis	read, write
mpls-te	read, write
ospf	read, write
multicast	read, write

Examples

The following example shows how to set the BFD minimum interval for a BGP routing process:

```
RP/0/0/CPU0:router(config)# router bgp 6500
RP/0/0/CPU0:router(config-bgp)# bfd minimum-interval 275
```

Related Commands

Command	Description
address-family ipv4 unicast (BFD), on page 105	Enables BFD fast-detection on a specific IPV4 unicast destination address prefix and on the forwarding next-hop address.
bfd fast-detect, on page 121	Enables BFD to detect failures in the path between adjacent forwarding engines.
bfd multiplier, on page 129	Sets the BFD multiplier.
show bfd, on page 149	Displays BFD information for a specific location.

bfd multipath include location

To include specific linecards to host BFD multiple path sessions, use the **bfd multipath include location** command in the global configuration mode. To remove the configuration, use the **no** form of this command.

bfd multipath include location *node-id*

no bfd multipath include location *node-id*

Syntax Description

location <i>node-id</i>	Configures BFD multipath on the specified location. The <i>node-id</i> variable is mentioned in the <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
Release 4.2.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operation
bgp	read, write
ospf	read, write
isis	read, write
mpls-te	read, write

Examples

This example shows how to run the **bfd multipath include location** command on a specific location:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd multipath include location 0/5/CPU0
```

Related Commands

Command	Description
bfd, on page 107	Enters BFD configuration mode.
show bfd multipath, on page 159	Displays information regarding BFD multipath sessions.

bfd multiplier

To set the Bidirectional Forwarding Detection (BFD) multiplier, use the **bfd multiplier** command in the appropriate configuration mode. To return the router to the default setting, use the **no** form of this command.

bfd multiplier *multiplier*

no bfd multiplier [*multiplier*]

Syntax Description

<i>multiplier</i>	Number of times a packet is missed before BFD declares the neighbor down. The ranges are as follows: • BGP—2 to 16 • IS-IS—2 to 50 • MPLS-TE—2 to 10 • OSPF and OSPFv3—2 to 50 • PIM—2 to 50

Command Default

The default multiplier is 3.

Command Modes

Router configuration
Interface configuration
MPLS-TE configuration
Router configuration
Area configuration
Area interface configuration
Interface configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.4.0	The bfd multiplier command was supported in router PIM interface configuration mode.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

In OSPF environments, the setting of the **bfd multiplier** command is inherited from the highest-level configuration mode in which the command was configured. From the lowest to the highest configuration modes, the inheritance rules are as follows:

- If you configure a multiplier in area interface configuration mode, the updated multiplier affects the BFD sessions on the specified interface only.
- If you configure a multiplier in area configuration mode, the updated multiplier affects the BFD sessions on all interfaces in the specified area.
- If you configure a multiplier in router configuration mode, the updated multiplier affects the BFD sessions in all areas and all associated interfaces in the specified routing process.

If desired, you can override these inheritance rules by explicitly configuring the **bfd multiplier** command for a specific area interface or area.

If the multiplier is changed using the **bfd multiplier** command, the new value is used to update all existing BFD sessions for the protocol (BGP, IS-IS, MPLS-TE, or OSPF).

Task ID

Task ID	Operations
bgp	read, write
isis	read, write
mpls-te	read, write
ospf	read, write
multicast	read, write

Examples

The following example shows how to set the BFD multiplier in a BGP routing process:

```
RP/0/0/CPU0:router(config)# router bgp 65000
RP/0/0/CPU0:router(config-bgp)# bfd multiplier 2
```

Related Commands

Command	Description
address-family ipv4 unicast (BFD), on page 105	Enables BFD fast-detection on a specific IPV4 unicast destination address prefix and on the forwarding next-hop address.
bfd fast-detect, on page 121	Enables BFD to detect failures in the path between adjacent forwarding engines.

Command	Description
bfd minimum-interval, on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
show bfd, on page 149	Displays BFD information for a specific location.

clear bfd counters

To clear Bidirectional Forwarding Detection (BFD) counters, use the **clear bfd counters** command in EXEC mode.

clear bfd counters {**ipv4**| [**singlehop**] || [**singlehop**] || **all**| **label**} [**packet**] [**timing**] [**interface type interface-path-id**] **location node-id**

Syntax Description

ipv4	(Optional) Clears BFD over IPv4 information only.
all	(Optional) Clears BFD over IPv4 information.
packet	(Optional) Specifies that packet counters are cleared.
timing	(Optional) Specifies that timing counters are cleared.
interface	(Optional) Specifies the interface from which the BFD packet counters are cleared.
<i>type</i>	Specifies the interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location node-id	Clears BFD counters from the specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command.

Command Modes

EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.7.0	The ipv4 , ipv6 , and all keywords were added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
 - *rack*: Chassis number of the rack.
 - *slot*: Physical slot number of the line card.
 - *module*: Module number. A physical layer interface module (PLIM) is always 0.
 - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

Task ID

Task ID	Operations
bgp	read, write
ospf	read, write
isis	read, write
mpls-te	read, write

Examples

The following example shows how to clear the BFD IPv4 timing counters:

```
RP/0/0/CPU0:router# clear bfd counters ipv4 timing location 0/5/cpu0
```

Related Commands

Command	Description
bfd fast-detect, on page 121	Enables BFD to detect failures in the path between adjacent forwarding engines.
bfd minimum-interval, on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
bfd multiplier, on page 129	Sets the BFD multiplier.
show bfd, on page 149	Displays BFD information for a specific location.

dampening (BFD)

To specify delays for BFD session startup, use the **dampening** command in Bidirectional Forwarding Detection (BFD) configuration mode. To return to the default, use the **no** form of this command.

dampening [**bundle-member**] {**initial-wait**| **maximum-wait**| **secondary-wait**} *milliseconds*

no dampening [**bundle-member**] {**initial-wait**| **maximum-wait**| **secondary-wait**} *milliseconds*

Syntax Description

bundle-member	(Optional) Specifies initial, maximum, or secondary delays in milliseconds for BFD session startup on BFD bundle members.
initial-wait	Specifies the initial delay in milliseconds before starting a BFD session. For bundle members, the default is 16000. For non-bundle interfaces, the default is 2000.
maximum-wait	Specifies the maximum delay in milliseconds before starting a BFD session. For bundle members, the default is 600000. For non-bundle interfaces, the default is 12000. Note The maximum delay must be greater than the initial delay.
secondary-wait	Specifies a secondary delay in milliseconds before starting a BFD session. For bundle members, the default is 20000. For non-bundle interfaces, the default is 5000.
<i>milliseconds</i>	Number from 1 to 3600000.

Command Default

BFD session startup delays are not configured and the default timer is indefinite.

Command Modes

BFD configuration

Command History

Release	Modification
Release 3.9.0	This command was introduced.
Release 4.0.0	The bundle-member keyword was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

You do not have to configure the BFD startup timers. If you do configure the initial wait startup timer (using the **initial-wait** keyword), then it must be less than the value of the maximum wait timer.

By default, BFD dampening is applied to all sessions in the following manner:

- If a session is brought down, then dampening is applied before a session is allowed to transition to initial/up states.
- Length of time a session is dampened grows exponentially with continuous session flap.
- If a session remains up for minimum two minutes, then the length of time a session dampens with the next session flap is reset to the initial dampening value.

BFD on bundle member applies dampening, only if the detected failure is specific to layer 3. BFD dampening is not invoked for L1 or L2 failures. BFD is started after Layer 1 and Layer 2 (LACP) is up to prevent a race condition and false triggers. BFD is notified to stop/ignore when L1 or L2 goes down and must be notified to start/resume when L1 or L2 recovers for a given/affected link/member.

BFD applies dampening till the session transitions from up to down state and the session is not removed. Whenever there is a failure detected at L1 or L2, the bundle manager removes BFD session on a member.

When dampening is removed a syslog message 'Exponential backoff dampening for BFD session has been cleared for specified BFD session. When/if same session gets created by application(s), only calculated initial wait time will be applied' is generated. If this is the desired behavior, then dampening can be enabled by configuring the BFD configuration, by using the command **bfd dampening bundle-member l3-failure-only**.

Task ID

Task ID	Operations
bgp	read, write
ospf	read, write
isis	read, write
mpls-te	read, write

Examples

The following example shows how to configure an initial and maximum delay for BFD session startup on BFD bundle members:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# dampening bundle-member initial-wait 8000
RP/0/0/CPU0:router(config-bfd)# dampening bundle-member maximum-wait 15000
```

The following example shows how to change the default initial-wait for BFD on a non-bundle interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# dampening initial-wait 30000
RP/0/0/CPU0:router(config-bfd)# dampening maximum-wait 35000
```

dampening (BFD)

Related Commands

Command	Description
bfd, on page 107	Enters BFD configuration mode.

echo disable

To disable echo mode on a router or on an individual interface or bundle, use the **echo disable** command in Bidirectional Forwarding Detection (BFD) configuration mode. To return the router to the default configuration where echo mode is enabled, use the **no** form of this command.

echo disable

no echo disable

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes BFD configuration
BFD interface configuration

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you are using BFD with Unicast Reverse Path Forwarding (uRPF), you need to use the **echo disable** command to disable echo mode; otherwise, echo packets are rejected.



Note To enable or disable IPv4 uRPF checking on an IPv4 interface, use the **[no] ipv4 verify unicast source reachable-via** command in interface configuration mode.

Task ID	Operations
bgp	read, write
ospf	read, write
isis	read, write
mpls-te	read, write

Examples

The following example shows how to disable echo mode on a router:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# echo disable
```

The following example shows how to disable echo mode on an individual interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-bfd-if)# echo disable
```

Related Commands

Command	Description
bfd , on page 107	Enters BFD configuration mode.
interface (BFD) , on page 145	Enters BFD interface configuration mode.
ipv4 verify unicast source reachable-via	Enables and disables IPv4 uRPF checking on an IPv4 interface.
show bfd , on page 149	Displays BFD information.

echo ipv4 source

To specify the IP address that you want to use as the source address for BFD echo packets, use the **echo ipv4 source** command in BFD or BFD interface configuration mode. To return to the default, use the **no** form of this command.

echo ipv4 source *ip-address*

no echo ipv4 source *ip-address*

Syntax Description

<i>ip-address</i>	32-bit IPv4 address in dotted-decimal format (A.B.C.D).

Command Default

The IP address of the output interface, or the IP address in the **router-id** command (if configured), is the default address used for an echo packet when the **echo ipv4 source** command is not configured.

Command Modes

BFD configuration
BFD interface configuration

Command History

Release	Modification
Release 3.9.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you do not configure the IPv4 source address for echo packets, then BFD uses the IP address of the output interface or the address in the **router-id** command if specified.

You can override the default address for BFD echo packets by specifying an IPv4 source address for echo packets globally for all BFD sessions on the router and at an individual interface. Specifying the IP address at an individual interface will override any value specified globally for BFD on the router.

Task ID

Task ID	Operations
bgp	read, write
ospf	read, write
isis	read, write
mpls-te	read, write

Examples

The following example shows how to specify the IP address 10.10.10.1 as the source address for BFD echo packets for all BFD sessions on the router:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# echo ipv4 source 10.10.10.1
```

The following example shows how to specify the IP address 10.10.10.1 as the source address for BFD echo packets on an individual Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-bfd-if)# echo ipv4 source 10.10.10.1
```

The following example shows how to specify the IP address 10.10.10.1 as the source address for BFD echo packets on an individual Packet-over-SONET (POS) interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# interface pos 0/1/0/0
RP/0/0/CPU0:router(config-bfd-if)# echo ipv4 source 10.10.10.1
```

Related Commands

Command	Description
bfd , on page 107	Enters BFD configuration mode.
echo disable , on page 137	Disables echo mode on a router or on an individual interface or bundle.

echo latency detect

To enable latency detection for BFD echo packets, use the **echo latency detect** command in BFD configuration mode. To return to the default, use the **no** form of this command.

echo latency detect [**percentage** *percent-value* [**count** *packet-count*]]

no echo latency detect [**percentage** *percent-value* [**count** *packet-count*]]

Syntax Description

percentage <i>percent-value</i>	(Optional) Percentage of the echo failure detection time to be detected as bad latency. The range is 100 to 250. The default is 100.
count <i>packet-count</i>	(Optional) Number of consecutive packets received with the detected bad latency that will take down a BFD session. The range is 1 to 10. The default is 1.

Command Default

Echo latency detection is disabled.

Command Modes

BFD configuration

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

Latency detection is only valid where echo mode is supported for BFD. However, it is not supported on bundle interfaces.

Without latency detection, standard BFD echo failure detection tracks only the absence of receipt of echo packets within a period of time based on a counter. However, this standard echo failure detection does not address latency between transmission and receipt of any specific echo packet, which can build beyond desired tolerances over the course of the BFD session.

When latency detection is enabled, a percentage is multiplied to the echo failure detection value ($I \times M \times \%$), and the roundtrip delay is computed for the echo packet. If this delay is greater than ($I \times M \times \%$), then the BFD session is taken down.

If you have specified a packet count, then the system tracks the number of packets received back-to-back with bad latency before taking down the session.

Task ID

Task ID	Operations
bgp	read, write
ospf	read, write
isis	read, write
mpls-te	read, write

Examples

In the following examples, consider that the BFD minimum interval is 50 ms, and the multiplier is 3 for the BFD session.

The following example shows how to enable echo latency detection using the default values of 100% of the echo failure period (I x M) for a packet count of 1. In this example, when one echo packet is detected with a roundtrip delay greater than 150 ms, the session is taken down:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# echo latency detect
```

The following example shows how to enable echo latency detection based on 200% (two times) of the echo failure period for a packet count of 1. In this example, when one packet is detected with a roundtrip delay greater than 300 ms, the session is taken down:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# echo latency detect percentage 200
```

The following example shows how to enable echo latency detection based on 100% of the echo failure period for a packet count of 3. In this example, when three consecutive echo packets are detected with a roundtrip delay greater than 150 ms, the session is taken down:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# echo latency detect percentage 100 count 3
```

Related Commands

Command	Description
bfd , on page 107	Enters BFD configuration mode.
bfd minimum-interval , on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
bfd multiplier , on page 129	Sets the BFD multiplier.
echo startup validate , on page 143	Enables verification of the echo packet path before starting a BFD session.

echo startup validate

To enable verification of the echo packet path before starting a BFD session, use the **echo startup validate** command in BFD configuration mode. To return to the default, use the **no** form of this command.

echo startup [force]

no echo startup [force]

Syntax Description

force	(Optional) Ignores the remote 'Required Min Echo RX Interval' setting.

Command Default

Echo startup validation is disabled.

Command Modes

BFD configuration

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

Echo validation is only valid where echo mode is supported for BFD. However, it is not supported on bundle interfaces.

When a BFD session is down and the **echo startup validate** command is configured, an echo packet is periodically transmitted on the link while it is down to verify successful transmission within the configured latency before allowing the BFD session to change state.

Without the **force** option, the echo validation test only runs if the last received control packet contains a non-zero “Required Min Echo RX Interval” value. When the **force** keyword is configured, the echo validation test runs regardless of this value.

Task ID

Task ID	Operations
bgp	read, write
ospf	read, write

Task ID	Operations
isis	read, write
mpls-te	read, write

Examples

The following example shows how to enable echo startup validation for BFD sessions on non-bundle interfaces if the last received control packet contains a non-zero “Required Min Echo RX Interval” value:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# echo startup validate
```

The following example shows how to enable echo startup validation for BFD sessions on non-bundle interfaces regardless of the “Required Min Echo RX Interval” value in the last control packet:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# echo startup validate force
```

Related Commands

Command	Description
bfd , on page 107	Enters BFD configuration mode.
echo latency detect , on page 141	Enables latency detection for BFD echo packets.

interface (BFD)

To enter Bidirectional Forwarding Detection (BFD) interface configuration mode, where you can disable echo mode on an interface, use the **interface** command in BFD configuration mode. To return to BFD configuration mode, use the **no** form of this command.

interface *type interface-path-id*

no interface *type interface-path-id*

Syntax Description

<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

No default behavior or values

Command Modes

BFD configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
 - *rack*: Chassis number of the rack.
 - *slot*: Physical slot number of the line card.
 - *module*: Module number. A physical layer interface module (PLIM) is always 0.
 - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

If you are using BFD with Unicast Reverse Path Forwarding (uRPF) on a particular interface, then you need to use the **echo disable** command in BFD interface configuration mode to disable echo mode on that interface; otherwise, echo packets are rejected by the interface.

**Note**

To enable or disable IPv4 uRPF checking on an IPv4 interface, use the **[no] ipv4 verify unicast source reachable-via** command in interface configuration mode.

Task ID

Task ID	Operations
bgp	read, write
ospf	read, write
isis	read, write
mpls-te	read, write

Examples

The following example shows how to enter BFD interface configuration mode for a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-bfd-if)#
```

The following example shows how to enter BFD interface configuration mode for a Packet-over-SONET/SDH (POS) interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# bfd
RP/0/0/CPU0:router(config-bfd)# interface pos 0/1/0/0
RP/0/0/CPU0:router(config-bfd-if)#
```

Related Commands

Command	Description
bfd , on page 107	Enters BFD configuration mode.
echo disable , on page 137	Disables echo mode on an individual interface or on the entire router.
ipv4 verify unicast source reachable-via	Enables and disables IPv4 uRPF checking on an IPv4 interface.
show bfd , on page 149	Displays BFD information.

multihop ttl-drop-threshold

To specify the maximum time to live (TTL) value for multihop sessions per system, use the **multihop ttl-drop-threshold** command in the BFD configuration mode. To return to the default, use the **no** form of this command.

multihop ttl-drop-threshold *value*

no multihop ttl-drop-threshold *value*

Syntax Description

<i>value</i>	Specifies the configurable range of values for TTL. It ranges from 0 to 254.

Command Default

No default behavior or values

Command Modes

BFD configuration

Command History

Release	Modification
Release 4.2.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

This configuration command is only applicable for BFD multihop sessions.

Task ID

Task ID	Operation
bgp	read, write
ospf	read, write
isis	read, write
mpls-te	read, write

Examples

This example shows how to set the maximum ttl value as 2 using the **multihop-ttl-drop-threshold** command:

```
RP/0/0/CPU0:router#configure
RP/0/0/CPU0:router#bfd multihop ttl-drop threshold 2
```

Related Commands

Command	Description
show bfd counters, on page 153	Displays BFD counter information.
show bfd multipath, on page 159	Displays information regarding BFD multipath sessions.

show bfd

To display Bidirectional Forwarding Detection (BFD) information for a specific location, use the **show bfd** command in EXEC mode.

```
show bfd [ipv4| [singlehop| ]] all[label]interface[destination| ] [location node-id]
```

Syntax Description

ipv4	(Optional) Displays BFD over IPv4 information only.
all	(Optional) Displays BFD over IPv4 information.
label	(Optional) Displays the BFD label information.
interface	Specifies the BFD interface.
destination	(Optional) Specifies the destination IPv4 unicast address.
source	(Optional) Specifies the source IPv4 unicast address.
location node-id	Displays BFD information for the specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command.

Command Modes

EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
bgp	read
ospf	read
isis	read

Task ID	Operations
mpls-te	read

Examples

The following example shows the output from the **show bfd** command:

```
RP/0/0/CPU0:router# show bfd
IPV4 Sessions Up: 0, Down: 0, Total: 0
```

The following example shows the output from the **show bfd all** command:

```
RP/0/0/CPU0:router# show bfd all
IPv4:
-----
IPV4 Sessions Up: 20, Down: 0, Unknown/Retry: 2, Total: 22
IPv6:
-----
IPV6 Sessions Up: 128, Down: 2, Unknown/Retry: 1, Total: 131
Label:
-----
Label Sessions Up: 10, Down: 0, Unknown/Retry: 1, Total: 11
```

The following example shows the output from the **show bfd ipv4** command:

```
RP/0/0/CPU0:router# show bfd ipv4
IPV4 Sessions Up: 0, Down: 0, Total: 0
```

The following example shows the output from the **show bfd ipv4 location** command:

```
RP/0/0/CPU0:router# show bfd ipv4 location 0/3/cpu0
IPV4 Sessions Up: 0, Down: 1, Standby: 0, Total: 1
```

Related Commands

Command	Description
bfd fast-detect, on page 121	Enables BFD to detect failures in the path between adjacent forwarding engines.
bfd minimum-interval, on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
bfd multiplier, on page 129	Sets the BFD multiplier.

show bfd client

To display Bidirectional Forwarding Detection (BFD) client information, use the **show bfd client** command in EXEC mode.

show bfd client [detail]

Syntax Description

detail	(Optional) Specifies detailed client information including number of sessions and client reconnects.

Command Default

Enter the **show bfd client** command without specifying the **detail** keyword to display summarized BFD client information.

Command Modes

EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
bgp	read
ospf	read
isis	read
mpls-te	read

Examples

The following example shows the output from the **show bfd client** command:

```
RP/0/0/CPU0:router# show bfd client
Name           Node           Num sessions
-----
```

```
show bfd client
```

```

bgp          0/0/CPU0 0
isis         0/0/CPU0 0
isis         0/0/CPU0 0

```

Table 12: show bfd client Field Descriptions

Field	Description
Name	Name of the BFD client.
Node	Location of the BFD client.
Num sessions	Number of active sessions for the BFD client.

Related Commands

Command	Description
bfd fast-detect, on page 121	Enables BFD to detect failures in the path between adjacent forwarding engines.
bfd minimum-interval, on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
bfd multiplier, on page 129	Sets the BFD multiplier.
show bfd, on page 149	Displays BFD information for a specific location.

show bfd counters

To display Bidirectional Forwarding Detection (BFD) counter information, use the **show bfd counters** command in EXEC mode.

show bfd counters [**ipv4**] [**singlehop**] [**all**] [**label**] **packet** [**interface** *type interface-path-id*] **location** *node-id*

Syntax Description

ipv4	(Optional) Displays BFD over IPv4 information only.
all	(Optional) Displays BFD over IPv4 information.
packet	Specifies that packet counters are displayed.
interface	(Optional) Specifies the interface for which to show counters.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location <i>node-id</i>	Displays BFD counters from the specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command.

Command Modes

EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.7.0	The ipv4 , ipv6 , and all keywords were added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
 - *rack*: Chassis number of the rack.
 - *slot*: Physical slot number of the line card.
 - *module*: Module number. A physical layer interface module (PLIM) is always 0.
 - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

Task ID

Task ID	Operations
bgp	read
ospf	read
isis	read
mpls-te	read

Examples

The following example shows the output from the **show bfd counters packet** command for IPv4:

```
RP/0/0/CPU0:router# show bfd counters ipv4 packet

IPv4 Singlehop:
GigabitEthernet0/0/1/2          Recv      Xmit      Echo: (    Recv      Xmit
  Async:          4148      4137      Echo: (  47136)    80192
GigabitEthernet0/1/1/2          Recv      Xmit      Echo: (    Recv      Xmit
  Async:    116876    125756      Echo: ( 2268192)  2301312
Bundle-Ether10                  Recv      Xmit      Echo:      Recv      Xmit
  Async:           2         0      Echo:           0         0
Bundle-Ether20                  Recv      Xmit      Echo:      Recv      Xmit
  Async:          91         0      Echo:           0         0

IPv4 Multihop: (Src IP/Dst IP/Vrf Id)
33.15.151.4/33.16.151.4/0x12345678  Recv      Xmit
  Async:           0      570337
```

Table 13: show bfd counters packet Field Descriptions

Field	Description
Async	Number of asynchronous mode (control) packets that were received or transmitted on the specified interface.
Echo	Number of echo packets that were received or transmitted on the specified interface.

Related Commands

Command	Description
bfd fast-detect , on page 121	Enables BFD to detect failures in the path between adjacent forwarding engines.
bfd minimum-interval , on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
bfd multiplier , on page 129	Sets the BFD multiplier.

show bfd mib session

To display IPv4 Bidirectional Forwarding Detection (BFD) MIB session information, use the **show bfd mib session** command in EXEC mode.

show bfd mib session [*location node-id*]

Syntax Description

location <i>node-id</i>	(Optional) Displays all IPv4 BFD MIB session information stored on the specified node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

When *node-id* is not specified, information for all IPv4 BFD MIB sessions, stored on the route processor node, is displayed.

Command Modes

EXEC

Command History

Release	Modification
Release 3.8.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When *node-id* is not specified, information for all IPv4 BFD MIB sessions, stored on the route processor node, is displayed, and this information is populated and updated only after SNMP operations for those BFD MIB sessions are performed.

When *node-id* is specified, information for all IPv4 BFD MIB sessions, stored on the specified node (linecard), is displayed, and this information is updated automatically without SNMP operations being performed.

Task ID

Task ID	Operations
bgp	read
ospf	read
isis	read
mpls-te	read

Examples

The following example displays all IPv4 BFD MIB session information stored on the RP node:

```
RP/0/0/CPU0:router# show bfd mib session

Tue Sep  9 07:49:30.828 PST DST
Local Discr: 327681(0x50001), Remote Discr: 0(0x0)
BFD session: GigabitEthernet0_1_5_2(0x11800c0), 10.27.4.7
  Current State: ADMIN DOWN, Number of Times UP: 0
  Running Version: 0, Last Down Diag: None
  Last Up Time (s.ns): 0.0
  Last Down Time (s.ns): 0.0
  Detection Multiplier: 0
  Desired Min TX Interval: 0
  Required Min RX Interval: 0
  Required Min RX Echo Interval: 0
  Packets in/out: 0/0
  Current Trap Bitmap: 0x0
  Last Time Cached: Not yet cached
```

The following example displays all IPv4 and IPv6 BFD MIB session information stored on 0/1/CPU0:

```
RP/0/0/CPU0:router# show bfd mib session location 0/1/CPU0

Tue Sep  9 07:44:49.190 PST DST
Local Discr: 327681(0x50001), Remote Discr: 0(0x0)
BFD session: GigabitEthernet0_1_5_2(0x11800c0), 10.27.4.7
  Number of times UP: 0
  Last Down Diag: None
  Last Up Time (s.ns): 0.0
  Last Down Time (s.ns): 0.0
  Packets in/out: 0/1140134
```

Table 14: show bfd mib Field Descriptions

Field	Description
date and timestamp	Date and time stamp during which a snapshot of the BFD MIB session information is taken.
Local Discr	Local discriminator (in decimal and hexadecimal) that uniquely identifies the BFD MIB session.
Remote Discr	Session discriminator (in decimal and hexadecimal) that was chosen by the remote system for the BFD MIB session.
BFD session	Index of interface upon which the BFD MIB session is running. Also, neighboring IP address that is monitored with the BFD MIB session.
Current State	Current state of the BFD MIB session.
Number of Times UP	Number of times the BFD MIB session has gone into the up state since the router was last rebooted.

Field	Description
Running Version	BFD protocol version number in which the BFD MIB session is running.
Last Down Diag	Diagnostic value associated with the last time the BFD MIB session went down.
Last Up Time (s.ns)	Value of sysUpTime, in <i>seconds.nanoseconds</i> , during which the BFD MIB session last came up. If such an event does not exist, a zero is displayed.
Last Down Time (s.ns)	Value of sysUpTime, in <i>seconds.nanoseconds</i> , during which communication was last lost with the neighbor. If such an event does not exist, a zero is displayed.
Detection Multiplier	Failure detection multiplier.
Desired Min TX Interval	Minimum interval, in microseconds, preferred by the local system when transmitting BFD control packets.
Required Min RX Interval	Minimum interval, in microseconds, that the local system supports between received BFD control packets.
Required Min RX Echo Interval	Minimum interval, in microseconds, that the local system supports between received BFD echo packets.
Packets in/out	Total number of BFD messages received and transmitted for the BFD MIB session.
Current Trap Bitmap	Bits that control the trap for the BFD MIB session. A nonzero value indicates that the trap is generated when the next trap event is triggered.
Last Time Cached	When information for the BFD MIB session was last cached. Typically, the information is cached when SNMP operations for the BFD MIB session are performed.

Related Commands

Command	Description
show bfd session , on page 161	

show bfd multipath

To display information concerning only BFD multipath sessions, use the **show bfd multipath** command in the EXEC mode.

show bfd multipath{**ipv4**|**ipv6**|**label**|**all**} **location** *node-id*

Syntax Description

ipv4	Displays BFD over IPv4 information only.
ipv6	Displays BFD over IPv6 information only.
label	Displays BFD label information.
all	Displays both BFD over IPv4 and BFD over IPv6 information.
location <i>node-id</i>	Displays BFD counters from the specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 4.2.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operation
bgp	read
ospf	read
isis	read
mpls-te	read

Examples

This example shows the sample output for **show bfd multipath** command:

RP/0/0/CPU0:router#show bfd multipath location 0/5/cpu0

Int/Src Addr	Label/Dest Addr	VRF ID	Discr	Node	State
pw-ether 1	10.10.10.10	0x00000002	0x4	0/5/CPU0	DOWN
tunnel-ip 1	1.1.1.1	0x8	0x5	0/5/CPU0	UP

show bfd session

To display Bidirectional Forwarding Detection (BFD) session information, use the **show bfd session** command in EXEC mode.

show bfd [**ipv4**] [**singlehop**] || [**ipv6**] [**singlehop**] || **all** [**label**] **session** [**interface** *type interface-path-id*] [**destination** *ip-address*] [**detail**][**in-label**] [**location** *node-id*]

Syntax Description

ipv4	(Optional) Displays BFD over IPv4 information only.
all	(Optional) Displays BFD over IPv4 information.
label	(Optional) Displays the MPLS Transport Profile (MPLS-TP) label BFD information only.
interface	(Optional) Specifies the interface for which to show information.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
destination <i>ip-address</i>	(Optional) Displays the BFD session destined for the specified IP address.
detail	(Optional) Displays detailed session information, including statistics and number of state transitions.
in-label	(Optional) Displays the BFD session with a specific incoming MPLS-TP label.
location <i>node-id</i>	(Optional) Displays BFD sessions hosted from the specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

The default is the default address family identifier (AFI) that is set by the **set default-afi** command.

Command Modes

EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Release	Modification
Release 3.7.0	The ipv4 , ipv6 , and all keywords were added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
 - *rack*: Chassis number of the rack.
 - *slot*: Physical slot number of the line card.
 - *module*: Module number. A physical layer interface module (PLIM) is always 0.
 - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.



Note

Only VRF ID is displayed in the summary CLI (such as **show bfd multiple-path**, **show bfd all session**, **show bfd counters**) and VRF name and VRF ID is displayed in the detailed CLI (such as **show bfd all session detail**, **show bfd all session status**).

Task ID

Task ID	Operations
bgp	read
ospf	read
isis	read
mpls-te	read

Examples

The following example shows the output from the **show bfd session** command with the **detail** keyword and IPv4 as the default:

```
RP/0/0/CPU0:router# show bfd session detail
I/f:TenGigE0/2/0/0.6, Location:0/2/CPU0, dest:10.0.6.2, src:10.0.6.1
State:UP for 0d:0h:3m:4s, number of times UP:1
Received parameters:
Version:1, desired tx interval:2 s, required rx interval:2 s
Required echo rx interval:1 ms, multiplier:3, diag:None
My discr:589830, your discr:590028, state UP, D/F/P/C/A:0/0/0/1/0
```

```

Transmitted parameters:
  Version:1, desired tx interval:2 s, required rx interval:2 s
  Required echo rx interval:1 ms, multiplier:3, diag:None
  My discr:590028, your discr:589830, state UP, D/F/P/C/A:0/0/0/1/0
Timer Values:
  Local negotiated async tx interval:2 s
  Remote negotiated async tx interval:2 s
  Desired echo tx interval:250 ms, local negotiated echo tx interval:250 ms
  Echo detection time:750 ms(250 ms*3), async detection time:6 s(2 s*3)
Local Stats:
  Intervals between async packets:
    Tx:Number of intervals=100, min=952 ms, max=2001 ms, avg=1835 ms
      Last packet transmitted 606 ms ago
    Rx:Number of intervals=100, min=1665 ms, max=2001 ms, avg=1828 ms
      Last packet received 1302 ms ago
  Intervals between echo packets:
    Tx:Number of intervals=100, min=250 ms, max=252 ms, avg=250 ms
      Last packet transmitted 188 ms ago
    Rx:Number of intervals=100, min=250 ms, max=252 ms, avg=250 ms
      Last packet received 187 ms ago
  Latency of echo packets (time between tx and rx):
    Number of packets:100, min=1 ms, max=2 ms, avg=1 ms
Session owner information:
  Client          Desired interval      Multiplier
  -----
  bgp-            250 ms                      3

```

The following example shows the output from the **show bfd session** command with the **all** keyword, which displays both IPv4 and IPv6 information:

```

RP/0/0/CPU0:router# show bfd all session location 0/1/CPU0

Mon Nov  5 08:51:50.339 UTC
IPv4:
-----
Interface          Dest Addr          Local det time(int*mult)      State
                   Echo              Async
-----
PO0/1/0/0          10.0.0.2           300ms(100ms*3)      6s(2s*3)      UP

IPv6:
-----
Interface          Dest Addr          Local det time(int*mult)      State
                   Echo              Async
-----
PO0/1/0/0          abcd::2            0s(0s*0)            15s(5s*3)      UP

```

Table 15: show bfd session detail command Field Descriptions

Field	Description
I/f	Interface type.
Location	Location of the node that hosts the local endpoint of the connection, in the <i>rack/slot/module</i> notation
dest	IP address of the destination endpoint.
src	IP address of the source endpoint.

Field	Description
State	Current state of the connection, and the number of days, hours, minutes, and seconds that this connection has been active.
number of times UP	Number of times this connection has been brought up.
Received parameters	Provides information on the last transmitted control packet for the session: • Version—Version number of the BFD protocol. • desired tx interval—Desired transmit interval. • required rx interval—Required receive interval. • Required echo rx interval—Required echo receive interval. • multiplier— Number of times a packets is missed before BFD declares the neighbor down. • diag—diagnostic code specifying the peer system's reason for the last transition of the session from Up to some other state. • My discr—unique, nonzero discriminator value generated by the transmitting system, used to demultiplex multiple BFD sessions between the same pair of systems. • your discr— discriminator received from the corresponding remote system. This field reflects back the received value of My discr, or is zero if that value is unknown.

Field	Description
Transmitted parameters	Provides information on the last transmitted control packet for the session: • Version—Version number of the BFD protocol. • desired tx interval—Desired transmit interval. • required rx interval—Required receive interval • Required echo rx interval—Required echo receive interval • multiplierNumber of times a packets is missed before BFD declares the neighbor down. • diag—diagnostic code specifying the local system's reason for the last transition of the session from Up to some other state. • My discr—unique, nonzero discriminator value generated by the transmitting system, used to demultiplex multiple BFD sessions between the same pair of systems. • your discr— discriminator received from the corresponding remote system. This field reflects back the received value of My discr, or is zero if that value is unknown.

Field	Description
Timer Values	Provides information on the timer values used by the local and remote ends, as follows: • Local negotiated async tx interval—interval at which control packets are being transmitted by the local end. • Remote negotiated async tx interval—interval at which control packets should be transmitted by the remote end. • Desired echo tx interval—interval at which the local end would like to transmit echo packets. • local negotiated echo tx interval—interval at which echo packets are being transmitted by the local end. • Echo detection time—local failure detection time of echo packets. It is the product of the local negotiated echo tx interval and the local multiplier. • async detection time—local failure detection time of the asynchronous mode (control packets). It is the product of the remote negotiated async tx interval and the remote multiplier.

Field	Description
Local Stats	Displays the local transmit and receive statistics, • Intervals between async packets—provides measurements on intervals between control packets (tx and rx): ◦ Number of intervals—number of sampled intervals between control packets ◦ min—minimum measured interval between 2 consecutive control packets ◦ max—maximum measured interval between 2 consecutive control packets ◦ avg—average measured interval between 2 consecutive control packets ◦ Last packet received/transmitted—indicates how long ago the last control packet was received/transmitted. • Intervals between echo packets—provides measurements on intervals between echo packets (tx and rx). The measurements have the same meaning as for async packets. • Latency of echo packets (time between tx and rx)—provides measurements on latency of echo packets, i.e. the time between tx and rx of echo packets: ◦ Number of packets—number of sampled echo packets. ◦ min—minimum measured latency for echo packets. ◦ max—maximum measured latency of echo packets. ◦ avg—average measured latency of echo packets.

Field	Description
Session owner information	Provides the following information about the session owner. • Client—name of the client application process. • Desired interval—desired interval provided by the client, in milliseconds. • Multiplier—multiplier value provided by the client.

Related Commands

Command	Description
bfd fast-detect, on page 121	Enables BFD to detect failures in the path between adjacent forwarding engines.
bfd minimum-interval, on page 124	Specifies the minimum control packet interval for BFD sessions for the corresponding BFD configuration scope.
bfd multiplier, on page 129	Sets the BFD multiplier.
show bfd mib session, on page 156	Displays BFD MIB session information.

show bfd summary

To display the percentage of PPS rate in use per line card, maximum usage of PPS, and total number of sessions, use the **show bfd summary** command in the EXEC mode.

show bfd summary [**private**]**location***node-id*

Syntax Description

private	Displays the private information.
location <i>node-id</i>	Displays BFD counters from the specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 4.2.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operation
bgp	read
ospf	read
isis	read
mpls-te	read

Examples

This example shows the sample output from the **show bfd summary** command for a specified location:

```
RP/0/0/CPU0:router#show bfd summary location 0/1/cpu0
```

show bfd summary

Node	PPS %	rate Used	usage Max	Session Total	number Max
0/1/CPU0	0	80	9600	4	4000

This example shows the sample output from the **show bfd summary** command:

```
RP/0/0/CPU0:router#show bfd summary
```

Node	PPS %	rate Used	usage Max	Session Total	number Max
0/0/CPU0	0	0	9600	0	4000
0/1/CPU0	0	0	9600	0	4000
0/2/CPU0	0	0	9600	0	4000
0/5/CPU0	0	0	9600	0	4000
0/6/CPU0	0	0	9600	0	4000
0/7/CPU0	0	0	9600	0	4000



Diagnostics Commands on the Cisco IOS XR Software

This module provides command line interface (CLI) commands for configuring diagnostics on your router.

- [diagnostic load, page 172](#)
- [diagnostic monitor, page 174](#)
- [diagnostic monitor interval, page 176](#)
- [diagnostic monitor syslog, page 178](#)
- [diagnostic monitor threshold, page 179](#)
- [diagnostic ondemand action-on-failure, page 181](#)
- [diagnostic ondemand iterations, page 183](#)
- [diagnostic schedule, page 184](#)
- [diagnostic start, page 187](#)
- [diagnostic stop, page 189](#)
- [diagnostic unload, page 191](#)
- [ping \(administration EXEC\), page 193](#)
- [show diag , page 198](#)
- [show diagnostic bootup level, page 203](#)
- [show diagnostic content, page 205](#)
- [show diagnostic ondemand settings, page 208](#)
- [show diagnostic result, page 209](#)
- [show diagnostic schedule, page 212](#)
- [show diagnostic status, page 214](#)
- [show run diagnostic monitor, page 215](#)

diagnostic load

To load an offline diagnostic image for integrated field diagnostics, use the **diagnostic load** command in administration EXEC mode.

diagnostic load location *node-id* [**autostart** {**all**|**basic**}]

Syntax Description

location <i>node-id</i>	Loads an offline diagnostic image for a specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation. All modules in the specified slot are loaded with the offline diagnostic image.
autostart { all basic }	(Optional) Starts running the diagnostic tests after the image has loaded. The following options are available: • all—Runs all tests. • basic—Runs basic tests

Command Default

None

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic load** command to load an offline diagnostic image used for integrated field diagnostics. Loading a diagnostic image places the specified card out of service.

The time it takes to load a diagnostic image varies depending on the card. Use the **show platform** command to determine if the image has been loaded and if the card has been placed out of service.



Note

The distributed route processor (DRP) does not support the automatic running of tests when the image is loaded for CPU0 and CPU1. After the diagnostic image is loaded, use the **diagnostic start location** *node-id* **test** {*id* | **all** | **basic** | **non-disruptive**} command to execute the tests.

For more information about running Cisco IOS XR diagnostics, refer to *Cisco IOS XR Diagnostics*.

Task ID

Task ID	Operations
diag	execute

Examples

The following example shows how to load an offline diagnostic image:

```
RP/0/RP0/CPU0:router# admin
RP/0/RP0/CPU0:router(admin)# diagnostic load location 0/0/CPU0 autostart basic

diagnostic load will bring requested slot out of service. [confirm(y/n)] y
User has confirmed diagnostic load request
Preparing UUT for Diagnostics software.
Downloading IDS diagnostics image /pkg/ucode/hfr-diag-l3sp-fdiags
Downloading IDS diagnostics image /pkg/ucode/hfr-diag-l3-fdiags
Please wait for UUT image downloading ...
diagnostic load in progress.
```

Related Commands

Command	Description
show platform	Displays information and status of each node in the system.

diagnostic monitor

To configure the health-monitoring diagnostic testing for a specified location, use the **diagnostic monitor** command in administration configuration mode. To remove the specified command from the configuration file and restore the system to its default condition, use the **no** form of this command.

diagnostic monitor location *node-id* **test** {*id* | *test-name*} [**disable**]

no diagnostic monitor location *node-id* **test** {*id* | *test-name*} [**disable**]

Syntax Description

node-id	Location to enable diagnostic monitoring. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
test { <i>id</i> <i>test-name</i> }	Specifies diagnostic test selection. The following test selections are available: • <i>id</i>—Test ID . • <i>test-name</i>—Name of the test. Use the show diagnostic content command in administration EXEC mode to see a list of test names and their associated IDs.
disable	Disables diagnostic monitoring for a specified location.

Command Default

To view the default value for each test, use the **show diagnostic content** command in administration EXEC mode when the diagnostic image is first installed. The default may be different for each test.

Command Modes

Administration configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic monitor** command to enable or disable health-monitoring diagnostic testing for a specified test at the specified location.

Use the **disable** keyword to disable a health-monitoring diagnostic test that is enabled by default. For example, if test 1 is enabled by default, the **disable** keyword disables the diagnostic test. If the **no** form of the command is used, the test is set to the default condition, which is enabled.

Task ID

Task ID	Operations
diag	read, write

Examples

The following example shows how to enable health-monitoring diagnostic testing for 0/1/cpu0:

```
RP/0/0/CPU0:router(admin-config)# diagnostic monitor location 0/1/cpu0 test 1
```

Related Commands

Command	Description
show diagnostic content, on page 205	Displays test information including test ID, test attributes, and supported coverage test levels for each test and for all components.

diagnostic monitor interval

To configure the health-monitoring diagnostic testing for a specified interval for a specified location, use the **diagnostic monitor interval** command in administration configuration mode. To remove the specified command from the configuration file and restore the system to its default condition, use the **no** form of this command.

diagnostic monitor interval location *node-id* **test** {*id* | *test-name*} *number-of-days* *hour* : *minutes* : *seconds* . *milliseconds*

no diagnostic monitor interval location *node-id* **test** {*id* | *test-name*} *number-of-days* *hour* : *minutes* : *seconds* . *milliseconds*

Syntax Description

location <i>node-id</i>	Specifies a location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
test { <i>id</i> <i>test-name</i> }	Specifies diagnostic test selection. The following test selections are available: • <i>id</i>—Test ID. • <i>test-name</i>—Test name . Use the show diagnostic content command in administration EXEC mode to see a list of test names and their associated IDs.
<i>number-of-days</i> <i>hour:minutes:seconds.milliseconds</i>	Interval between each test run. The <i>number-of-days</i> argument specifies the number of days between testing. The range is from 0 through 20. The <i>hour:minutes:seconds.milliseconds</i> argument specifies the interval, where <i>hour</i> is a number in the range from 0 through 23, <i>minutes</i> is a number in the range from 0 through 59, <i>seconds</i> is a number in the range from 0 through 59, and <i>milliseconds</i> is a number in the range from 0 through 999.

Command Default

To view the default value for each test, use the **show diagnostic content** command in administration EXEC mode when the diagnostic image is first installed. The default may be different for each test.

Command Modes

Administration configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic monitor interval** command to set the health-monitoring interval of a specified test at the specified location. The **no** version of the command resets the interval to the default setting. The **diagnostic monitor** command is used to enable health-monitoring.

Task ID

Task ID	Operations
diag	read, write

Examples

The following example shows how to set the health-monitoring diagnostic testing at an interval of 1 hour, 2 minutes, 3 seconds, and 4 milliseconds for 0/1/cpu0:

```
RP/0/0/CPU0:router(admin-config)# diagnostic monitor interval location 0/1/cpu0 test 1 0 1:2:3.4
```

Related Commands

Command	Description
diagnostic monitor , on page 174	Configures the health-monitoring diagnostic testing for a specified location.
show diagnostic content , on page 205	Displays test information including test ID, test attributes, and supported coverage test levels for each test and for all components.

diagnostic monitor syslog

To enable the generation of a syslog message when any health monitoring test fails, use the **diagnostic monitor syslog** command in administration configuration mode. To remove the specified command from the configuration file and restore the system to its default condition, use the **no** form of this command.

diagnostic monitor syslog

no diagnostic monitor syslog

Syntax Description This command has no keywords or arguments.

Command Default Syslog is disabled.

Command Modes Administration configuration

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic monitor syslog** command to enable the generation of a syslog message when a health-monitoring test fails.

Task ID	Operations
diag	read, write

Examples The following example shows how to enable the generation of syslog messages:

```
RP/0/0/CPU0:router(admin-config)# diagnostic monitor syslog
```

Command	Description
show diagnostic content , on page 205	Displays test information including test ID, test attributes, and supported coverage test levels for each test and for all components.

diagnostic monitor threshold

To configure the health-monitoring diagnostic testing failure threshold, use the **diagnostic monitor threshold** command in administration configuration mode. To remove the specified command from the configuration file and restore the system to its default condition, use the **no** form of this command.

diagnostic monitor threshold location *node-id* **test** {*id* | *test-name*} **failure count** *failures*

no diagnostic monitor threshold location *node-id* **test** {*id* | *test-name*} **failure count** *failures*

Syntax Description

location <i>node-id</i>	Specifies a location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
test { <i>id</i> <i>test-name</i> }	Specifies diagnostic test selection. The following test selections are available: • <i>id</i>—Test ID. • <i>test-name</i>—Test name . Use the show diagnostic content command in administration EXEC mode to see a list of test names and their associated IDs.
failure count <i>failures</i>	Specifies the number of allowable test failures. Range is 1 to 99.

Command Default

To view the default value for each test, use the **show diagnostic content** command in administration EXEC mode when the diagnostic image is first installed. The default can be different for each test.

Command Modes

Administration configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic monitor threshold** command to specify health-monitoring diagnostic testing failure threshold.

Task ID

Task ID	Operations
diag	read, write

Examples

The following example shows how to set the failure threshold to 35 test failures for all tests for 0/1/cpu0:

```
RP/0/0/CPU0:router(admin-config)# diagnostic monitor threshold location 0/1/cpu0 test all failure count 35
```

Related Commands

Command	Description
show diagnostic content, on page 205	Displays test information including test ID, test attributes, and supported coverage test levels for each test and for all components.

diagnostic ondemand action-on-failure

To set when to stop test execution for a **diagnostic start** command, use the **diagnostic ondemand action-on-failure** command in administration EXEC mode. This command is used in conjunction with the **diagnostic ondemand iteration** command.

diagnostic ondemand action-on-failure {**continue** [*failure-count*]| **stop**}

Syntax Description

continue	Specifies that test execution continues until all iterations are complete, no matter how many failures are encountered.
failure-count	(Optional) Specifies that test execution continues until the number of failures reaches the specified <i>failure-count</i> . Range is 0 to 65534. A <i>failure-count</i> of 0 indicates to not stop execution until all iterations are complete, no matter how many failures are encountered.
stop	Stops execution immediately when the first test failure occurs.

Command Default

failure-count: 0

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.5.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic ondemand action-on-failure** command to specify whether or when to stop test execution if a test fails. This command is used in conjunction with the **diagnostic ondemand iterations** command.

Task ID

Task ID	Operations
diag	execute

Examples

The following example shows how to set the test failure action to stop:

```
RP/0/0/CPU0:router(admin)# diagnostic ondemand action-on-failure stop
```

Related Commands

Command	Description
diagnostic ondemand iterations, on page 183	Sets the number of times to repeat execution of the diagnostic test.
diagnostic start, on page 187	Runs a specified diagnostic test.

diagnostic ondemand iterations

To set the number of times to repeat execution of the tests specified by the **diagnostic start** command, use the **diagnostic ondemand iterations** command in administration EXEC mode.

diagnostic ondemand iterations *count*

Syntax Description

<i>count</i>	Number of times to repeat the specified on-demand tests. Range is 1 to 999.

Command Default

count: 1

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.5.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic ondemand iterations** command to specify the number of times the specified on-demand tests run. The on-demand tests are specified using the **diagnostic start** command.

Task ID

Task ID	Operations
diag	execute

Examples

The following example shows how to set the number of iterations to 12:

```
RP/0/0/CPU0:router(admin)# diagnostic ondemand iterations 12
```

Related Commands

Command	Description
diagnostic ondemand action-on-failure , on page 181	Sets when to stop test execution for a diagnostic test.
diagnostic start , on page 187	Runs a specified diagnostic test.

diagnostic schedule

To configure a diagnostic schedule, use the **diagnostic schedule** command in administration configuration mode. To disable the diagnostic schedule, use the **no** form of this command.

diagnostic schedule location *node-id* **test** {*id* | *test-name*} [**all** | **basic** | **complete** | **minimal** | **non-disruptive** | **per-device**] [**device** *number* | **all**] {**daily** | **on** *month day year* | **weekly** *day-of-week*} *hour:minute*

no diagnostic schedule location *node-id* **test** {*id* | *test-name*} [**all** | **basic** | **complete** | **minimal** | **non-disruptive** | **per-device**] [**device** *number* | **all**] {**daily** | **on** *month day year* | **weekly** *day-of-week*} *hour:minute*

Syntax Description

location <i>node-id</i>	Schedules a diagnostic test for a specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
test	Specifies a specific diagnostic test, or all diagnostic tests.
id	Specifies a test ID or list of test IDs. Use the show diagnostic content command in administration EXEC mode to see a list of test names and their associated IDs. Multiple tests can be listed if separated by semicolons (;) as follows: • <i>x;y-z</i> (for example: 1; 3-4 or 1;3;4)
test-name	Specifies the name of a test. Use the show diagnostic content command in administration EXEC mode to see a list of test names.
all	Specifies all tests.
basic	Specifies the basic on-demand test suite [Attribute = B].
complete	Specifies the complete bootup test suite [Attribute = C].
minimal	Specifies the minimal bootup test suite [Attribute = M].
non-disruptive	Specifies the non-disruptive test suite [Attribute = N].
per-device	Specifies the per-device test suite [Attribute = V].
device <i>number</i> all	Note This string works only with the all, basic, complete, minimal, non-disruptive, and per-device keywords. (Optional) Specifies the devices on which the diagnostic tests should run. The following options are available: • <i>number</i>—Runs tests on one or more devices. The range is 1 through 8. To specify multiple devices, you can use hyphens (-) and semicolons (;); for example, 1; 3-4 or 1;3;4). • all—Runs tests on all devices.
daily	Specifies a daily schedule.

on <i>month day year</i>	Schedules an exact date.
weekly <i>day-of-week</i>	Specifies a weekly schedule with a set day of the week. Enter the name of a day of the week or a number that specifies a day of the week in the range from 0 through 6.
<i>hour:minute</i>	Scheduled start time, where <i>hour</i> is a number in the range from 0 through 23, and <i>minute</i> is a number in the range from 0 through 59.

Command Default No default behavior or values

Command Modes Administration configuration

Command History	Release	Modification
	Release 3.3.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For more information about running Cisco IOS XR diagnostics, refer to *Cisco IOS XR Diagnostics*.

Task ID	Task ID	Operations
	diag	read, write

Examples The following example shows how to schedule all diagnostic tests for location 0/0/CPU0 every day at 12:30 pm:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# configure
RP/0/0/CPU0:router(admin-config)# diagnostic schedule location 0/0/CPU0 test all daily 12:30
```

The following example shows how to schedule all bootstrap tests for device 1 every Sunday at 12:30 pm:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# configure
RP/0/0/CPU0:router(admin-config)# diagnostic schedule location 0/0/CPU0 test all daily
complete device 1 weekly 12:30
```

Related Commands

Command	Description
show diagnostic schedule, on page 212	Displays the current scheduled diagnostic tasks.

diagnostic start

To run a specified diagnostic test, use the **diagnostic start** command in administration EXEC mode.

diagnostic start *location node-id* **test** [*id* | *test-name*] **all** | **basic** | **complete** | **minimal** | **non-disruptive** | **per-device**] [*device number*] **all**

Syntax Description

location <i>node-id</i>	Runs diagnostic testing for a specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
test	Specifies a specific diagnostic test, or all diagnostic tests.
id	Test ID or list of test IDs. Use the show diagnostic content command in administration EXEC mode to see a list of test names and their associated IDs. Multiple tests can be listed if separated by semicolons (;) as follows: • <i>x;y-z</i> (for example: 1; 3-4 or 1;3;4)
test-name	Name of the test. Use the show diagnostic content command in administration EXEC mode to see a list of test names.
all	Specifies all tests.
basic	Specifies the basic on-demand test suite [Attribute = B].
complete	Specifies the complete bootup test suite [Attribute = C].
minimal	Specifies the minimal bootup test suite [Attribute = M].
non-disruptive	Specifies the nondisruptive test suite [Attribute = N].
per-device	Specifies the per-device test suite [Attribute = V].
device <i>number</i> all	Note This string works only with the all, basic, complete, minimal, non-disruptive, and per-device keywords. (Optional) Specifies the devices on which the diagnostic tests should start. The following options are available: • <i>number</i>—Start tests on one or more devices. The range is 1 through 8. To specify multiple devices, you can use hyphens (-) and semicolons (;); for example, 1; 3-4 or 1;3;4). • all—Starts tests on all devices.

Command Default

No default behavior or values

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.5.0	The per-device keyword was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic start** command to run a diagnostic test on a specified card.

For more information about running Cisco IOS XR diagnostics, refer to *Cisco IOS XR Diagnostics*.

Task ID

Task ID	Operations
diag	execute

Examples

The following example shows how to start a suite of basic diagnostic tests for a specified location:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# diagnostic start location 0/0/CPU0 test basic
```

The following example shows how to start a suite of minimal bootup tests for devices 1 through 7 at the specified location:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# diagnostic start location 0/0/CPU0 test minimal devices 1-7
```

Related Commands

Command	Description
diagnostic stop , on page 189	Stops the diagnostic testing in progress on a node.

diagnostic stop

To stop the diagnostic testing in progress on a node, use the **diagnostic stop** command in administration EXEC mode.

diagnostic stop location *node-id*

Syntax Description

location <i>node-id</i>	Stops diagnostic testing for a specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic stop** command to stop a diagnostic test on a specified node. The command is used for scheduled tests, a test that is causing errors, or a test that does not finish.

For more information about running Cisco IOS XR diagnostics, refer to *Cisco IOS XR Diagnostics*.

Task ID

Task ID	Operations
diag	execute

Task ID

Examples

The following example shows how to stop the diagnostic test process:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# diagnostic stop location 0/0/CPU0
```

diagnostic stop

Related Commands

Command	Description
diagnostic start, on page 187	Runs a specified diagnostic test.

diagnostic unload

To unload an offline diagnostic image, use the **diagnostic unload** command in administration EXEC mode.

diagnostic unload location *node-id*

Syntax Description

location <i>node-id</i>	Unloads an offline diagnostic image for a specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation. The diagnostic image is unloaded for all modules in the specified slot.

Command Default

No default behavior or values

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **diagnostic unload** command to unload an offline diagnostic image used for integrated field diagnostics. Unloading the image returns the specified card to service.

Use the **show platform** command to determine if the card has been placed back into service.

For more information about running Cisco IOS XR diagnostics, refer to *Cisco IOS XR Diagnostics*.

Task ID

Task ID	Operations
diag	execute

Examples

The following example shows how to unload a diagnostic image:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# diagnostic unload location 0/0/CPU0
```

Related Commands

Command	Description
diagnostic load , on page 172	Loads a diagnostic test.
show platform	Displays information and status of each node in the system.

ping (administration EXEC)

To send internal echo messages from one node to another, use the **ping** command in administration EXEC mode.

ping {**control-eth**|**fabric**} {**fgid** *id*|**location** *node-id*} [**count** *pings*] [**debug**] [**interval** *milliseconds*] [**pattern** *random*] [**queue** *priority*] [**retries** *number*] [**size** *payload_size*] [**timeout** *seconds*] [**tlate** *seconds*] [**uc**] [**via-egressq**] [**via-fabricq-1**]

Syntax Description

control-eth	Specifies a control ethernet ping test.
fabric	Specifies a fabric ping test.
fgid <i>id</i>	Specifies that a multicast ping is sent over a fabric to nodes with the fabric group identifier (FGID) of 1024 through 1000000. Nodes that receive the ping respond with a unicast packet.
location <i>node-id</i>	Specifies that a unicast ping is sent a node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
count <i>pings</i>	(Optional) Number of pings to send each time the command is run. The test reports results and statistics after all pings have been sent and received (or timed out). Range is from 0 through 4294967295. The default is 1.
debug	Note This keyword is available only if you specified the fgid keyword. (Optional) Specifies verbose debugging of the multicast ping utility.
interval <i>milliseconds</i>	(Optional) Hold-off time between each ping in milliseconds. Range is from 0 through 4294967295. The total test time is as follows: $(\text{count}-1) * (\text{RTT} + \text{interval}) + \text{RTT}$ RTT = Round Trip Time for the ping.
pattern <i>random</i>	(Optional) Specifies a data pattern for the ping packet payload.
queue <i>priority</i>	Note This keyword is available only if you specified the fgid keyword. (Optional) Specifies the priority of the queue. The priority can be 0 or 1.
retries <i>number</i>	(Optional) Maximum number of times a failed ping transmission is sent before the packet transmission is considered a failure. Range is from 0 through 4294967295. Note Packet transmission failure is usually an indication of a server software transient. In this case, we recommend that you run the ping command again.
size <i>payload_size</i>	(Optional) Specifies the payload size for each ping packet size. Range is from 0 through 4294967295 bytes. The maximum payload size allowed may be limited, depending on the transport type that is used (fabric or control-ethernet).

timeout <i>seconds</i>	(Optional) Specifies the maximum time to wait for response to a ping. Range is from 0 through 4294967295 seconds. If a ping does not receive a response before the configured timeout expires, the ping statistics reflect it as a discrepancy between the “Sent:” and “Rec’d:” packet count, and the test is considered failed. Because of this, we recommend that you do not set the timeout to 0.
tlate <i>seconds</i>	Note This keyword is available only if you specified the fgid keyword. (Optional) Specifies the amount of time to wait for a response to a multicast ping. The amount of time you specify must be less than the value of the timeout keyword. Range is from 0 through 4294967295 seconds.
uc	Note This keyword is available only if you specified the fgid keyword. (Optional) Specifies that unicast pings (instead of multicast pings) are sent to nodes with the specified FGID.
via-egressq	(Optional) Specifies that a unicast or multicast ping packet is routed to the first fabricq ASIC (instance 0); then, to the egressq ASIC, and finally to the destination CPU. By default, a unicast ping is routed to the first fabricq ASIC (instance 0), then to the destination CPU. A multicast ping is routed to the constituent fabricq ASIC instances, then to the destination CPU.
via-fabricq-1	Note This keyword is available if you specified the location keyword, or both the fgid and uc keywords. (Optional) Specifies that a unicast ping is routed to the current fabricq ASIC (instance 1), then to the egressq ASIC, and finally, to the destination CPU. By default, a unicast ping is routed to the first fabricq ASIC (instance 0), then to the destination CPU.

Command Default

No default behavior or values

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.6.0	The fgid keyword was added.
Release 3.8.0	The via-egressq and via-fabricq-1 keywords were added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you enter the **ping** command, a ping is sent to the node at the specified location or to nodes with the specified FGID. The received response is compared byte-by-byte to the sent packet. If a ping response is not received before the specified time-out, or if the ping response does not match the transmitted ping, the ping is considered failed.

A node that is unreachable or intermittently working impacts the total run time for the test as follows:

```
(received_packet_count * RTT + lost_packet_count * timeout + (count-1) * interval)
```

Line cards have two fabricq ASICs and an egressq ASIC. From the first fabricq ASIC (instance 0), the CPU can be reached directly or via the egressq ASIC. From the second fabricq ASIC (instance 1), the CPU can be reached only via the egressq ASIC. In other words, no direct packet path exists between instance 1 and the CPU.

The route processor (RP) and distributed route processor (DRP) cards have only one fabricq ASIC per node (CPU) and no egressq ASIC. Therefore, a fabric ping on an RP or DRP destination specified with the **via-egressq** or **via-fabricq-1** keyword fails.

Task ID

Task ID	Operations
diag	execute

Examples

The following example shows sample output from a control-ethernet ping to an SP node in slot 0/0:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# ping control-eth location 0/0/SP count 5

Src node:      529 : 0/RP0/CPU0
Dest node:      0 : 0/0/SP
Local node:     529 : 0/RP0/CPU0
Packet cnt:     5  Packet size: 128  Payload ptn type: default (0)
Hold-off (ms): 300  Time-out(s):    2  Max retries: 5
Destination node has MAC addr 5246.4800.0000

Running CE node ping.
Please wait...
Src: 529:, Dest: 0, Sent: 5, Rec'd: 5, Mismatched: 0
Min/Avg/Max RTT: 0/200/1000
CE node ping succeeded for node: 0
```

The following example shows a fabric ping from the active RP to the active RP. In this example, the ping contains 72 packets of 1 kilobyte each. This command performs a good coverage test of the entire switch fabric:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# ping fabric location 0/RP0/CPU0 count 72 size 1024

Src node:      529 : 0/RP0/CPU0
Dest node:      529 : 0/RP0/CPU0
Local node:     529 : 0/RP0/CPU0
Packet cnt:     72  Packet size: 1024  Payload ptn type: default (0)
```

```
Hold-off (ms): 300 Time-out(s): 2 Max retries: 5
```

```
Running Fabric node ping.
```

```
Please wait...
```

```
Src: 529:, Dest: 529, Sent: 72, Rec'd: 72, Mismatched: 0
```

```
Min/Avg/Max RTT: 3000/3013/4000
```

```
Fabric node ping succeeded for node: 529
```

The following example shows a ping to a control Ethernet node that has a problem or does not exist:

```
RP/0/0/CPU0:router# admin
```

```
RP/0/0/CPU0:router(admin)# ping control-eth location 0/1/CPU0 count 3
```

```
Src node: 529 : 0/RP0/CPU0
```

```
Dest node: 17 : 0/1/CPU0
```

```
Local node: 529 : 0/RP0/CPU0
```

```
Packet cnt: 3 Packet size: 128 Payload ptn type: default (0)
```

```
Hold-off (ms): 300 Time-out(s): 2 Max retries: 5
```

```
Destination node has MAC addr 5246.4800.0011
```

```
Running CE node ping.
```

```
Please wait...
```

```
Src: 529:, Dest: 17, Sent: 3, Rec'd: 0, Mismatched: 0
```

```
Requested ping failed for node: 17
```

The following example shows how to send a multicast fabric ping to nodes with the FGID of 1024. The node that sent the multicast ping waits 1 second for a response from each node.

```
RP/0/0/CPU0:router# admin
```

```
RP/0/0/CPU0:router(admin)# ping fabric fgid 1024 tlate 1
```

```
Src node: 513 : 0/RP0/CPU0
```

```
fgid: 1024
```

```
Local node: 513 : 0/RP0/CPU0
```

```
Packet cnt: 1 Packet size: 128 Payload ptn type: default (0)
```

```
Hold-off (ms): 1 Time-out(s): 2 Max retries: 5
```

```
DelayTimeout: 1 Priority: High
```

```
Running Fabric node ping.
```

```
Please wait...
```

```
Multicast (Pinging fgid) ...
```

Node	Sent	Rcv.	Late	Lost
0/1/CPU0 (0x11:17)	1	1	0	0
0/4/CPU0 (0x41:65)	1	1	0	0
0/4/CPU1 (0x42:66)	1	1	0	0
0/6/CPU0 (0x61:97)	1	1	0	0
0/RP0/CPU0 (0x201:513)	1	1	0	0
0/RP1/CPU0 (0x211:529)	1	1	0	0

```
diag_ping: All 6 nodes responded to all 1 pings
```

The following example shows how to send a multicast fabric ping to nodes with the FGID of 1024. The ping packets are routed from the first fabricq ASIC (instance 0) to the destination CPU via the egressq ASIC. The pings to the two line cards (0/1/CPU0 and 0/6/CPU0) succeeded, while the pings to the RPs (0/RP0/CPU0 and 0/RP1/CPU0) and DRPs (0/4/CPU0 and 0/4/CPU1) failed because they do not have an egressq ASIC.

```
RP/0/0/CPU0:router# admin
```

```
RP/0/0/CPU0:router(admin)# ping fabric fgid 1024 count 10 via-egressq
```

```
Src node: 513 : 0/RP0/CPU0
```

```
fgid: 1024
```

```
Local node: 513 : 0/RP0/CPU0
```

```
Packet cnt: 10 Packet size: 128 Payload ptn type: default (0)
```

```
Hold-off (ms): 1 Time-out(s): 2 Max retries: 5
```

```
DelayTimeout: 1 Priority: High
```

```
Reaching destination CPUs via egressq
```

Running Fabric node ping.
Please wait...

Multicast (Pinging fgid) ...

Node	Sent	Rcv.	Late	Lost
0/1/CPU0 (0x11:17)	10	10	0	0
0/4/CPU0 (0x41:65)	10	0	0	10
0/4/CPU1 (0x42:66)	10	0	0	10
0/6/CPU0 (0x61:97)	10	10	0	0
0/RP0/CPU0 (0x201:513)	10	0	0	10
0/RP1/CPU0 (0x211:529)	10	0	0	10

diag_ping: Out of 6 node(s), 2 node(s) responded to all 10 pings, 4 node(s) hads

The following example shows how to send a unicast ping to nodes with the FGID of 1024. The ping packets are routed from the second fabricq ASIC (instance 1) to the destination CPU via the egressq ASIC. The pings to the two line cards (0/1/CPU0 and 0/6/CPU0) succeeded, while the pings to the RPs (0/RP0/CPU0 and 0/RP1/CPU0) and DRPs (0/4/CPU0 and 0/4/CPU1) failed because they do not have a second fabricq ASIC nor an egressq ASIC.

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# ping fabric fgid 1024 count 10 uc via-fabricq-1
```

```
Src node:      513 : 0/RP0/CPU0
fgid:          1024
Local node:    513 : 0/RP0/CPU0
Packet cnt:    10  Packet size: 128  Payload ptn type: default (0)
Hold-off (ms): 1   Time-out(s): 2   Max retries: 5
DelayTimeout: 1   Priority:      High
Using other fabricq instance
```

Running Fabric node ping.
Please wait...

Multicast (Pinging Individual Sponge Ids) ...

Node	Sent	Rcv.	Late	Lost
0/1/CPU0 (0x11:17)	10	10	0	0
0/4/CPU0 (0x41:65)	10	0	0	10
0/4/CPU1 (0x42:66)	10	0	0	10
0/6/CPU0 (0x61:97)	10	10	0	0
0/RP0/CPU0 (0x201:513)	10	0	0	10
0/RP1/CPU0 (0x211:529)	10	0	0	10

diag_ping: Out of 6 node(s), 2 node(s) responded to all 10 pings, 4 node(s) hads

show diag

To display details about the hardware and software on each node in a router, use the **show diag** command in the appropriate mode.

show diag [*node-id*] [**chassis-info** | **details** | **summary**]

Syntax Description

details	(Optional) Displays detailed hardware and diagnostics information. Note Specifying the details keyword displays EEPROM information for the chassis or specified node.
summary	(Optional) Displays a summary of the installed hardware.
node-id	(Optional) Identifies the node for which you want to display information. The <i>node-id</i> argument is expressed in the <i>rack/slot/module</i> notation.
chassis-info	(Optional) Displays information about the chassis.

Command Default

Hardware and software information for all nodes installed in the router is displayed

Command Modes

EXEC
Administration EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	The chassis-info keyword was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **show diag** command displays detailed information on the hardware components for each node, and on the status of the software running on each node.

Task ID

Task ID	Operations
sysmgr	read

Examples

```

RP/0/5/CPU0:router# show diag details
SLOT 0 (RP/LC 0): Cisco 12000 Series - Multi-Service Blade
MAIN: type 150, 800-25972-02 rev A0 dev 0
HW config: 0x00 SW key: 00-00-00
PCA: 73-9289-04 rev A0 ver 3
HW version 1.0 S/N SAD11360218
MBUS: Embedded Agent
Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
DIAG: Test count: 0x00000000 Test results: 0x00000000
EEPROM contents (hex):
Release Modification
Release 3.3.0 The chassis-info keyword was added to the show diags command on the
Cisco XR 12000 Series Router.
Task ID Operations
sysmgr read
00: 01 00 0C 00 00 00 00 00 00 00 00 00 00 00 00 00
10: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
20: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
30: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
40: 00 96 01 00 00 49 00 24 49 04 50 03 FE 01 00 03
50: 03 20 00 65 74 02 50 00 00 00 00 0A 01 00 00 00
60: 53 41 44 31 31 33 36 30 32 31 38 00 00 00 00 00
70: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
80: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
90: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
A0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
B0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 DA 00 00
C0: 58 52 2D 31 32 4B 2D 4D 53 42 00 00 00 00 00 00
D0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
E0: 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
F0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
FRU: Linecard/Module: 12000-ServEngCard
L3 Engine: Service Engine - ISE OC192 (10 Gbps)
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.4)
Using CAN Bus A
ROM Monitor version 1.3
Fabric Downloader version used 3.2 (ROM version is 3.2)
Primary clock is CSC0
Board State is IOS-XR RUN
Last Reset Reason: Card graceful reboot
Insertion time: Fri Oct 10 22:34:58 2008 (4w2d ago)
DRAM size: 2147483648 bytes
FrFab SDRAM size: 1610612736 bytes
ToFab SDRAM size: 268435456 bytes
0 resets since restart/fault forgive
...
SLOT 2 (RP/LC 2): Cisco 12000 Series SPA Interface Processor- 601
MAIN: type 149, 68-2647-01 rev A0 dev 85437
HW config: 0x20 SW key: 00-00-00
PCA: 73-9607-04 rev A0 ver 4
HW version 1.0 S/N SAD10330441
MBUS: Embedded Agent
Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
DIAG: Test count: 0x00000000 Test results: 0x00000000
EEPROM contents (hex):
00: 01 00 0C 00 00 00 00 00 00 00 00 00 00 00 00 00
10: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
20: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
30: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
40: 00 95 01 00 00 49 00 25 87 04 50 04 FE 01 00 00
50: 00 44 00 0A 57 01 50 01 4D BD 20 09 01 00 00 00
60: 53 41 44 31 30 33 33 30 34 34 31 00 00 00 00 00
70: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
80: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
90: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
A0: 00 01 40 98 00 00 00 00 00 00 00 00 00 00 00 00
B0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 DA 00 00
C0: 31 32 30 30 30 2D 53 49 50 2D 36 30 31 00 00 00
D0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

```

```

E0: 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
F0: B8 07 A4 1F 8A 52 6D 1F 9A CE AE CF BF F4 00 00
FRU: Linecard/Module: 12000-SIP-601
Route Memory: MEM-LC5-2048=
Packet Memory: MEM-LC5-PKT-512=
L3 Engine: 5 (MultiRate) - ISE OC192 (10 Gbps)
Operational rate mode: 10 Gbps
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.2)
Using CAN Bus A
ROM Monitor version 17.1
Fabric Downloader version used 4.7 (ROM version is 4.7)
Primary clock is CSC0
Board State is IOS-XR RUN
Last Reset Reason: Reload initiated by user
Insertion time: Wed Nov 5 17:39:51 2008 (5d01h ago)
DRAM size: 2147483648 bytes
FrFab SDRAM size: 268435456 bytes
ToFab SDRAM size: 268435456 bytes
0 resets since restart/fault forgive
SPA Information:
subslot 0/2/0: SPA-4XOC3-POS-V2 (0x526), status is ok
subslot 0/2/1: SPA-IPSEC-2G-2 (0x549), status is ok
subslot 0/2/2: SPA-8X1FE (0x4c5), status is ok
subslot 0/2/3: Empty
...
SLOT 5 (RP/LC 5): Cisco 12000 Series Performance Route Processor 2
MAIN: type 96, 800-23469-06 rev A0 dev 84610
HW config: 0x10 SW key: 00-00-00
PCA: 73-8812-09 rev A0 ver 7
HW version 0.0 S/N SAD103003M7
MBUS: MBUS Agent (1) 73-8048-07 rev A0 dev 0
HW version 0.1 S/N SAL1026THV9
Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
DIAG: Test count: 0x00000000 Test results: 0x00000000
EEPROM contents (hex):
00: 01 00 01 00 49 00 1F 70 07 50 00 00 00 00 00 00
10: 53 41 4C 31 30 32 36 54 48 56 39 00 00 00 00 00
20: 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00
30: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
40: 00 60 00 00 00 49 00 22 6C 09 50 07 00 02 00 00
50: 03 20 00 5B AD 06 50 01 4A 82 10 00 01 00 00 00
60: 53 41 44 31 30 33 30 30 33 4D 37 00 00 00 00 00
70: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
80: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
90: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
A0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
B0: 00 00 00 00 00 00 00 00 00 00 00 00 00 32 DA 00 00
C0: 50 52 50 2D 32 00 00 00 00 00 00 00 00 00 00 00
D0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
E0: 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
F0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
FRU: Linecard/Module: PRP-2
Route Memory: MEM-PRP/LC-2048=
MBUS Agent Software version 4.4 (RAM) (ROM version is 4.2)
Using CAN Bus A
ROM Monitor version 1.16dev(0.1)
Primary clock is CSC0
Board State is IOS-XR RUN
Insertion time: Fri Oct 10 21:19:10 2008 (4w2d ago)
DRAM size: 2147483648 bytes
0 resets since restart/fault forgive

```

The output displayed for the **show diag details** command is the most comprehensive output displayed for **show diag** command variations. All other variations show a subset of the fields displayed except for the **show diag details chassis-info** and **show diag summary chassis-info** commands, which show different information.

Table 16: show diags Field Descriptions

Field	Description
SLOT	Physical slot number of the line card.
MAIN	General information about the hardware.
PCA	Cisco Protection Channel Access (PCA) hardware and revision number.
MBUS	Provides version information for the Mbus agent.
DIAG	Results of the last diagnostics test, in hexadecimal format.
EEPROM contents	EEPROM contents, in hexadecimal, of the component.
FRU	Information about the Field-replaceable Units (FRUs) associated with the nodes that are installed in the router.
MBUS Agent Software version	Mbus agent software version currently running on the router.
ROM Monitor version	Version of monitor library used by ROMMON.
Fabric Downloader version	Version of fabric downloader used.
Primary clock	Primary clock source configured on the router.
Board State	Current software on the board, and whether or not the board is running.
Last Reset Reason	Reason the card was last reset.
Insertion time	Time at which the last diagnostics test was executed.
DRAM size	Dynamic Random-Access Memory (DRAM) size in bytes.
<i>number</i> resets since restart/fault forgive	Number of resets since the card was last restarted.
SPA Information	Subslot in which SPA is installed, name of SPA, and current status of SPA.

The following example shows how to display detailed information for a chassis:

```
RP/0/5/CPU0:router# show diag details chassis-info
```

```

Backplane NVRAM [version 0x20] Contents -
  Chassis: type 12406 Fab Ver: 2
    Chassis S/N: TBM10421465
  PCA: 73-5796-2 rev: C0 dev: 0 HW ver: 1.0
    Backplane S/N: TBM10402356
  MAC Addr: base 0019.aaa3.3a00 block size: 1024
  RMA Number: 0x00-0x00-0x00 code: 0x00 hist: 0x00
  Backplane NVRAM (hex)
00: 20 00 00 49 16 a4 00 02 00 60 00 02 01 00 00 07
10: 54 42 4d 31 30 34 30 32 33 35 36 00 00 00 00 00
20: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
30: 54 42 4d 31 30 34 32 31 34 36 35 00 00 00 00 00
40: 00 19 aa a3 3a 00 04 00 00 00 00 00 00 00 00 00
50: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
60: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
70: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

```

Table 17: show diags details chassis-info Field Descriptions

Field	Description
Chassis	Type and fabrication version of the chassis.
Chassis S/N	Serial number of the chassis.
PCA	Cisco Protection Channel Access (PCA) hardware and revision number.
Backplane S/N	Serial number of the backplane.
MAC Addr	MAC address and block size of the chassis.
RMA Number	RMA information for the chassis.
Backplane NVRAM	Contents of the backplane NVRAM, in hexadecimal.

Related Commands

Command	Description
show platform	Displays information and status for each node in the system.
show version	Displays details on the hardware and software status of the system.

show diagnostic bootup level

To display the current diagnostic bootup level, use the **show diagnostic bootup level** command in administration EXEC mode.

show diagnostic bootup level location *node-id*

Syntax Description

location <i>node-id</i>	Specifies a card. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **show diagnostic bootup level** command to display the current diagnostic bootup level for a specified card.

Task ID

Task ID	Operations
diag	read

Examples

The following example shows how to display the current diagnostic bootup level for 0/1/cpu0:

```
RP/0/0/CPU0:router(admin)# show diagnostic bootup level location 0/1/cpu0
Current bootup diagnostic level for LC 0/1/CPU0: minimal
```

show diagnostic bootup level

Related Commands

Command	Description
diagnostic bootup level	Configures the diagnostic for booting a card.

show diagnostic content

To display test information including test ID, test attributes, and supported coverage test levels for each test and for all components, use the **show diagnostic content** command in administration EXEC mode.

show diagnostic content location *node-id*

Syntax Description

location <i>node-id</i>	Displays the diagnostic content for a specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **show diagnostic content** command to display diagnostic test information for a specific location. The test information includes the supported tests and attributes.

For more information about running Cisco IOS XR diagnostics, refer to *Cisco IOS XR Diagnostics*.

Task ID

Task ID	Operations
diag	read

Examples

The following example shows how to display the test information for a specified location:

For a route processor:

```
RP/0/0/CPU0:router(admin): show diagnostic content
location 0/0/cpu0
```

```
Diagnostics test suite attributes:
M/C/* - Minimal bootup level test / Complete bootup level test / NA
```

show diagnostic content

```

B/* - Basic ondemand test / NA
P/V/* - Per port test / Per device test / NA

D/N/* - Disruptive test / Non-disruptive test / NA

S/* - Only applicable to standby unit / NA
X/* - Not a health monitoring test / NA
F/* - Fixed monitoring interval test / NA
E/* - Always enabled monitoring test / NA
A/I - Monitoring is active / Monitoring is inactive

ID   Test Name                               Attributes      Test Interval    Thre-
      (day hh:mm:ss.ms shold)

=====
1) ControlEthernetPingTest -----> *B*N*X**I      001 00:00:00.000 1
2) SelfPingOverFabric -----> *B*N*X**I      001 00:00:00.000 1
3) FabricPingTest -----> *B*N*X**I      001 00:00:00.000 1
4) ControlEthernetInactiveLinkTest -> *B*NS***I      001 00:00:00.000 1
5) RommonRevision -----> *B*N*X**I      001 00:00:00.000 1
6) FabricDiagnosisTest -----> *B*NS***I      000 00:02:00.000 1
7) FilesystemBasicDisk0 -----> *B*N****I      003 00:00:00.000 1
8) FilesystemBasicDisk1 -----> *B*N****I      003 00:00:00.000 1
9) FilesystemBasicHarddisk -----> *B*N****I      003 00:00:00.000 1
10) ScratchRegisterTest -----> CBVN****I      001 00:00:00.000 1
11) FabricMcastTest -----> *B*NS***I      000 00:02:00.000 1
12) ControlEthernetIntraSwitchTest --> *B*N****I      000 00:00:02.000 3
13) FabricUcastMcastTest -----> *B*N****A      000 00:01:00.000 1

RP/0/0/CPU0:router(admin)# show diagnostic content location 0/1/cpu0

Wed Feb 16 09:27:01.424 PST

MSC 0/1/CPU0:

Diagnostics test suite attributes:
M/C/* - Minimal bootup level test / Complete bootup level test / NA
B/* - Basic ondemand test / NA
P/V/* - Per port test / Per device test / NA
D/N/* - Disruptive test / Non-disruptive test / NA
S/* - Only applicable to standby unit / NA
X/* - Not a health monitoring test / NA
F/* - Fixed monitoring interval test / NA
E/* - Always enabled monitoring test / NA
A/I - Monitoring is active / Monitoring is inactive

ID   Test Name                               Attributes      Test Interval    Thre-
      (day hh:mm:ss.ms shold)

=====
1) ControlEthernetPingTest -----> *B*N*X**I      001 00:00:00.000 1
2) SelfPingOverFabric -----> *B*N*X**I      001 00:00:00.000 1
3) RommonRevision -----> *B*N*X**I      001 00:00:00.000 1
4) ScratchRegisterTest -----> CBVN****I      001 00:00:00.000 1
5) TcamFullScanTest -----> *BVN****I      001 00:00:00.000 1
6) EgressqMemoryBISTTest -----> **VD*X**I      001 00:00:00.000 1
7) IngressqMemoryBISTTest -----> **VD*X**I      001 00:00:00.000 1
8) FabricqMemoryBISTTest -----> **VD*X**I      001 00:00:00.000 1

```

Table 18: show diagnostic content Field Descriptions, on page 206 describes the significant fields shown in the display.

Table 18: show diagnostic content Field Descriptions

Field	Description
M/C/* - Minimal bootup level test / Complete bootup level test / NA	Minimal bootup test or complete bootup test.

Field	Description
B/* - Basic ondemand test / NA	Basic on-demand test.
P/V/* - Per port test / Per device test / NA	Test is per port or device.
D/N/* - Disruptive test / Non-disruptive test / NA	Test is disruptive or nondisruptive.
S/* - Only applicable to standby unit / NA	Test is available for standby node only.
X/* - Not a health monitoring test / NA	Test is not a health-monitoring test.
F/* - Fixed monitoring interval test / NA	Test is a fixed monitoring interval test.
E/* - Always enabled monitoring test / NA	Test is an always enabled monitoring test.
A/I - Monitoring is active / Monitoring is inactive	Test is active or inactive.
ID	ID of the test.
Test Name	Name of the test.
Attributes	Attributes for the test.
Test Interval	Interval of the test.
Threshold	Failure threshold of the text.

Related Commands

Command	Description
diagnostic bootup level	Configures the diagnostic for booting a card.
diagnostic load, on page 172	Loads an offline diagnostic image for integrated field diagnostics.
diagnostic monitor interval, on page 176	Configures the health-monitoring diagnostic testing for a specified interval for a specified location.
diagnostic schedule, on page 184	Configures a diagnostic schedule.
diagnostic start, on page 187	Runs a specified diagnostic test.
diagnostic unload, on page 191	Unloads an offline diagnostic image.

show diagnostic ondemand settings

To display the current on-demand settings, use the **show diagnostic ondemand settings** command in administration EXEC mode.

show diagnostic ondemand settings

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes Administration EXEC

Command History	Release	Modification
	Release 3.5.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Task ID	Operations
	diag	read

Examples The following example shows how to display the on-demand settings:

```
RP/0/0/CPU0:router(admin)# show diagnostic ondemand settings
Test iterations = 45
Action on test failure = continue until test failure limit reaches 25
```

show diagnostic result

To display diagnostic test results, use the **show diagnostic result** command in administration EXEC mode.

show diagnostic result location *node-id* [**test** {*id* | *test-name*| **all**}] [**detail**]

Syntax Description

location <i>node-id</i>	Displays the diagnostic test results for a specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
test { <i>id</i> <i>test-name</i> all }	(Optional) Specifies diagnostic test selection. The following test selections are available: • <i>id</i>—Test ID or list of test IDs . Multiple tests can be listed if separated by semicolons (;) as follows: ◦ x;y-z (for example: 1; 3-4 or 1;3;4) • <i>test-name</i>—Test name. • all—Specifies all tests. Use the show diagnostic content command in administration EXEC mode to see a list of test names and their associated IDs.
detail	(Optional) Specifies detailed results.

Command Default

No default behavior or values

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **show diagnostic result** command to display diagnostic results for a specific location.

For more information about running Cisco IOS XR diagnostics, refer to *Cisco IOS XR Diagnostics*.

Task ID

Task ID	Operations
diag	read

Examples

The following example shows how to display detailed diagnostic test results:

```
RP/0/0/CPU0:router(admin)# show diagnostic result location 0/3/CPU0 test 1 detail
```

Test results: (. = Pass, F = Fail, U = Untested)

```
1 ) Control Ethernet Ping Test -----> .
Error code -----> 0 (DIAG_SUCCESS)
Total run count -----> 1
Last test execution time ----> Thu Aug 11 18:13:38.918 2005
First test failure time -----> n/a
Last test failure time -----> n/a
Last test pass time -----> Thu Aug 11 18:13:38.918 2005
Total failure count -----> 0
Consecutive failure count ---> 0
```

Table 19: show diagnostic result Field Descriptions

Field	Description
Test results :	Test result options: • .—Pass • F—Fail • U—Untested
Error code	Code for the error. DIAG_SUCCESS is indicated if there were no code errors. DIAG_FAILURE is indicated for any failure. DIAG_SKIPPED is indicated if the test was stopped.
Total run count	Number of times the test has run.
Last test execution time	Last time the test was run.
First test failure time	First time the test failed.
Last test failure time	Last time the test failed.
Last test pass time	Last time the test passed.
Total failure count	Number of times the test has failed.
Consecutive failure count	Number of consecutive times the test has failed.

Related Commands

Command	Description
diagnostic load, on page 172	Loads an offline diagnostic image for integrated field diagnostics.
diagnostic schedule, on page 184	Configures a diagnostic schedule.
diagnostic start, on page 187	Runs a specified diagnostic test.

show diagnostic schedule

To display the current scheduled diagnostic tasks, use the **show diagnostic schedule** command in administration EXEC mode.

show diagnostic schedule location *node-id*

Syntax Description

location <i>node-id</i>	Displays the diagnostic schedule for a specified location. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

Administration EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **show diagnostic schedule** command to display scheduled diagnostic tasks for a specific location.

For more information about running Cisco IOS XR diagnostics, refer to *Cisco IOS XR Diagnostics*.

Task ID

Task ID	Operations
diag	read

Examples

The following example shows how to display scheduled diagnostic tasks:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)# show diagnostic schedule location 0/3/CPU0

Current Time = Tue Sep 27 12:41:24 2005
Diagnostic for LC 0/3/CPU0:

Schedule #1:
  To be run daily 14:40
  Test ID(s) to be executed: 1 .
```

Table 20: show diagnostic schedule Field Descriptions

Field	Description
Current Time	Current system time.
Diagnostic for	Card for which the diagnostic is scheduled.
Schedule	Schedule number.
To be run	Time at which the diagnostics are scheduled to run.
Test ID(s) to be executed	Tests to be run at scheduled time.

Related Commands

Command	Description
diagnostic schedule , on page 184	Configures a diagnostic schedule.

show diagnostic status

To display the current running tests, use the **show diagnostic status** command in administration EXEC mode.

show diagnostic status

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes Administration EXEC

Command History	Release	Modification
	Release 3.5.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Task ID	Operations
	diag	read

show run diagnostic monitor

To display the card type of a line card or a Shared Port Adapter (SPA), use the **show run diagnostic monitor** command in the administration configuration mode.

show run diagnostic monitor

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes Administration configuration

Command History	Release	Modification
	Release 3.8.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

You need to be aware of the card type when you configure a slot or swap a card, and the configuration must re-apply. If the card type is different, the configuration does not re-apply. You can display the card type using the **show run diagnostic monitor** command in the administration configuration mode.

Task ID	Task ID	Operations
	diag	read, write

Examples

```
RP/0/0/CPU0:router#admin
RP/0/0/CPU0:router(admin)# config
RP/0/0/CPU0:router(admin-config)# diagnostic monitor location 0/RP1/CPU0 test
FabricDiagnosisTest
RP/0/0/CPU0:router(admin-config)# commit
RP/0/0/CPU0:router(admin-config)# end
RP/0/0/CPU0:router(admin)# show run diagnostic monitor

diagnostic monitor location 0/RP1/CPU0 test FabricDiagnosisTest card-type 100006
```

 **show run diagnostic monitor**



Ethernet Interface Commands on the Cisco IOS XR Software

This module provides command line interface (CLI) commands for configuring Ethernet interfaces on the Cisco XR 12000 Series Router.

- [carrier-delay](#), page 218
- [clear mac-accounting \(Ethernet\)](#), page 220
- [duplex full \(Fast Ethernet\)](#), page 222
- [duplex half \(Fast Ethernet\)](#), page 224
- [flow-control](#), page 226
- [interface \(Ethernet\)](#), page 228
- [loopback \(Ethernet\)](#), page 230
- [mac-accounting](#), page 232
- [mac-address \(Ethernet\)](#), page 234
- [negotiation auto](#), page 236
- [packet-gap non-standard](#), page 237
- [show controllers \(Ethernet\)](#), page 239
- [show mac-accounting \(Ethernet\)](#), page 241
- [speed \(Fast Ethernet\)](#), page 243

carrier-delay

To delay the processing of hardware link down notifications, use the **carrier-delay** command in interface configuration mode.

carrier-delay {**down** *milliseconds* [**up** *milliseconds*]| **up** *milliseconds* [**down** *milliseconds*]}

Syntax Description

down <i>milliseconds</i>	Length of time, in milliseconds, to delay the processing of hardware link down notifications. Range is from 0 through 65535.
up <i>milliseconds</i>	Length of time, in milliseconds, to delay the processing of hardware link up notifications. Range is from 0 through 65535.

Command Default

No carrier-delay is used, and the upper layer protocols are notified as quickly as possible when a physical link goes down.

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.2	This command was introduced.
Release 3.4.0	The msec keyword was replaced by the down keyword, and the value of the <i>milliseconds</i> argument was increased to 0 through 65535. The up keyword was added, and the value of the <i>milliseconds</i> argument was set at 0 through 65535.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you delay the processing of hardware link down notifications, the higher layer routing protocols are unaware of a link until that link is stable.

If the **carrier-delay down milliseconds** command is configured on a physical link that fails and cannot be recovered, link down detection is increased, and it may take longer for the routing protocols to re-route traffic around the failed link.

In the case of very small interface state flaps, running the **carrier-delay down milliseconds** command prevents the routing protocols from experiencing a route flap.

**Note**

Enter the **show interface** command to see the current state of the carrier-delay operation for an interface. No carrier-delay information is displayed if carrier-delay has not been configured on an interface.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to delay the processing of hardware link down notifications:

```
RP/0/0/CPU0:router(config-if)# carrier-delay down 10
```

The following example shows how to delay the processing of hardware link up and down notifications:

```
RP/0/0/CPU0:router(config-if)# carrier-delay up 100 down 100
```

Related Commands

Command	Description
dampening , on page 538	Turns on event dampening.

clear mac-accounting (Ethernet)

To clear Media Access Control (MAC) accounting statistics, use the **clear mac-accounting** command in EXEC mode.

clear mac-accounting {**GigabitEthernet**| **TenGigE**| **FastEthernet**} *interface-path-id* [**location** *node-id*]

Syntax Description

{ GigabitEthernet TenGigE FastEthernet }	Type of Ethernet interface whose MAC accounting statistics you want to clear. Enter GigabitEthernet , TenGigE , or FastEthernet .
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location <i>node-id</i>	(Optional) Clears MAC accounting statistics for the designated node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 3.2	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
interface	read, write
basic-services	read, write

Examples

The following example shows how to clear all MAC accounting statistics for the TenGigE port at 1/0/0/1:

```
RP/0/0/CPU0:router# clear mac-accounting TenGigE 0/1/5/0 location 1/0/0/1
```

Related Commands

Command	Description
mac-accounting , on page 232	Generates accounting information for IP traffic based on the source and destination MAC addresses on LAN interfaces.
show mac-accounting (Ethernet) , on page 241	Displays MAC accounting statistics for an interface.

duplex full (Fast Ethernet)

To configure full-duplex operation on a Fast Ethernet interface, use the **duplex full** command in interface configuration mode. To return the system to the default duplex operation, use the **no** form of the **duplex full** command.

duplex full

no duplex full

Syntax Description

This command has no keywords or arguments.

Command Default

If autonegotiation is disabled on an interface, then the default duplex operation is full duplex.

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **duplex full** command automatically replaces the **duplex half** command if half duplex was previously configured on your router.



Note

The **duplex full** command and the **duplex half** command cannot be configured simultaneously.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to set the Fast Ethernet interface at full duplex:

```
RP/0/RP0/CPU0:router(config)# interface FastEthernet 0/2/0/0
RP/0/RP0/CPU0:router(config-if)# duplex full
```


Related Commands

Command	Description
duplex half (Fast Ethernet), on page 224	Configures half-duplex operation on a Fast Ethernet interface.
negotiation auto, on page 236	Enables link autonegotiation on Ethernet interfaces.
show interfaces, on page 549	Displays statistics for all interfaces configured on the router or for a specific node.
speed (Fast Ethernet), on page 243	Configures the speed for a Fast Ethernet interface.

duplex half (Fast Ethernet)

To configure half-duplex operation on a Fast Ethernet interface, use the **duplex half** command in interface configuration mode. To return the system to the default duplex operation, use the **no** form of the **duplex half** command.

duplex half

no duplex half

Syntax Description

This command has no keywords or arguments.

Command Default

If autonegotiation is disabled on an interface, then the default duplex operation is full duplex.

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **duplex half** command automatically replaces the **duplex full** command if full duplex was previously configured on your router.



Note

The **duplex half** command and the **duplex full** command cannot be configured simultaneously.

Task ID

Task ID	Operations
interface	read, write

Examples

The following examples shows how to set the Fast Ethernet interface at half duplex:

```
RP/0/RP0/CPU0:router(config)# interface mgmteth 0/RP0/CPU0/0
RP/0/RP0/CPU0:router(config-if)# duplex half
```

Related Commands

Command	Description
duplex full (Fast Ethernet), on page 222	
negotiation auto, on page 236	Enables link autonegotiation on Ethernet interfaces.
show interfaces, on page 549	Displays statistics for all interfaces configured on the router or for a specific node.
speed (Fast Ethernet), on page 243	Configures the speed for a Fast Ethernet interface.

flow-control

To enable the sending of flow-control pause frames, use the **flow-control** command in interface configuration mode. To disable flow control, use the **no** form of this command.

flow-control {**bidirectional**| **egress**| **ingress**}

no flow-control ingress {**bidirectional**| **egress**| **ingress**}

Syntax Description

bidirectional	Enables flow-control for egress and ingress direction.
egress	Pauses egress traffic if IEEE 802.3x PAUSE frames are received.
ingress	Sends IEEE 802.3x PAUSE frames in case of congestion with ingress traffic.

Command Default

If autonegotiate is enabled on the interface, then the default is negotiated.

If autonegotiate is disabled on the interface, then the sending of flow-control pause frames is disabled for both egress and ingress traffic.

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.2	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

When you explicitly enable the sending of flow-control pause frames, the value you configured with the **flow-control** command overrides any autonegotiated value. This prevents a link from coming up if the value you set with the **flow-control** command conflicts with the allowable settings on the other end of the connection.



Note

The **flow-control** command is supported on Gigabit Ethernet, TenGigE, and FastEthernet interfaces only; the **flow-control** command is not supported on Management Ethernet Interfaces.

**Note**

The **flow-control** command syntax options may vary, depending on the type of PLIM or SPA that is installed in your router.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to enable the sending of flow-control pause frames for ingress traffic on the TenGigE interface 0/3/0/0:

```
RP/0/0/CPU0:router(config)# interface TenGigE 0/3/0/0  
RP/0/0/CPU0:router(config-if)# flow-control ingress
```

Related Commands

Command	Description
show interfaces , on page 549	Displays statistics for all interfaces configured on the router or for a specific node.

interface (Ethernet)

To specify or create an Ethernet interface and enter interface configuration mode, use the **interface (Ethernet)** command in global configuration mode.

interface {FastEthernet| GigabitEthernet| TenGigE} *interface-path-id*

no interface {FastEthernet| GigabitEthernet| TenGigE} *interface-path-id*

Syntax Description

FastEthernet	Specifies or creates a Fast Ethernet (100 Mbps) interface.
GigabitEthernet	Specifies or creates a Gigabit Ethernet (1000 Mbps) interface.
TenGigE	Specifies or creates a Ten Gigabit Ethernet (10 Gbps) interface.
<i>interface-path-id</i>	Physical interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

None

Command Modes

Global configuration (config)

Command History

Release	Modification
Release 3.2	This command was introduced.
Release 3.3.0	This command was modified. The FastEthernet keyword was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

To specify a physical interface, the notation for the *interface-path-id* is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:

- *rack*: Chassis number of the rack.
- *slot*: Physical slot number of the line card.

- *module*: Module number. A physical layer interface module (PLIM) is always 0.
- *port*: Physical port number of the interface.

Task ID

Task ID	Operation
interface	read, write

Examples

The following example shows how to enter interface configuration mode for a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router(config)# interface GigabitEthernet 0/4/0/0  
RP/0/0/CPU0:router(config-if)#
```

Related Commands

Command	Description
show interfaces , on page 549	Displays statistics for all interfaces configured on the router or for a specific node.

loopback (Ethernet)

To configure an Ethernet controller for loopback mode, use the **loopback** command in interface configuration mode. To disable loopback, use the **no** form of this command.

loopback {external| internal| line}

no loopback

Syntax Description

external	All IPv4 self-ping packets are sent out of the interface and looped back externally before being received on the ingress path.
internal	All packets are looped back internally within the router before reaching an external cable.
line	Incoming network packets are looped back through the external cable.

Command Default

Loopback mode is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.2	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **loopback** command is available for all Ethernet interface types (Gigabit Ethernet, 10-Gigabit Ethernet, and Fast Ethernet).

Two loopback operation modes are supported for diagnostic purposes: internal and line. In the terminal (internal) loopback, the sent signal is looped back to the receiver. In the facility (line) loopback, the signal received from the far end is looped back and sent on the line. The two loopback modes cannot be active at the same time. In normal operation mode, neither of the two loopback modes is enabled.



Tip

Use the **loopback external** command when an external loopback connector is attached to the interface.

Task ID

Task ID	Operations
interface	read, write

Examples

In the following example, all packets are looped back to the TenGigE controller:

```
RP/0/0/CPU0:router(config)# interface TenGigE 0/3/0/0  
RP/0/0/CPU0:router(config-if)# loopback internal
```

mac-accounting

To generate accounting information for IP traffic based on the source and destination Media Access Control (MAC) addresses on LAN interfaces, use the **mac-accounting** command in interface configuration mode. To disable MAC accounting, use the **no** form of this command.

mac-accounting {egress| ingress}

Syntax Description

egress	Generates accounting information for IP traffic based on the destination MAC addresses (egress direction).
ingress	Generates accounting information for IP traffic based on the source MAC addresses (ingress direction).

Command Default

MAC accounting is disabled

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.2	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **mac-accounting** command calculates the total packet and byte counts for a LAN interface that receives or sends IPv4 packets to or from a unique MAC address.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to enable MAC accounting for the source MAC address on the ingress direction:

```
RP/0/0/CPU0:router(config-if)# mac-accounting ingress
```

Related Commands

Command	Description
clear mac-accounting (Ethernet), on page 220	Clears MAC accounting statistics for an interface.
show mac-accounting (Ethernet), on page 241	Displays MAC accounting statistics for an interface.

mac-address (Ethernet)

To set the MAC layer address of an Ethernet interface, use the **mac-address** command in interface configuration mode. To return the device to its default MAC address, use the **no** form of this command.

mac-address *value1.value2.value3*

no mac-address

Syntax Description

<i>value1.</i>	High 2 bytes of the MAC address in hexadecimal format. Range is from 0 to ffff.
<i>value2.</i>	Middle 2 bytes of the MAC address in hexadecimal. Range is from 0 to ffff.
<i>value3</i>	Low 2 bytes of the MAC address in hexadecimal. Range is from 0 to ffff.

Command Default

The default MAC address is read from the hardware burned-in address (BIA).

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.2	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The MAC address must be in the form of three 4-digit values (12 digits in dotted decimal notation).

The **mac-address** command is available for all types of line card Ethernet interfaces (Gigabit Ethernet, 10-Gigabit Ethernet, Fast Ethernet) and for the Management Ethernet interface.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to set the MAC address of a Gigabit Ethernet interface located at 0/1/5/0:

```
RP/0/0/CPU0:router(config)# interface GigabitEthernet 0/1/5/0
```

```
RP/0/0/CPU0:router(config-if)# mac-address 0001.2468.ABCD
```

negotiation auto

To enable link autonegotiation on Gigabit Ethernet Fast Ethernet interfaces, use the **negotiation auto** command in interface configuration mode. To disable link autonegotiation, use the **no** form of this command.

negotiation auto

no negotiation auto

Syntax Description This command has no keywords or arguments.

Command Default Link autonegotiation is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	Release 3.3.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **negotiation auto** command is available on Gigabit Ethernet Fast Ethernet interfaces only.

Task ID	Task ID	Operations
	interface	read, write

Examples The following example shows how to enable link autonegotiation on an interface:

```
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/0/2/0
RP/0/0/CPU0:router(config-if)# negotiation auto
```

The following example shows how to disable link autonegotiation on an interface:

```
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/0/2/0
RP/0/0/CPU0:router(config-if)# no negotiation auto
```

packet-gap non-standard

To change the packet interval for traffic on an interface for improved interoperability with Cisco Catalyst 6000 series switches, use the **packet-gap non-standard** command in interface configuration mode. To use the standard packet interval as defined by the IEEE 802.3e specification, use the **no** form of this command.

packet-gap non-standard

no packet-gap non-standard

Syntax Description This command has no keywords or arguments.

Command Default The interface uses the standard packet interval as defined by the IEEE 802.3e specification.

Command Modes Interface configuration

Command History	Release	Modification
	Release 3.2	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

An interface that is connected to a Cisco Catalyst 6000 series switch may experience packet loss problems that can be resolved by changing the packet interval of traffic from standard (as defined by the IEEE 802.3e specification) to nonstandard using the **packet-gap non-standard** command.



Note The **packet-gap non-standard** command is available on 10-Gigabit Ethernet interfaces only.

Task ID	Task ID	Operations
	interface	read, write

Examples The following example shows how to change the packet interval for traffic on an interface from standard to nonstandard:

```
RP/0/0/CPU0:router(config)# interface TenGigE 0/3/0/0
```

packet-gap non-standard

```
RP/0/0/CPU0:router(config-if)# packet-gap non-standard
```


show controllers (Ethernet)

To display status and configuration information about the Ethernet interfaces on a specific node, use the **show controllers** command in EXEC mode.

show controllers {FastEthernet| GigabitEthernet| TenGigE} *interface-path-id* [**all**| **bert**| **internal**| **mac**| **phy**| **stats**| **xgxs**]

Syntax Description

{FastEthernet GigabitEthernet TenGigE}	Specifies the type of Ethernet interface whose status and configuration information you want to display. Enter FastEthernet, GigabitEthernet, or TenGigE.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
all	Displays detailed information for the specified interface.
bert	Displays BERT status information for the interface.
internal	Displays internal information for the interface.
mac	Displays mac information for the interface.
phy	Displays physical information for the interface.
stats	Displays statistical information for the interface.
xgxs	Displays information about the 10 Gigabit Ethernet Extended Sublayer (XGXS).

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.2	This command was introduced.
Release 3.5.0	This command was modified. The GigabitEthernet and TenGigE keywords were added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
 - *rack*: Chassis number of the rack.
 - *slot*: Physical slot number of the line card.
 - *module*: Module number. A physical layer interface module (PLIM) is always 0.
 - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

Task ID

Task ID	Operations
cisco-support	read
	Note Required in addition to the interface (read) task ID to use the control keyword only.
dwdm	read
interface	read
sonet-sdh	read

show mac-accounting (Ethernet)

To display MAC accounting statistics for an interface, use the **show mac-accounting** command in EXEC mode.

show mac-accounting {GigabitEthernet| TenGigE| FastEthernet} *interface-path-id* [**location node-id**]

Syntax Description

{GigabitEthernet TenGigE FastEthernet}	Indicates the type of Ethernet interface whose MAC accounting statistics you want to display. Enter GigabitEthernet , TenGigE , FastEthernet .
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location node-id	(Optional) Displays detailed MAC accounting information for the specified interface on the specified node. The <i>node-id</i> argument is entered in the <i>rack/slot/module/port</i> notation.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 3.2	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
 - *rack*: Chassis number of the rack.
 - *slot*: Physical slot number of the line card.
 - *module*: Module number. A physical layer interface module (PLIM) is always 0.
 - *port*: Physical port number of the interface.

- If specifying a virtual interface, the number range varies, depending on interface type.

Task ID

Task ID	Operations
interface	read

Examples

The following example shows the output from the **show mac-accounting** command, which displays MAC accounting statistics on the specified interface:

```
RP/0/0/CPU0:router# show mac-accounting TenGigE 0/2/0/4 location 0/1/CPU0
TenGigE0/2/0/4
  Input (511 free)
000b.4558.caca: 4 packets, 456 bytes
                Total: 4 packets, 456 bytes
```

Table 21: show mac-accounting Field Descriptions

Field	Description
Interface	The interface from which the statistics are generated.
Input	Heading for the ingress MAC accounting statistics. The number of MAC accounting entries still available is shown in parentheses.
Total	Total statistics for the traffic accounted for by MAC accounting. This excludes any traffic for which there is no MAC address entry, such as non-IP traffic from an unknown MAC source address.

Related Commands

Command	Description
clear mac-accounting (Ethernet) , on page 220	Clears MAC accounting statistics for an interface.
mac-accounting , on page 232	Generates accounting information for IP traffic based on the source and destination MAC addresses on LAN interfaces.

speed (Fast Ethernet)

To configure the speed for a Fast Ethernet interface, enter the **speed** command in interface configuration mode. To return the system to autonegotiate speed, use the **no** form of this command.

speed {10| 100| 1000}

no speed

Syntax Description

10	Configures the interface to transmit at 10 Mbps.
100	Configures the interface to transmit at 100 Mbps.
1000	Configures the interface to transmit at 1000 Mbps (1 Gbps).

Command Default

If autonegotiation is enabled on an interface, the default speed is negotiated.

If autonegotiation is disabled on an interface, the default speed is the maximum speed allowed on the interface.

Command Modes

Interface configuration

Command History

Release	Modification
Release 3.2	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

The **speed** command is available on Management Ethernet interfaces and Fast Ethernet interfaces only.



Note

Keep in mind that both ends of a link must have the same interface speed. A manually configured interface speed overrides any autonegotiated speed, which can prevent a link from coming up if the configured interface speed at one end of a link is different from the interface speed on the other end.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to configure the Fast Ethernet interface to transmit at one gigabit:

```
RP/0/0/CPU0:router(config)# interface FastEthernet 0/0/2/0  
RP/0/0/CPU0:router(config-if)# speed 1000
```



Ethernet OAM Commands on the Cisco IOS XR Software

This module provides command line interface (CLI) commands for configuring Ethernet Operations, Administration, and Maintenance (EOAM) on the Cisco XR 12000 Series Router.

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- [action critical-event, page 251](#)
- [action discovery-timeout, page 253](#)
- [action dying-gasp, page 255](#)
- [action high-threshold, page 257](#)
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- [statistics measure, page 458](#)
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action capabilities-conflict

To configure what action is taken on an interface when a capabilities-conflict event occurs, use the **action capabilities-conflict** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action capabilities-conflict {disable| efd | error-disable-interface| log}

no action capabilities-conflict {disable| efd | error-disable-interface| log}

Syntax Description

disable	Performs no action on the interface when a capabilities-conflict event occurs.
efd	Puts the line protocol into the down state for an interface when a capabilities-conflict event occurs. The state is removed when the first packet is received without a conflict.
error-disable-interface	Puts the interface into the error-disable state when a capabilities-conflict event occurs.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when a capabilities-conflict event occurs. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to create a syslog entry.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.
Release 4.1.0	The efd keyword was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when a capabilities-conflict event occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action capabilities-conflict disable
```

The following example shows how to configure putting the interface into the line-protocol-down state when a capabilities-conflict event occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action capabilities-conflict efd
```

The following example shows how to configure that the interface is put into the error-disable state when a capabilities-conflict event occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action capabilities-conflict error-disable-interface
```

The following example shows how to configure that a syslog entry is created when a capabilities-conflict event occurs. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action capabilities-conflict log
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.

action critical-event

To configure what action is taken on an interface when a critical-event notification is received from the remote Ethernet OAM peer, use the **action critical-event** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action critical-event {**disable**| **error-disable-interface**| **log**}

no action critical-event {**disable**| **error-disable-interface**| **log**}

Syntax Description

disable	Performs no action on the interface when a critical-event notification is received.
error-disable-interface	Puts the interface into the error-disable state when a critical-event notification is received.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when a critical-event notification is received. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to create a syslog entry.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when a critical-event notification is received.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action critical-event disable
```

The following example shows how to configure that the interface is put into the error-disable state when a critical-event notification is received.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action critical-event error-disable-interface
```

The following example shows how to configure that a syslog entry is created when a critical-event notification is received. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action critical-event log
```

Related Commands

Command	Description
ethernet oam profile , on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam , on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM) , on page 382	Attaches an Ethernet OAM profile to an interface.

action discovery-timeout

To configure what action is taken on an interface when a connection timeout occurs, use the **action discovery-timeout** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action discovery-timeout {**disable**| **efd error-disable-interface**| **log**}

no action discovery-timeout {**disable**| **efd error-disable-interface**| **log**}

Syntax Description

disable	Performs no action on the interface when a connection timeout occurs.
efd	Puts the line protocol into the down state for an interface when a connection timeout occurs. The state is removed when the session is re-established.
error-disable-interface	Puts the interface into the error-disable state when a connection timeout occurs.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when a connection timeout occurs. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to create a syslog entry.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.
Release 4.1.0	The efd keyword was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when a connection timeout occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action discovery-timeout disable
```

The following example shows how to configure putting the interface into the line-protocol-down state when a connection timeout occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action discovery-timeout efd
```

The following example shows how to configure that the interface is put into the error-disable state when a connection timeout occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action discovery-timeout error-disable-interface
```

The following example shows how to configure that a syslog entry is created when a connection timeout occurs. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action discovery-timeout log
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.

action dying-gasp

To configure what action is taken on an interface when a dying-gasp notification is received from the remote Ethernet OAM peer, use the **action dying-gasp** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action dying-gasp {**disable**| **error-disable-interface**| **log**}

no action dying-gasp {**disable**| **error-disable-interface**| **log**}

Syntax Description

disable	Performs no action on the interface when a dying-gasp notification is received.
error-disable-interface	Puts the interface into the error-disable state when a dying-gasp notification is received.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when a dying-gasp notification is received. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to create a syslog entry.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when a dying-gasp notification is received.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action dying-gasp disable
```

The following example shows how to configure that the interface is put into the error-disable state when a dying-gasp notification is received.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action dying-gasp error-disable-interface
```

The following example shows how to configure that a syslog entry is created when a dying-gasp notification is received. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action dying-gasp log
```

Related Commands

Command	Description
ethernet oam profile , on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam , on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM) , on page 382	Attaches an Ethernet OAM profile to an interface.

action high-threshold

To configure what action is taken on an interface when a high threshold is exceeded, use the **action high-threshold** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action high-threshold {**disable**| **error-disable-interface**| **log**}

no action high-threshold {**disable**| **error-disable-interface**| **log**}

Syntax Description

disable	(Interface Ethernet OAM configuration only) Performs no action on the interface when a high threshold is exceeded.
error-disable-interface	Puts the interface into the error-disable state when a high threshold is exceeded.
log	Creates a syslog entry when a high threshold is exceeded. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default is that no action is taken when a high threshold is exceeded.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that a syslog entry is created on the interface when a high threshold is exceeded.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action high-threshold log
```

The following example shows how to configure that the interface is put into the error-disable state when a high threshold is exceeded.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action high-threshold error-disable-interface
```

The following example shows how to configure that no action is taken when a high threshold is exceeded. This configuration overrides the Ethernet OAM profile configuration.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action high-threshold disable
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.

action remote-loopback

To configure what action is taken on an interface when a remote-loopback event occurs, use the **action remote-loopback** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action remote-loopback {disable| log}

no action remote-loopback {disable| log}

Syntax Description

disable	Performs no action on the interface when a remote-loopback event occurs.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when a remote-loopback event occurs. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to create a syslog entry.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when a remote-loopback event occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
```

```
RP/0/0/CPU0:router(config-eoam)# action remote-loopback disable
```

The following example shows how to configure that a syslog entry is created when a remote-loopback event occurs. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action remote-loopback log
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.

action session-down

To configure what action is taken on an interface when an Ethernet OAM session goes down, use the **action session-down** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action session-down {**disable**| **efd** | **error-disable-interface**| **log**}

no action session-down {**disable**| **efd** | **error-disable-interface**| **log**}

Syntax Description

disable	Performs no action on the interface when a capabilities-conflict event occurs.
efd	Puts the line protocol into the down state for an interface when a capabilities-conflict event occurs. The state is removed when the first packet is received without a conflict.
error-disable-interface	Puts the interface into the error-disable state when a capabilities-conflict event occurs.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when a capabilities-conflict event occurs. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to create a syslog entry.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.
Release 4.1.0	The efd keyword was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when an Ethernet OAM session goes down.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action session-down disable
```

The following example shows how to configure putting the interface into the line-protocol-down state when an Ethernet OAM session goes down.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action session-down efd
```

The following example shows how to configure that the interface is put into the error-disable state when an Ethernet OAM session goes down.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action session-down error-disable-interface
```

The following example shows how to configure that a syslog entry is created when an Ethernet OAM session goes down. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action session-down log
```

Related Commands

Command	Description
ethernet oam profile , on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam , on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM) , on page 382	Attaches an Ethernet OAM profile to an interface.

action session-up

To configure what action is taken on an interface when an Ethernet OAM session is established, use the **action session-up** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action session-up {disable| log}

no action session-up {disable| log}

Syntax Description

disable	Performs no action on the interface when an Ethernet OAM session is established.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when an Ethernet OAM session is established. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to create a syslog entry.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when an Ethernet OAM session is established.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
```

```
RP/0/0/CPU0:router(config-eoam)# action session-up disable
```

The following example shows how to configure that a syslog entry is created when an Ethernet OAM session is established. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action session-up log
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.

action uni-directional link-fault

To configure what action is taken on an interface when a link-fault notification is received from the remote Ethernet OAM peer, use the **action uni-directional link-fault** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action uni-directional link-fault {**disable**| **efd** | **error-disable-interface**| **log**}

no action uni-directional link-fault {**disable**| **efd** | **error-disable-interface**| **log**}

Syntax Description

disable	Performs no action on the interface when a capabilities-conflict event occurs.
efd	Puts the line protocol into the down state for an interface when a capabilities-conflict event occurs. The state is removed when the first packet is received without a conflict.
error-disable-interface	Puts the interface into the error-disable state when a capabilities-conflict event occurs.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when a capabilities-conflict event occurs. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to create a syslog entry.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.
Release 4.1.0	The efd keyword was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command only determines the action taken when a uni-directional link fault notification is received from the peer; it does not affect the action taken when a fault is detected locally.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when a link-fault notification is received.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action uni-directional link-fault disable
```

The following example shows how to configure putting the interface into the line-protocol-down state when a link-fault notification is received.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action uni-directional link-fault efd
```

The following example shows how to configure that the interface is put into the error-disable state when a link-fault notification is received.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action uni-directional link-fault error-disable-interface
```

The following example shows how to configure that a syslog entry is created when a link-fault notification is received. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# action uni-directional link-fault log
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.

action wiring-conflict

To configure what action is taken on an interface when a wiring-conflict event occurs, use the **action wiring-conflict** command in Ethernet OAM configuration mode or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of this command.

action wiring-conflict {**disable**| **efd** | **error-disable-interface**| **log**}

no action wiring-conflict {**disable**| **efd** | **error-disable-interface**| **log**}

Syntax Description

disable	Performs no action on the interface when a capabilities-conflict event occurs.
efd	Puts the line protocol into the down state for an interface when a capabilities-conflict event occurs. The state is removed when the first packet is received without a conflict.
error-disable-interface	Puts the interface into the error-disable state when a capabilities-conflict event occurs.
log	(Interface Ethernet OAM configuration only) Creates a syslog entry when a capabilities-conflict event occurs. This action is available only in interface Ethernet OAM configuration mode to override the OAM profile on a specific interface.

Command Default

The default action is to put the interface into error-disable state.

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.
Release 4.1.0	The efd keyword was added.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure that no action is performed on the interface when a wiring-conflict event occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action wiring-conflict disable
```

The following example shows how to configure putting the interface into the line-protocol-down state when a wiring-conflict event occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action wiring-conflict efd
```

The following example shows how to configure that a syslog entry is created when a wiring-conflict event occurs.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# action wiring-conflict log
```

The following example shows how to configure that the interface is put into the error-disable state when a wiring-conflict event occurs. This configuration overrides the interface Ethernet OAM profile.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# ethernet oam
(config-if-eoam)# action wiring-conflict error-disable-interface
```

Related Commands

Command	Description
ethernet oam profile , on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam , on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM) , on page 382	Attaches an Ethernet OAM profile to an interface.

aggregate

To configure the size and number of bins into which to aggregate the results of statistics collection, use the **aggregate** command in SLA profile statistics configuration mode. To return to the default, use the **no** form of this command.

aggregate {*bins count width width*| **none**}

no aggregate {*bins count width width*| **none**}

Syntax Description

bins <i>count</i>	Number of bins. The range is 2 to 100.
width <i>width</i>	For delay and jitter measurements, the size of each bin in milliseconds (range 1-10000). In addition, the width must be specified if the number of bins is at least 2, regardless of the type of measurement.
none	No aggregation is performed. All samples are stored individually.

Command Default

For delay measurements, all collected statistics are aggregated into one bin.

Command Modes

SLA profile statistics configuration (config-sla-prof-stat-cfg)

Command History

Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Changing the aggregation for a given metric clears all stored data for that metric.

When aggregation is enabled, a number of bins are created, each of which represents a range of values. Instead of storing each individual result, all that is stored is a counter of the number of results that fall within the range for each bin. This uses much less memory than storing each individual result.

For delay and jitter measurements, the first bin starts at 0, each bin covers a range of values defined by the specified width, except for the last bin which ends at infinity. For example, an aggregate bin count of 4 and a width of 20 for delay measurements yields 4 bins of statistics for these sample ranges:

- Bin 1—Samples with delay ranges 0 to < 20 ms.
- Bin 2—Samples with delay ranges greater than or equal to 20 and < 40 ms.
- Bin 3—Samples with delay ranges greater than or equal to 40 and < 60 ms.

- Bin 4—Samples with delay ranges 60 ms or greater (unbounded).

**Note**

The lower bound of each bin is inclusive, while the upper bound is exclusive. Changing the aggregation for a given metric clears all stored data for that metric.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

This example shows how to configure round-trip-delay statistics measurement in 4 bins each with a range of 20 milliseconds:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# statistics measure round-trip-delay
RP/0/0/CPU0:router(config-sla-prof-stat-cfg)# aggregate bins 4 width 20
```


ais transmission

To configure Alarm Indication Signal (AIS) transmission for a Connectivity Fault Management (CFM) domain service, use the **ais transmission** command in CFM domain service configuration mode. To disable AIS transmission in a CFM domain service, use the no form of this command.

ais transmission [**interval** **1s**| **1m**] [**cos** *cos*]

no ais transmission [**interval** **1s**| **1m**] [**cos** *cos*]

Syntax Description

interval	(Optional) Interval at which AIS packets are transmitted. Valid values are: • 1s – Interval of 1 second • 1m – Interval of 1 minute
cos <i>cos</i>	(Optional) Specifies the Class of Service (CoS) for the AIS packets. Valid values are 0 to 7.

Command Default

AIS transmission is disabled by default.

If **interval** is not specified, the default interval is 1 second.

If **cos** is not specified, each MEP uses its own CoS value, inherited from the interface.

Command Modes

CFM domain service configuration (config-cfm-dmn-svc)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command enables AIS for all MEPs in the service. AIS messages are triggered by the following events:

- Detection of a CCM defect.
- Detection of a missing peer MEP (when cross-check is configured).
- Receipt of AIS or LCK messages.
- Detection of interface down events (for down MEPs only).

AIS messages are transmitted in the opposite direction of CCMs and other CFM messages that are sent by the MEP. Therefore, up MEPs send AIS messages out of the interface, whereas down MEPs send AIS messages toward the bridging function.

In addition, AIS messages are sent at a higher maintenance level than other CFM messages sent by the MEP:

- If there is a higher-level MEP on the interface in the same direction (up MEP or down MEP), then the AIS messages are passed internally to this higher level MEP. In this case, no AIS messages are actually transmitted (unless the higher-level MEP is also in a service with AIS transmission configured).
- If there is a MIP on the interface, then AIS messages are sent at the level of the MIP.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure Alarm Indication Signal (AIS) transmission for a CFM domain service:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# ais transmission interval 1m cos 7
```

Related Commands

Command	Description
log ais, on page 351	Configures AIS logging for a CFM domain service to indicate when AIS or LCK packets are received.
ais transmission up, on page 273	Configures AIS transmission on a CFM interface.
show ethernet cfm interfaces ais, on page 404	Displays the information about interfaces that are currently transmitting AIS.
show ethernet cfm local meps, on page 412	Displays information about local MEPs.

ais transmission up

To configure Alarm Indication Signal (AIS) transmission on a Connectivity Fault Management (CFM) interface, use the **ais transmission up** command in interface CFM configuration mode. To disable AIS transmission on an interface, use the no form of this command.

ais transmission up [*interval 1s*| *1m*] [*cos cos*]

no ais transmission up [*interval 1s*| *1m*] [*cos cos*]

Syntax Description

interval	(Optional) Interval at which AIS packets are transmitted. Valid values are: • 1s – Interval of 1 second • 1m – Interval of 1 minute
cos cos	(Optional) Specifies the Class of Service (CoS) for the AIS packets. Valid values are 0 to 7.

Command Default

AIS transmission is disabled by default.

If **interval** is not specified, the default interval is 1 second.

If **cos** is not specified, each MEP uses its own CoS value, inherited from the interface.

Command Modes

Interface CFM configuration (config-if-cfm)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

AIS transmission packets for CFM can be configured only on interfaces with no down MEPs. AIS packets are transmitted only if a MIP exists on the interface and the line protocol state is down. AIS messages are transmitted up, toward the bridging function (same direction as an up MEP sends CCMs), and they are transmitted at the level of the MIP.

If AIS transmission is configured on an interface with any down MEPs, the configuration is ignored, and an error is displayed in the **show ethernet cfm configuration-errors** command.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure AIS transmission on a CFM interface.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/2
RP/0/0/CPU0:router(config-if)# ethernet cfm
RP/0/0/CPU0:router(config-if-cfm)# ais transmission up interval 1m cos 7
```

Related Commands

Command	Description
ais transmission, on page 271	Configures AIS transmission for a CFM domain service.
log ais, on page 351	Configures AIS logging for a CFM domain service to indicate when AIS or LCK packets are received.
show ethernet cfm interfaces ais, on page 404	Displays the information about interfaces that are currently transmitting AIS.
show ethernet cfm local meps, on page 412	Displays information about local MEPS.

buckets archive

To configure the number of buckets to store in memory, use the **buckets archive** command in SLA profile statistics configuration mode. To return to the default value, use the no form of this command.

buckets archive *number*

Syntax Description

<i>number</i>	Number of buckets to store. The range is 1 to 100.

Command Default

The default number of buckets stored in memory is 100.

Command Modes

SLA profile statistics configuration (config-sla-prof-stat-cfg)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The results stored in the oldest bucket are discarded when the limit is reached, to make room for new results. If the number of archived buckets for a given metric decreases, the oldest buckets are deleted and the remaining buckets are untouched. If the number archived buckets for a given metric increases, the newest buckets are filled when the data is collected. See the Usage Guidelines in the [buckets size, on page 277](#) command for a description of buckets.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the number of buckets to store in memory:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# statistics measure round-trip-delay
RP/0/0/CPU0:router(config-sla-prof-stat-cfg)# buckets archive 50
```

Related Commands

Command	Description
buckets size, on page 277	Configures the size of the buckets in which statistics are collected.

buckets size

To configure the size of the buckets in which statistics are collected, use the **buckets size** command in SLA profile statistics configuration mode. To return the **buckets size** to the default value, use the no form of this command.

buckets size *number* {**probes**}

no buckets size *number* {**probes**}

Syntax Description

<i>number</i>	Specifies the size of each bucket. The number of probes that each buckets may contain. The range is 1 to 100.
probes	Buckets span multiple probes.

Command Default

1 probe per bucket is collected.

Command Modes

SLA profile statistics configuration mode (config-sla-prof-stat-cfg)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

A bucket represents a time period during which statistics are collected. All the results received during that time period are recorded in the corresponding bucket. If aggregation is enabled, each bucket has its own set of bins and counters, and only results received during the time period represented by the bucket are included in those counters.

By default, there is a separate bucket for each probe. The time period is determined by how long the probe lasts (configured by the [probe](#), on page 381, [send \(SLA\)](#), on page 392, and [schedule \(SLA\)](#), on page 388 commands). This command allows you to modify the size of buckets so that you can have more buckets per probe, or fewer buckets per probe (fewer buckets allows the results from multiple probes to be included in the same bucket).



Note

Changing the size of the buckets for a given metric clears all stored data for that metric. All existing buckets are deleted and new buckets are created.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

This example shows how to configure the size of the buckets in which statistics are collected.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# statistics measure round-trip-delay
RP/0/0/CPU0:router(config-sla-prof-stat-cfg)# buckets size 100 per-probe
```

Related Commands

Command	Description
buckets archive, on page 275	Configures the number of buckets to store in memory.
probe, on page 381	Enters SLA profile probe configuration mode.
schedule (SLA), on page 388	
send (SLA), on page 392	Configures the number and timing of packets sent by a probe in an operations profile.

clear ethernet cfm ccm-learning-database location

To clear the Continuity Check Message (CCM) learning database, use the **clear ethernet cfm ccm-learning-database location** command in EXEC mode.

clear ethernet cfm ccm-learning-database location {**all**| *node-id*}

Syntax Description

all	Clears the CCM learning database for all interfaces.
<i>node-id</i>	Clears the CCM learning database for the designated node, entered in <i>r ack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to clear all the CFM CCM learning databases on all interfaces:

```
RP/0/0/CPU0:router# clear ethernet cfm ccm-learning-database location all
```

Related Commands

Command	Description
show ethernet cfm ccm-learning-database , on page 400	Displays the CCM learning database.

clear ethernet cfm interface statistics

To clear the counters for an Ethernet CFM interface, use the **clear ethernet cfm interface statistics** command in EXEC mode.

clear ethernet cfm interface *interface-path-id* **statistics** [**location** {**all**| **location**}]

clear ethernet cfm interface statistics location {**all**| *node-id*}

Syntax Description

<i>interface-path-id</i>	(Optional) Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location	(Optional only when used with a specified interface) Clears MAC accounting statistics for a designated interface or for all interfaces.
all	Clears CFM counters for all interfaces.
<i>node-id</i>	Clears CFM counters for a specified interface, using <i>rack/slot/module</i> notation.

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to clear all the CFM counters from all interfaces:

```
RP/0/0/CPU0:router# clear ethernet cfm interface statistics location all
```

Related Commands

Command	Description
show ethernet cfm interfaces statistics, on page 407	Displays the per-interface counters for CFM.

clear ethernet cfm local meps

To clear the counters for all MEPs or a specified MEP, use the **clear ethernet cfm local meps** command in EXEC mode.

clear ethernet cfm local meps [**all** | **domain** *domain-name* [**all** | **service** *service-name* [**all** | **mep-id** *id*]] | **interface** *interface-name* [**all** | **domain** *domain-name*]]

Syntax Description

all	Clears counters for all local MEPs.
domain <i>domain-name</i>	String of a maximum of 80 characters that identifies the domain in which the maintenance points reside. Note For more information about the syntax, use the question mark (?) online help function.
service <i>service-name</i>	String of a maximum of 80 characters that identifies the maintenance association to which the maintenance points belong.
mep-id <i>id</i>	Maintenance end point (MEP) ID number. The range for MEP ID numbers is 1 to 8191.
interface <i>interface-name</i>	String of a maximum of 80 characters that identifies the Ethernet interface.

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The following counters are cleared:

- Number of continuity-check messages (CCMs) sent
- Number of CCMs received
- Number of CCMs received out of sequence
- Number of CCMs received, but discarded due to the **maximum-meps** limit

- Number of loopback messages (LBMs), used for CFM ping
- Number of loopback replies (LBRs), used for CFM ping, sent and received
- Number of LBRs received out of sequence
- Number of LBRs received with bad data (such as LBRs containing padding which does not match the padding sent in the corresponding LBM)
- Number of alarm indication signal (AIS) messages sent and received
- Number of lock (LCK) messages received

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to clear counters for all MEPs:

```
RP/0/0/CPU0:router# clear ethernet cfm local meps all
```

Related Commands

Command	Description
show ethernet cfm local meps , on page 412	Displays information about local MEPs.

clear ethernet cfm peer meps

To clear all peer MEPs or peer MEPs for a specified local MEP, use the **clear ethernet cfm peer meps** command in EXEC mode.

clear ethernet cfm peer meps {**all**| **domain** *domain-name* {**all**| **service** *service-name* {**all**| **local mep-id** *id* } }| **interface** *interface-name* {**all**| **domain** *domain-name* } }

all	Clears counters for all peer MEPs.
domain <i>domain-name</i>	String of a maximum of 80 characters that identifies the domain in which the maintenance points reside. Note For more information about the syntax, use the question mark (?) online help function.
service <i>service-name</i>	String of a maximum of 80 characters that identifies the maintenance association to which the maintenance end points belong.
local mep-id <i>id</i>	Local maintenance end point (MEP) ID number. The range for MEP ID numbers is 1 to 8191.
interface <i>interface-name</i>	String of a maximum of 80 characters that identifies the Ethernet interface.

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command removes all received CCMs and corresponding peer MEPs from the database (other than those configured with cross-check). The peer MEPs will be added again when the next CCM is received.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to clear all peer MEPs:

```
RP/0/0/CPU0:router# clear ethernet cfm peer meps all
```

Related Commands

Command	Description
show ethernet cfm peer meps , on page 418	Displays information about maintenance end points (MEPs) for peer MEPs.

clear ethernet cfm traceroute-cache

To remove the contents of the traceroute cache, use the **clear ethernet cfm traceroute-cache** command in EXEC mode.

clear ethernet cfm traceroute-cache {**all**| **domain** *domain-name* {**all**| **service** *service-name* {**all**| **mep-id** *id*}}| **interface** *interface-name* {**all**| **domain** *domain-name*}}

Syntax Description

domain <i>domain-name</i>	String of a maximum of 80 characters that identifies the domain in which the maintenance points reside. Note For more information about the syntax, use the question mark (?) online help function.
service <i>service-name</i>	String of a maximum of 80 characters that identifies the maintenance association to which the maintenance end points belong.
mep-id <i>id</i>	Maintenance end point (MEP) ID number. The range for MEP ID numbers is 1 to 8191.
interface <i>interface-name</i>	String of a maximum of 80 characters that identifies the Ethernet interface.

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to clear all ethernet cfm traceroute-cache:

```
RP/0/0/CPU0:router# clear ethernet cfm traceroute-cache all
```

Related Commands

Command	Description
traceroute cache , on page 460	Sets the maximum limit of traceroute cache entries or the maximum time limit to hold the traceroute cache entries.
show ethernet cfm traceroute-cache , on page 425	Displays the contents of the traceroute cache.

clear ethernet oam statistics

To clear the packet counters on Ethernet OAM interfaces, use the **clear ethernet oam statistics** command in EXEC mode.

clear ethernet oam statistics [*interface type interface-path-id*] **location** *node-id* **all**

Syntax Description

interface type <i>interface-path-id</i>	(Optional) Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location	Clears the statistics for a specific node. For more information about the syntax for the router, use the question mark (?) online help function.
<i>node-id</i>	Path ID of the node.
all	Clears the statistics for all nodes on the router.

Command Default

No parameters clears the packet counters on all Ethernet OAM interfaces.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to clear the packet counters on a specific interface:

```
RP/0/0/CPU0:router# clear ethernet oam statistics interface gigabitethernet 0/1/5/1
```

Related Commands

Command	Description
show ethernet oam statistics, on page 441	Displays the local and remote Ethernet OAM statistics for interfaces.
show ethernet oam interfaces, on page 438	

clear ethernet sla statistics all

To delete the contents of buckets containing SLA statistics collected by all operations probes, including on-demand operations, use the **clear ethernet sla statistics all** command in EXEC mode.

clear ethernet sla statistics [**current**| **history**] **all**

Syntax Description

current	(Optional) Clears statistics for buckets currently being filled for all operations.
history	(Optional) Clears statistics for full buckets for all operations.
all	Clears statistics for all operations.

Command Default

When **current** or **history** are not used, all buckets (current, old, new, half empty, and full) for all operations (including on-demand operations) are cleared. This is equivalent to restarting the operation.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you clear a bucket for a currently running probe, the remaining statistics are still collected and stored in that bucket.

See the Usage Guidelines in the [buckets size, on page 277](#) command for a description of buckets.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to delete the contents of all buckets containing SLA metrics collected by all probes:

```
RP/0/0/CPU0:router# clear ethernet sla statistics all
```

The following example shows how to delete the contents of all current buckets containing SLA metrics collected by all probes:

```
RP/0/0/CPU0:router# clear ethernet sla statistics current all
```

The following example shows how to delete the contents of all full buckets containing SLA metrics collected by all probes:

```
RP/0/0/CPU0:router# clear ethernet sla statistics history all
```

clear ethernet sla statistics on-demand

To delete the contents of buckets containing SLA statistics collected by on-demand probes, use the **clear ethernet sla statistics on-demand** command in EXEC mode.

clear ethernet sla statistics [**current**|**history**] **on-demand** {**all**|*id*} [**interface type** *interface-path-id* **domain** **all**|**interface type** *interface-path-id* **domain** *domain-name* **target** {**all**|**mac-address** *H.H.H*|**mep-id** *id*}|**interface all domain** *domain-name*]

Syntax Description

current	(Optional) Clears statistics for all buckets currently being filled.
history	(Optional) Clears statistics for all full buckets.
all	Clears statistics for all on-demand operations.
<i>id</i>	Clears statistics for the on-demand operation of the specified number.
interface type	(Optional) Clears statistics for the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
domain all	Clears statistics for on-demand operations for all domains.
domain <i>domain-name</i>	Clears statistics for on-demand operations for the specified domain.
target all	Clears statistics for on-demand operations targeted to all MEPs for the specified interface domain.
target mac-address <i>H.H.H</i>	Clears statistics for on-demand operations targeted to the specified MAC address.
target mep-id <i>id</i>	Clears statistics for on-demand operations targeted to the specified MEP ID.
interface all	(Optional) Clears statistics for on-demand operations on all interfaces.

Command Default

When **current** or **history** are not used, all buckets for on-demand operations (current, old, new, half empty, and full) are cleared. This is equivalent to restarting the operation.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you clear a bucket for a currently running probe, the remaining statistics are still collected and stored in that bucket.

See the Usage Guidelines in the [buckets size, on page 277](#) command for a description of buckets.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to delete the contents of all buckets currently being filled for the on-demand operation with ID 1:

```
RP/0/0/CPU0:router# clear ethernet sla statistics current on-demand 1
```

The following example shows how to delete the contents of all buckets for all on-demand operations:

```
RP/0/0/CPU0:router# clear ethernet sla statistics on-demand all
```

The following example shows how to delete the contents of all buckets for all on-demand operations on a specified interface and domain that is targeted to a specific MEP:

```
RP/0/0/CPU0:router# clear ethernet sla statistics on-demand all interface TenGigE 0/6/1/0
domain D1 target mep-id 3
```

Related Commands

Command	Description
clear ethernet sla statistics all, on page 290	Deletes the contents of buckets containing SLA statistics collected by all operations probes.
ethernet sla on-demand operation type cfm-delay-measurement probe, on page 322	Executes an on-demand Ethernet SLA operation probe for CFM delay measurement.
ethernet sla on-demand operation type cfm-loopback probe, on page 329	Executes an on-demand Ethernet SLA operation probe for CFM loopback measurements
show ethernet sla operations, on page 445	Displays information about configured Ethernet SLA operations.

Command	Description
show ethernet sla statistics, on page 448	Displays the contents of buckets containing Ethernet SLA metrics collected by probes.

clear ethernet sla statistics profile

To delete the contents of buckets containing SLA statistics collected by probes for a profile, use the **clear ethernet sla statistics profile** command in EXEC mode.

clear ethernet sla statistics [**current**| **history**] **profile** {**all**| *profile-name*} [**interface** *type interface-path-id* **domain** **all**| *interface type interface-path-id domain domain-name* **target** {**all**| **mac-address** *H.H.H*| **mep-id** *id*}| **interface** **all** **domain** *domain-name*]

Syntax Description

current	(Optional) Clears statistics for all buckets currently being filled.
history	(Optional) Clears statistics for all full buckets.
<i>profile-name</i>	Clears statistics for the specified profile name.
all	Clears statistics for all profiles.
interface <i>type</i>	(Optional) Clears statistics for the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
domain all	Clears statistics for on-demand operations for all domains.
domain <i>domain-name</i>	Clears statistics for on-demand operations for the specified domain.
target all	Clears statistics for on-demand operations targeted to all MEPs for the specified interface domain.
target mac-address <i>H.H.H</i>	Clears statistics for on-demand operations targeted to the specified MAC address.
target mep-id <i>id</i>	Clears statistics for on-demand operations targeted to the specified MEP ID.
interface all	(Optional) Clears statistics for on-demand operations on all interfaces.

Command Default

When **current** or **history** are not used, all buckets in the profile (current, old, new, half empty, and full) are cleared. This is equivalent to restarting the operation.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you clear a bucket for a currently running probe, the remaining statistics are still collected and stored in that bucket.

See the Usage Guidelines in the [buckets size, on page 277](#) command for a description of buckets.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to delete the contents of all buckets currently being filled for a specified profile:

```
RP/0/0/CPU0:router# clear ethernet sla statistics current profile P1
```

The following example shows how to delete the contents of all full buckets for a specified profile:

```
RP/0/0/CPU0:router# clear ethernet sla statistics history profile P2
```

The following example shows how to delete the contents of all buckets for a specified profile:

```
RP/0/0/CPU0:router# clear ethernet sla statistics profile P3
```

The following example shows how to delete the contents of all buckets for all profiles:

```
RP/0/0/CPU0:router# clear ethernet sla statistics profile all
```

The following example shows how to delete the contents of all buckets for all profiles on a specified interface and domain that is targeted to a specific MEP:

```
RP/0/0/CPU0:router# clear ethernet sla statistics profile all interface TenGigE 0/6/1/0
domain D1 target mep-id 3
```

Related Commands

Command	Description
buckets size, on page 277	Configures the size of the buckets in which statistics are collected.

connection timeout

To configure the timeout value for an Ethernet OAM session, use the **connection timeout** command in Ethernet OAM configuration mode.

connection timeout *seconds*

Syntax Description

<i>seconds</i>	Connection timeout period in seconds. The range is 2 to 30.

Command Default

The default value is 5.

Command Modes

Ethernet OAM configuration (config-eoam)
Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If no packets are received from the OAM peer in the specified time, the OAM session is brought down, and the negotiation phase starts again.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the connection timeout value of an Ethernet OAM session:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# connection timeout 20
```

Related Commands

Command	Description
action discovery-timeout, on page 253	Configures what action is taken on an interface when a connection timeout occurs.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam discovery, on page 435	Displays the currently configured OAM information of Ethernet OAM sessions on interfaces.
show ethernet oam interfaces, on page 438	

continuity-check archive hold-time

To configure the time limit for how long peer maintenance-end-points (MEPs) are held in the continuity-check database after they have timed out (no more CCMs are received), use the **continuity-check archive hold-time** command in CFM domain service configuration mode. To return to the default value, use the no form of this command.

continuity-check archive hold-time *minutes*

no continuity-check archive hold-time *minutes*

Syntax Description

<i>minutes</i>	Time limit (in minutes) that peer MEPs are held in the continuity-check database before they are cleared. Range is 1 to 65535.

Command Default

The default is 100.

Command Modes

CFM domain service configuration (config-cfm-dmn-svc)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Peer MEPs appear in **show ethernet cfm peer meps** command display output after they timeout (no more continuity check messages (CCMs) are received).

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the time limit for how long continuity-check messages are held in the continuity-check archive:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
```

```
RP/0/0/CPU0:router(config-cfm-dmn-svc)# continuity-check archive hold-time 100
```

Related Commands

Command	Description
show ethernet cfm peer meps, on page 418	Displays information about maintenance end points (MEPs) for peer MEPs.

continuity-check interval

To enable continuity check and configure the time interval at which continuity-check messages are transmitted or to set the threshold limit for when a MEP is declared down, use the **continuity-check interval** command in CFM domain service configuration mode. To disable continuity check, use the **no** form of this command.

continuity-check interval *time* [**loss-threshold** *threshold*]

no continuity-check interval *time* [**loss-threshold** *threshold*]

Syntax Description

<i>time</i>	Interval at which continuity-check messages are transmitted. Valid values are: • 100ms: 100 milliseconds • 1s: 1 second • 10s: 10 seconds • 1m: 1 minute • 10m: 10 minutes
loss-threshold <i>threshold</i>	(Optional) Specifies the number of continuity-check messages that are lost before CFM declares that a MEP is down (unreachable). Range is 2 to 255. Used in conjunction with interval .

Command Default

Continuity check is off by default.

If **loss-threshold** is not specified, the default is 3.

Command Modes

CFM domain service configuration (config-cfm-dmn-svc)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the time interval at which continuity-check messages are transmitted and set the threshold limit for when a MEP is declared down.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# continuity-check interval 100ms loss-threshold 10
```


continuity-check loss auto-traceroute

To configure automatic triggering of a traceroute when a MEP is declared down, use the **continuity-check loss auto-traceroute** command in CFM domain service configuration mode. To disable automatic triggering of a traceroute, use the no form of this command.

continuity-check loss auto-traceroute

no continuity-check loss auto-traceroute

This command has no keywords or arguments.

Command Default

Auto-trigger is off.

Command Modes

CFM domain service configuration (config-cfm-dmn-svc)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The results of the traceroute can be seen using the **show ethernet cfm traceroute-cache** command.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure automatic triggering of a traceroute when a MEP is declared down:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# continuity-check loss auto-traceroute
```

Related Commands

Command	Description
show ethernet cfm traceroute-cache , on page 425	Displays the contents of the traceroute cache.

cos (CFM)

To configure the class of service (CoS) for all CFM packets generated by the maintenance end point (MEP) on an interface, use the **cos** command in interface CFM MEP configuration mode. To return to the default CoS, use the no form of this command.

cos *cos*

no cos *cos*

Syntax Description

<i>cos</i>	Class of Service for this MEP. The range is 0 to 7.

Command Default

When not configured, the default CoS value is inherited from the Ethernet interface.

Command Modes

Interface CFM MEP configuration (config-if-cfm-mep)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Configuring the class of service (CoS) on maintenance end points (MEPs) is supported on all Ethernet interfaces. The specified CoS value is used for all CFM messages transmitted by the MEP, except for the following:

- Loopback and Linktrace replies—These are transmitted using the CoS value received in the corresponding loopback or linktrace message.
- AIS messages—If a different CoS value is specified in the AIS configuration.
- Ethernet SLA probe messages.



Note

For Ethernet interfaces, the CoS is carried as a field in the VLAN tag. Therefore, CoS only applies to interfaces where packets are sent with VLAN tags. If the **cos (CFM)** command is specified for a MEP on an interface that does not have a VLAN encapsulation configured, an error message will be logged and no CFM packets will be sent.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the class of service (CoS) for a maintenance end point (MEP) on an interface.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/1
RP/0/0/CPU0:router(config-if)# ethernet cfm mep domain Dm1 service Sv1 mep-id 1
RP/0/0/CPU0:router(config-if-cfm-mep)# cos 7
```

Related Commands

Command	Description
ethernet cfm (interface) , on page 317	Enters interface CFM configuration mode.

debug ethernet cfm packets

To log debug messages about CFM packets that are sent or received by the Ethernet connectivity fault management (CFM) process, use the **debug ethernet cfm packets** command in EXEC mode.

debug ethernet cfm packets [**domain** *domain-name* [**service** *service-name* [**mep-id** *mep-id*]]] [**interface** *type interface-path-id* [**domain** *domain-name*]] [**packet-type** {**ccm**|**linktrace**|**loopback**}] [**remote mac-address** *mac-address*] [**remote mep-id** *mep-id*] [**sent**|**received**] [**brief**|**full**|**hexdump**]
debug ethernet cfm packets [**domain** *domain-name* [**service** *service-name* [**mep-id** *mep-id*]]] [**interface** *type interface-path-id* [**domain** *domain-name*]] [**packet-type** {**ais**|**ccm**|**delay-measurement**|**linktrace**|**loopback**}] [**remote mac-address** *mac-address*] [**remote mep-id** *mep-id*] [**sent**|**received**] [**brief**|**full**|**hexdump**]

Syntax Description

domain <i>domain-name</i>	(Optional) Filters packets for display by the specified CFM maintenance domain, where <i>domain-name</i> is a string of up to 80 characters.
service <i>service-name</i>	(Optional) Filters packets for display by the specified service name, where <i>service-name</i> is a string of up to 80 characters.
mep-id <i>mep-id</i>	(Optional) Filters packets for display by the specified maintenance end point (MEP) ID number. The range for MEP ID numbers is 1 to 8191.
interface <i>type interface-path-id</i>	(Optional) Filters packets for display by the specified physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
<i>packet-type</i>	(Optional) Filters packets for display by the specified packet type. The following packet types are valid: • ais • ccm • delay-measurement • linktrace • loopback
remote mac-address <i>mac-address</i>	(Optional) Filters packets for display by the specified MAC address.
remote mep-id <i>mep-id</i>	(Optional) Filters packets for display by the remote MEP properties.
sent	(Optional) Displays only sent packets.
received	(Optional) Displays only received packets.

brief	(Optional) Displays brief information about each packet.
full	(Optional) Displays a full decode of each packet.
hexdump	(Optional) Displays a full decode and hexadecimal output of each packet.

Command Default If no parameters are specified, all CFM packets are debugged and logged.

Command Modes EXEC (#)

Command History	Release	Modification
	Release 4.0.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Caution

Enabling packet debugging without filters can have an adverse effect on the performance of the router. To avoid this, filters should always be specified to restrict the output to the domain, service, local MEP, interface, direction and packet type of interest.

Packets can be filtered for debugging by specifying any of the optional parameters.

Task ID	Task ID	Operations
	ethernet-services	read

Examples The following example shows a sample output of the **debug ethernet cfm packets** command with a full decode and hexadecimal output for sent and received CCM packets:

```
RP/0/0/CPU0:router# debug ethernet cfm packets hexdump
```

```
RP/0/0/CPU0:May 29 14:15:39.621 : cfmd[150]: PKT-RX: GigabitEthernet0/1/0/0 ingress: CCM
packet rcvd at level 2 for domain foo, service foo: length 91, src MAC 0001.0203.0402, dst
MAC 0180.c200.0032: Packet processed successfully
RP/0/0/CPU0:May 29 14:15:39.621 : cfmd[150]: PKT-RX: CCM: Level 2, opcode CCM, version
0, RDI bit unset, interval 10s, seq. num 1, remote MEP ID 16, flags 0x05, first TLV offset
70, 0 unknown TLVs
RP/0/0/CPU0:May 29 14:15:39.621 : cfmd[150]: PKT-RX: CCM: MAID: MDID String 'dom4', SMAN
String 'ser4'
RP/0/0/CPU0:May 29 14:15:39.621 : cfmd[150]: PKT-RX: CCM: Sender ID: Chassis ID Local
'hpr', Mgmt Addr <none>
```

debug ethernet cfm packets

```

RP/0/0/CPU0:May 29 14:15:39.621 : cfmd[150]: PKT-RX: CCM: Port status: Up, interface
status Up
RP/0/0/CPU0:May 29 14:15:39.622 : cfmd[150]: PKT-RX: Raw Frame:
RP/0/0/CPU0:May 29 14:15:39.622 : cfmd[150]: PKT-RX: 0x40010546 00000001 00100404
646F6D34 02047365 72340000 00000000 00000000
RP/0/0/CPU0:May 29 14:15:39.622 : cfmd[150]: PKT-RX: 0x00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000
RP/0/0/CPU0:May 29 14:15:39.622 : cfmd[150]: PKT-RX: 0x00000000 00000000 00000200
01020400 01010100 05030768 707200
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: GigabitEthernet0/1/0/0 egress: CCM
packet sent at level 2 for domain foo, service foo: length 91, src MAC 0001.0203.0400, dst
MAC 0180.c200.0032
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: CCM: Level 2, opcode CCM, version
0, RDI bit set, interval 10s, seq. num 16, remote MEP ID 1, flags 0x85, first TLV offset
70, 0 unknown TLVs
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: CCM: MAID: MDID String 'foo', SMAN
String 'foo'
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: CCM: Sender ID: Chassis ID Local
'ios', Mgmt Addr <none>
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: CCM: Port status: Up, interface
status Up
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: Raw Frame:
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: 0x40018546 00000010 00010403
666F6F02 03666F6F 00000000 00000000 00000000
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: 0x00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000000
RP/0/0/CPU0:May 29 14:15:43.625 : cfmd[150]: PKT-TX: 0x00000000 00000000 00000200
01020400 01010100 05030769 6F7300

```

Related Commands

Command	Description
debug ethernet cfm protocol-state , on page 309	Logs debug messages about CFM state machines and protocol events.

debug ethernet cfm protocol-state

To log debug messages about CFM state machines and protocol events, use the **debug ethernet cfm protocol-state** command in EXEC mode.

debug ethernet cfm protocol-state [**domain** *domain-name* [**service** *service-name* [**mep-id** *mep-id*]]] [**interface** *type interface-path-id* [**domain** *domain-name*]]

Syntax Description

domain <i>domain-name</i>	(Optional) Filters information for display by the specified CFM maintenance domain, where <i>domain-name</i> is a string of up to 80 characters.
service <i>service-name</i>	(Optional) Filters information for display by the specified service name, where <i>service-name</i> is a string of up to 80 characters.
mep-id <i>mep-id</i>	(Optional) Filters information for display by the specified maintenance end point (MEP) ID number. The range for MEP ID numbers is 1 to 8191.
interface <i>type interface-path-id</i>	(Optional) Filters information for display by the specified physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

If no parameters are specified, all CFM state machines and protocol events are debugged and logged.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Debug messages can be filtered by specifying any of the optional parameters.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows a sample output of the **debug ethernet cfm protocol-state** command.

```
RP/0/0/CPU0:router# debug ethernet cfm protocol-state
```

```
RP/0/0/CPU0:May 29 14:41:49.966 : cfmd[150]: CFM: Created 1 local MEPs in PM and Engine
RP/0/0/CPU0:May 29 14:41:49.967 : cfmd[150]: CFM: State changes notification for 1 EFPs
RP/0/0/CPU0:May 29 14:42:14.143 : cfmd[150]: CFM: New remote MEP detected in domain foo,
service foo for local MEP ID 1 on interface GigabitEthernet0/1/0/0; remote MEP ID 16, MAC
0001.0203.0402, errors: set: mismatched MAID; current: mismatched MAID;
RP/0/0/CPU0:May 29 14:42:16.644 : cfmd[150]: CFM: Fault alarm notification for local MEP -
domain: foo, service: foo, MEP ID: 1, interface: GigabitEthernet0/1/0/0, defect:
cross-connect CCM
RP/0/0/CPU0:May 29 14:43:32.247 : cfmd[150]: CFM: Initiated exploratory linktrace to
ffff.ffff.ffff from MEP in domain foo, service foo, MEP ID 1, interface GigabitEthernet0/1/0/0
with ttl 64 and transaction ID 65537, reply-filtering Default and directed MAC None
May 29 14:43:49.155 : cfmd[150]: CFM: Remote MEP timed out in domain foo, service foo for
local MEP ID 1 on interface GigabitEthernet0/1/0/0; remote MEP ID 16, MAC 0001.0203.0402,
errors: cleared: mismatched MAID; current: none
```

Related Commands

Command	Description
debug ethernet cfm packets, on page 306	Logs debug messages about CFM packets that are sent or received by the Ethernet CFM process.

domain

To create and name a container for all domain configurations and enter the CFM domain configuration mode, use the **domain** command in CFM configuration mode. To remove the domain, use the no form of this command.

domain *domain-name* **level** *level-value* [**id** **null** [**dns** *dns-name*][**mac** *H.H.H*][**string** *string*]]

no domain *domain-name* **level** *level-value* [**id** **null** [**dns** *dns-name*][**mac** *H.H.H*][**string** *string*]]

Syntax Description

<i>domain-name</i>	Administrative name unique to this container, case sensitive ASCII string, up to 80 characters.
level <i>level-value</i>	The CFM protocol level of this domain. Range is 0 to 7.
id	(Optional) Maintenance domain identifier (MDID) used in conjunction with one of the following keywords to specify the MDID type and value: • null • dns <i>DNS-name</i> • mac <i>H.H.H</i> • string <i>string</i>
null	(Optional) Null value ID, used with the id keyword.
dns <i>DNS-name</i>	(Optional) DNS name, up to 43 characters in length, used with the id keyword.
mac <i>H.H.H</i>	(Optional) Hexadecimal MAC address, used with the id keyword.
string <i>string</i>	(Optional) Maintenance domain identifier (MDID) value, up to 43 characters in length, used with the id keyword. Note The domain name may be the used here as the maintenance domain identifier (MDID) if desired.

Command Default

If **id** is not specified, the domain name is used as the MDID.

Command Modes

CFM configuration (config-cfm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The level must be specified.

The maintenance domain identifier (MDID) is used as the first part of the maintenance association identifier (MAID) in CFM frames. If the MDID is not specified, the domain name is used as the MDID by default.

Multiple domains may be specified at the same level. If the MDID is specified as NULL, the MAID is constructed as a short maintenance association name.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to create a domain and give it a domain name, level, and maintenance domain identifier (MDID):

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)#
```

Related Commands

Command	Description
ethernet cfm (global), on page 315	Enters CFM configuration mode.
ethernet cfm (interface), on page 317	Enters interface CFM configuration mode.
mep domain, on page 364	Creates a MEP on an interface.
service, on page 395	
show ethernet cfm configuration-errors, on page 402	Displays information about errors that are preventing configured CFM operations from becoming active, as well as any warnings that have occurred.
show ethernet cfm local maintenance-points, on page 409	Displays a list of local maintenance points.
show ethernet cfm local meps, on page 412	Displays information about local MEPs.

efd

To enable Ethernet Fault Detection (EFD) on all down Maintenance End Points (MEPs) in a down MEPs service, use the **efd** command in CFM domain service configuration mode. To disable EFD, use the no form of this command.

efd

no efd

Syntax Description This command has no keywords or arguments.

Command Default EFD is disabled.

Command Modes CFM domain service configuration (config-cfm-dmn-svc)

Command History	Release	Modification
	Release 4.1.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

EFD can only be enabled for down MEPs within a down MEPs service.

If the **efd** command is issued when any MEP in the service has any of the following error conditions, the MEP will shut down the interface:

- The MEP appears cross-connected to another MAID.
- The MEP is receiving invalid CCMs, such as receiving its own MAC or MEP-ID.
- All peer MEPs are reporting a state other than UP via the Port Status TLV.
- A peer MEP is reporting a state other than UP in Interface Status TLV.
- When cross-check is configured, and a session with an expected MEP times out, EFD is triggered on the local MEP.
- No CCMs are received from a peer MEP appearing in the configured cross-check list.
- An RDI is being received from a peer MEP.
- The MEP is receiving an AIS/LCK.

The MEP will bring the interface back up when the error condition is no longer detected.

**Note**

When an interface is shut down by a MEP using EFD, the MEP will continue to send and receive CCMs and other CFM messages.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to enable EFD:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain D1 level 1
RP/0/0/CPU0:router(config-cfm-dmn)# service S1 down-meps
RP/0/0/CPU0:router(config-cfm-dmn-svc)# efd
```

Related Commands

Command	Description
log efd, on page 357	Enables logging of EFD state changes to an interface (such as when an interface is shut down or brought up via EFD).
show efd interface, on page 398	Displays all interfaces that are shut down because of EFD.
show ethernet cfm local meps, on page 412	Displays information about local MEPs.

ethernet cfm (global)

To enter Connectivity Fault Management (CFM) configuration mode, use the **ethernet cfm (global)** command in global configuration mode.

ethernet cfm

Syntax Description This command has no keywords or arguments.

Command Default No default behavior or values

Command Modes Global configuration (config)

Command History	Release	Modification
	Release 4.0.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples The following example shows how to enter the CFM configuration mode.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)#
```

Related Commands	Command	Description
	domain , on page 311	
	ethernet cfm (interface) , on page 317	Enters interface CFM configuration mode.

Command	Description
show ethernet cfm configuration-errors, on page 402	Displays information about errors that are preventing configured CFM operations from becoming active, as well as any warnings that have occurred.
show ethernet cfm local maintenance-points, on page 409	Displays a list of local maintenance points.
show ethernet cfm local meps, on page 412	Displays information about local MEPs.

ethernet cfm (interface)

To enter interface CFM configuration mode, use the **ethernet cfm (interface)** command in interface configuration mode.

ethernet cfm

Syntax Description This command has no keywords or arguments.

Command Default No MEPs are configured on the interface.

Command Modes
Interface configuration (config-if)
Subinterface configuration (config-subif)

Command History	Release	Modification
	Release 4.0.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples The following example shows how to enter interface CFM configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/1
RP/0/0/CPU0:router(config-if)# ethernet cfm
RP/0/0/CPU0:router(config-if-cfm)#
```

Related Commands	Command	Description
	cos (CFM) , on page 304	Configures the CoS for all CFM packets generated by the MEP on an interface.
	ethernet cfm (global) , on page 315	Enters CFM configuration mode.

Command	Description
mep domain, on page 364	Creates a MEP on an interface.
show ethernet cfm configuration-errors, on page 402	Displays information about errors that are preventing configured CFM operations from becoming active, as well as any warnings that have occurred.
show ethernet cfm local maintenance-points, on page 409	Displays a list of local maintenance points.
show ethernet cfm local meps, on page 412	Displays information about local MEPs.

ethernet oam

To enable Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode, use the **ethernet oam** command in interface configuration mode. To disable Ethernet Link OAM, use the **no** form of this command.

ethernet oam

no ethernet oam

Syntax Description

This command has no keywords or arguments.

Command Default

When enabled on an interface, the Ethernet Link OAM default values apply.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you enable Ethernet Link OAM on an interface, the default Ethernet Link OAM values are applied to the interface. For the default Ethernet Link OAM values, see the related Ethernet Link OAM commands.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to enable Ethernet Link OAM and enter interface Ethernet OAM configuration mode.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/5/6
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)#
```

ethernet oam profile

To create an Ethernet Operations, Administration and Maintenance (EOAM) profile and enter EOAM configuration mode, use the **ethernet oam profile** command in global configuration mode. To delete an EOAM profile, use the **no** form of this command.

ethernet oam profile *profile-name*

no ethernet oam profile *profile-name*

Syntax Description

<i>profile-name</i>	Text string name of the OAM profile. The maximum length is 32 bytes.

Command Default

No default behavior or values

Command Modes

Global configuration (config)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Before you can delete an EOAM profile, you must remove the profile from all interfaces to which it is attached.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to create an Ethernet OAM profile and enter Ethernet OAM configuration mode:

```
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)#
```

ethernet sla

To enter the Ethernet Service Level Agreement (SLA) configuration mode, use the **ethernet sla** command in global configuration mode.

ethernet sla

Syntax Description	This command has no keywords or arguments.

Command Default	No default behavior or values

Command Modes	Global configuration (config)

Command History	Release	Modification
	Release 4.1.0	This command was introduced.

Usage Guidelines	To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples	The following example shows how to enter the Ethernet SLA configuration mode.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)#
```

ethernet sla on-demand operation type cfm-delay-measurement probe

To execute an on-demand Ethernet SLA operation probe for CFM delay measurement, use the **ethernet sla on-demand operation type cfm-delay-measurement probe** command in EXEC mode.

ethernet sla on-demand operation type {cfm-delay-measurement} probe [*priority number*] [*send {packet {once| every number {milliseconds| seconds| minutes| hours}}| burst {once| every number {seconds| minutes| hours}}}*] *packet count number interval number {milliseconds| seconds}*] *packet size bytes [test pattern {hex 0x HHHHHHHH| pseudo-random}] domain domain_name source interface type interface-path-id target {mac-address H.H.H.H| mep-id id_number} statistics measure {one-way-delay-ds| one-way-delay-sd| one-way-jitter-ds| one-way-jitter-sd| round-trip-delay| round-trip-jitter} [aggregate {none| bins number width milliseconds}] [buckets {archive number size number {per-probe| probes}}] [schedule {now| at hh:mm [.ss] [day [month [year]]]] in number {seconds| minutes| hours}} [for duration {seconds| minutes| hours}] [repeat every number {seconds| minutes| hours} count probes]] [asynchronous]*

Syntax Description

priority number	(Optional) Configures the priority of outgoing SLA probe packets. The range is 0 to 7. The default is to use the COS bits for the egress interface.
send packet once	(Optional) Sends one packet one time.
send packet every number {milliseconds seconds minutes hours}	(Optional) Sends one packet every specified number of milliseconds, seconds, minutes, or hours, where <i>number</i> is in the following range: • 1 to 3600 seconds • 1 to 1440 minutes • 1 to 168 hours • 100 to 10000 milliseconds (specified in increments of 100)
send burst once	(Optional) Specifies that a burst of packets is sent one time. This is the default.

send burst every <i>number</i> { seconds minutes hours }}	(Optional) Sends a burst of packets every specified number of seconds, minutes, or hours, where <i>number</i> is in the following range: • 1–3600 seconds • 1–1440 minutes • 1–168 hours The default is to send a burst every 10 seconds.
packet count <i>number</i>	Specifies the number of packets to be sent in a burst, in the range 2 to 600. The default is 10.
interval <i>number</i> { milliseconds seconds }	Specifies the time between sending packets in a burst, where <i>number</i> is in the following range: • 100 to 30000 milliseconds • 1 to 30 seconds Note The total length of a burst (the packet count multiplied by the interval) must not exceed 1 minute.
packet size <i>bytes</i>	Minimum size of the packet including padding when necessary. The range is 1 to 9000 bytes. This value is the total frame size including the Layer 2 or Layer 3 packet header.
test pattern hex 0x <i>HHHHHHHH</i>	(Optional) Specifies a 4-byte string (8 hexadecimal characters) to repeat as many times as required to fill the outgoing probe packet to the specified minimum packet size. The default is all 0s.
test pattern pseudo-random	(Optional) Specifies a pseudo-random bit sequence determined by the protocol to fill the outgoing probe packet to the specified minimum packet size.
domain <i>domain-name</i>	Specifies the name of the domain for the locally defined CFM MEP.

source interface <i>type</i>	Specifies the source interface type of the locally defined CFM MEP. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
target mac-address <i>H.H.H</i>	Specifies the MAC address (in dotted hexadecimal format) of the target MEP that is known to the local MEP for the probe.
target mep-id <i>id-number</i>	Specifies the ID (from 1 to 8191) of the target MEP that is known to the local MEP for the probe.
statistics measure	(Optional) Specifies the type of statistics to collect: • one-way-delay-ds—One-way delay statistics from destination to source. • one-way-delay-sd—One-way delay statistics from source to destination. • one-way-jitter-ds—One-way delay jitter from destination to source. • one-way-jitter-sd—One-way delay jitter from source to destination. • round-trip-delay—Round-trip delay statistics. • round-trip-jitter—Round-trip jitter statistics. All statistics are collected by default.

aggregate none	(Optional) Specifies that statistics are not aggregated into bins, and each statistic is stored individually. Caution This option can be memory-intensive and should be used with care.
aggregate bins <i>number</i>	(Optional) Specifies the number of bins (from 2 to 100) within each bucket to store sample packets from the probe. The default is to aggregate into one bin.
width <i>milliseconds</i>	Specifies the range of the samples to be collected within each bin in milliseconds, from 1 to 10000. Based on the specified width, bins are established in the following way: • Delay measurements (round-trip or one-way)—The lower bound of the bins is zero and the first bin's upper limit is 0 plus the specified width, and the last bin is unbounded. • Jitter measurements (round-trip or one-way)—The bins are evenly distributed around zero, with both the lowest and highest numbered bins being unbounded. See the Usage Guidelines for more information.
buckets archive <i>number</i>	(Optional) Specifies the number of buckets to store in memory from 1 to 100. The default is 100.
buckets size <i>number</i>	(Optional) Specifies the number of buckets to be used for probes from 1 to 100. The default is 1.
per-probe	Specifies that probes span multiple buckets.
probes	Specifies that buckets span multiple probes.

schedule now	(Optional) Specifies that the probe begins as soon as you enter the command. This is the default.
schedule at <i>hh:mm</i>	(Optional) Specifies a specific time at which to start the probe in 24-hour notation.
<i>ss</i>	(Optional) Number of seconds into the next minute at which to start the probe.
day	(Optional) Number in the range 1 to 31 of the day of the month on which to start the probe.
month	(Optional) Name of the month (full word in English) in which to start the probe.
year	(Optional) Year (fully specified as 4 digits) in which to start the probe.
schedule in <i>number</i> {seconds minutes hours}	(Optional) Specifies a relative time, as a number of seconds, minutes or hours from the current time, at which to start the probe, where <i>number</i> is in the following ranges: • 1 to 3600 seconds • 1 to 1440 minutes • 1 to 24 hours
for <i>duration</i> {seconds minutes hours}	(Optional) Specifies the length of the probe as a number of seconds, minutes, or hours, where <i>number</i> is in the following ranges: • 1 to 3600 seconds • 1 to 1440 minutes • 1 to 24 hours Note The duration should not exceed the interval specified by the repeat every option.

repeat every <i>number</i> { seconds minutes hours }	(Optional) Specifies the interval at which to restart the probe as a number of seconds, minutes, or hours, where <i>number</i> is in the following ranges: • 1 to 90 seconds • 1 to 90 minutes • 1 to 24 hours The default is that probes are not repeated, and there is no default interval.
count <i>probes</i>	Specifies the number of probes to run in the range 1–100. There is no default.
asynchronous	(Optional) Specifies that the command displays the on-demand operation ID and exits immediately, with the operation continuing in the background. The default is synchronous and the operation displays the on-demand operation ID and all results on the console when it completes.

Command Default No on-demand operations are configured or executed.

Command Modes EXEC (#)

Command History	Release	Modification
	Release 4.1.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

This example shows how to enter the most basic SLA on-demand operation to measure CFM delay statistics. This example implements these defaults:

- Send a burst once for a packet count of 10 and interval of 1 second (10-second probe).
- Use default class of service (CoS) for the egress interface.
- Measure all statistics, including both one-way and round-trip delay and jitter statistics.
- Aggregate statistics into one bin.
- Schedule now.
- Display results on the console.

```
RP/0/0/CPU0:router# ethernet sla on-demand operation type cfm-delay-measurement
probe domain D1 source interface TenGigE 0/6/1/0 target mep-id 100
```

Related Commands

Command	Description
clear ethernet sla statistics all, on page 290	Deletes the contents of buckets containing SLA statistics collected by all operations probes.
clear ethernet sla statistics on-demand, on page 292	Deletes the contents of buckets containing SLA statistics collected by on-demand probes.
show ethernet sla operations, on page 445	Displays information about configured Ethernet SLA operations.
show ethernet sla statistics, on page 448	Displays the contents of buckets containing Ethernet SLA metrics collected by probes.

ethernet sla on-demand operation type cfm-loopback probe

To execute an on-demand Ethernet SLA operation probe for CFM loopback measurement, use the **ethernet sla on-demand operation type cfm-loopback probe** command in EXEC configuration mode.

ethernet sla on-demand operation type cfm-delay-measurement probe [*priority number*]**send** {*packet* {*once*| *every number* {*milliseconds*| *seconds*| *minutes*| *hours*}}| *burst* {*once*| *every number* {*seconds*| *minutes*| *hours*}}| *packet count number interval number* {*milliseconds*| *seconds*}}| *packet size bytes* [*test pattern* {*hex 0x HHHHHHHH*| *pseudo-random*}]| *domain domain_name* **source interface type interface-path-id target** {*mac-address H.H.H.H*| *mep-id id_number*}| **statistics measure** {*one-way-delay-ds*| *one-way-delay-sd*| *one-way-jitter-ds*| *one-way-jitter-sd*| *round-trip-delay*| *round-trip-jitter*}| **aggregate** {*none*| *bins number width milliseconds*}| **buckets** {*archive number*| *size number* {*per-probe*| *probes*}}| **schedule** {*now*| *at hh:mm:ss* [*day month year*]}| **in** *number* {*seconds*| *minutes*| *hours*}}| **for duration** {*seconds*| *minutes*| *hours*}| **repeat every number** {*seconds*| *minutes*| *hours*}| **count probes**[*asynchronous*]

Syntax Description

priority number	(Optional) Configures the priority of outgoing SLA probe packets. The range is 0 to 7. The default is to use the COS bits for the egress interface.
send packet once	(Optional) Sends one packet one time.
send packet every number { <i>milliseconds</i> <i>seconds</i> <i>minutes</i> <i>hours</i> }	(Optional) Sends one packet every specified number of milliseconds, seconds, minutes, or hours, where <i>number</i> is in the following range: • 1 to 3600 seconds • 1 to 1440 minutes • 1 to 168 hours • 100 to 10000 milliseconds (specified in increments of 100)
send burst once	(Optional) Specifies that a burst of packets is sent one time. This is the default.

send burst every <i>number</i> { seconds minutes hours }}	(Optional) Sends a burst of packets every specified number of seconds, minutes, or hours, where <i>number</i> is in the following range: • 1–3600 seconds • 1–1440 minutes • 1–168 hours The default is to send a burst every 10 seconds.
packet count <i>number</i>	Specifies the number of packets to be sent in a burst, in the range 2 to 600. The default is 10.
interval <i>number</i> { milliseconds seconds }	Specifies the time between sending packets in a burst, where <i>number</i> is in the following range: • 100 to 30000 milliseconds • 1 to 30 seconds Note The total length of a burst (the packet count multiplied by the interval) must not exceed 1 minute.
packet size <i>bytes</i>	Minimum size of the packet including padding when necessary. The range is 1 to 9000 bytes. This value is the total frame size including the Layer 2 or Layer 3 packet header.
test pattern hex 0x <i>HHHHHHHH</i>	(Optional) Specifies a 4-byte string (8 hexadecimal characters) to repeat as many times as required to fill the outgoing probe packet to the specified minimum packet size. The default is all 0s.
test pattern pseudo-random	(Optional) Specifies a pseudo-random bit sequence determined by the protocol to fill the outgoing probe packet to the specified minimum packet size.
domain <i>domain-name</i>	Specifies the name of the domain for the locally defined CFM MEP.

source interface <i>type</i>	Specifies the source interface type of the locally defined CFM MEP. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
target mac-address <i>H.H.H.H</i>	Specifies the MAC address (in dotted hexadecimal format) of the target MEP that is known to the local MEP for the probe.
target mep-id <i>id-number</i>	Specifies the ID (from 1 to 8191) of the target MEP that is known to the local MEP for the probe.
statistics measure	(Optional) Specifies the type of statistics to collect: • one-way-delay-ds—One-way delay statistics from destination to source. • one-way-delay-sd—One-way delay statistics from source to destination. • one-way-jitter-ds—One-way jitter statistics from destination to source. • one-way-jitter-sd—One-way jitter statistics from source to destination. • round-trip-delay—Round-trip delay statistics. • round-trip-jitter—Round-trip jitter statistics. All statistics are collected by default.

aggregate none	(Optional) Specifies that statistics are not aggregated into bins, and each statistic is stored individually. Caution This option can be memory-intensive and should be used with care.
aggregate bins <i>number</i>	(Optional) Specifies the number of bins (from 2 to 100) within each bucket to store sample packets from the probe. The default is to aggregate into one bin.
width <i>milliseconds</i>	Specifies the range of the samples to be collected within each bin in milliseconds, from 1 to 10000. Based on the specified width, bins are established in the following way: • Delay measurements (round-trip or one-way)—The lower bound of the bins is zero and the first bin's upper limit is 0 plus the specified width, and the last bin is unbounded. • Jitter measurements (round-trip or one-way)—The bins are evenly distributed around zero, with both the lowest and highest numbered bins being unbounded. See the Usage Guidelines for more information.
buckets archive <i>number</i>	(Optional) Specifies the number of buckets to store in memory from 1 to 100. The default is 100.
buckets size <i>number</i>	(Optional) Specifies the number of buckets to be used for probes from 1 to 100. The default is 1.
per-probe	Specifies that probes span multiple buckets.
probes	Specifies that buckets span multiple probes.

schedule now	(Optional) Specifies that the probe begins as soon as you enter the command. This is the default.
schedule at <i>hh:mm:ss</i>	(Optional) Specifies a specific time at which to start the probe in 24-hour notation.
<i>day</i>	(Optional) Number in the range 1 to 31 of the day of the month on which to start the probe.
<i>month</i>	(Optional) Name of the month (full word in English) in which to start the probe.
<i>year</i>	(Optional) Year (fully specified as 4 digits) in which to start the probe.
schedule in <i>number</i> { seconds minutes hours }	(Optional) Specifies a relative time, as a number of seconds, minutes or hours from the current time, at which to start the probe, where <i>number</i> is in the following ranges: • 1 to 3600 seconds • 1 to 1440 minutes • 1 to 24 hours
for <i>duration</i> { seconds minutes hours }	(Optional) Specifies the length of the probe as a number of seconds, minutes, or hours, where <i>number</i> is in the following ranges: • 1 to 3600 seconds • 1 to 1440 minutes • 1 to 24 hours Note The duration should not exceed the interval specified by the repeat every option.

repeat every <i>number</i> { seconds minutes hours }	(Optional) Specifies the interval at which to restart the probe as a number of seconds, minutes, or hours, where <i>number</i> is in the following ranges: • 1 to 90 seconds • 1 to 90 minutes • 1 to 24 hours The default is that probes are not repeated, and there is no default interval.
count <i>probes</i>	Specifies the number of probes to run in the range 1–100. There is no default.
asynchronous	(Optional) Specifies that the command displays the on-demand operation ID and exits immediately, with the operation continuing in the background. The default is synchronous and the operation displays the on-demand operation ID and all results on the console when it completes.

Command Default No on-demand operations are configured or executed.

Command Modes EXEC (#)

Command History	Release	Modification
	Release 4.1.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	execute

Examples

The following example shows how to enter the most basic SLA on-demand operation to measure CFM loopback statistics. This example implements the following defaults:

- Send a burst once for a packet count of 10 and interval of 1 second (10-second probe).
- Use default test pattern of 0's for padding.
- Use default class of service (CoS) for the egress interface.
- Measure all statistics.
- Aggregate statistics into one bin.
- Schedule now.
- Display results on the console.

```
RP/0/0/CPU0:router# ethernet sla on-demand operation type cfm-loopback
probe packet size 1500 domain D1 source interface TenGigE 0/6/1/0 target mep-id 100
```

Related Commands

Command	Description
clear ethernet sla statistics all, on page 290	Deletes the contents of buckets containing SLA statistics collected by all operations probes.
clear ethernet sla statistics on-demand, on page 292	Deletes the contents of buckets containing SLA statistics collected by on-demand probes.
show ethernet sla operations, on page 445	Displays information about configured Ethernet SLA operations.
show ethernet sla statistics, on page 448	Displays the contents of buckets containing Ethernet SLA metrics collected by probes.

frame-period threshold

To configure the thresholds that trigger an Ethernet OAM frame-period error event, use the **frame-period threshold** command in Ethernet OAM link monitor or interface Ethernet OAM link monitor configuration mode. To return the threshold to the default value, use the **no** form of this command.

frame-period threshold low *threshold* [**high** *threshold*]

no frame-period threshold low *threshold* [**high** *threshold*]

Syntax Description

low <i>threshold</i>	Low threshold, in frames, that triggers a frame-period error event. The range is 0 to 1000000.
high <i>threshold</i>	(Optional) High threshold, in frames, that triggers a frame-period error event. The range is 0 to 1000000. The high threshold value can be configured only in conjunction with the low threshold value.

Command Default

The default low threshold is 1.

Command Modes

Ethernet OAM link monitor configuration (config-eoam-lm)
Interface Ethernet OAM link monitor configuration (config-if-eoam-lm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When the low threshold is passed, a frame-period error event notification is generated and transmitted to the OAM peer. Additionally, any registered higher level OAM protocols, such as Connectivity Fault Management (CFM), are also notified. When the high threshold is passed, the configured high threshold action is performed in addition to the low threshold actions. The high threshold is optional and is configurable only in conjunction with the low threshold.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the low and high thresholds that trigger a frame-period error event.

```
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1  
RP/0/0/CPU0:router(config-eoam)# link-monitor  
RP/0/0/CPU0:router(config-eoam-lm)# frame-period threshold low 100 high 600000
```

frame-period window

To configure the window size for an Ethernet OAM frame-period error event, use the **frame-period window** command in Ethernet OAM link monitor or interface Ethernet OAM link monitor configuration mode. To return the window size to the default value, use the **no** form of this command.

frame-period window *window*

no frame-period window *window*

Syntax Description

<i>window</i>	Size of the window for a frame-period error in milliseconds. The range is 100 to 60000.

Command Default

The default value is 1000.

Command Modes

Ethernet OAM link monitor configuration (config-eoam-lm)
Interface Ethernet OAM link monitor configuration (config-if-eoam-lm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the window size for a frame-period error.

```
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# link-monitor
RP/0/0/CPU0:router(config-eoam-lm)# frame-period window 60000
```

frame-seconds threshold

To configure the thresholds that trigger a frame-seconds error event, use the **frame-seconds threshold** command in Ethernet OAM link monitor or interface Ethernet OAM link monitor configuration mode. To return the threshold to the default value, use the **no** form of this command.

frame-seconds threshold low threshold [**high threshold**]

no frame-seconds threshold low threshold [**high threshold**]

Syntax Description

low threshold	Low threshold, in seconds, that triggers a frame-seconds error event. The range is 0 to 900.
high threshold	(Optional) High threshold, in seconds, that triggers a frame-seconds error event. The range is 1 to 900. The high threshold value can be configured only in conjunction with the low threshold value.

Command Default

The default value is 1.

Command Modes

Ethernet OAM link monitor configuration (config-eoam-lm)

Interface Ethernet OAM link monitor configuration (config-if-eoam-lm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When the low threshold is passed, a frame-seconds error event notification is generated and transmitted to the OAM peer. Additionally, any registered higher level OAM protocols, such as Connectivity Fault Management (CFM), are also notified. When the high threshold is passed, the configured high threshold action is performed in addition to the low threshold actions. The high threshold is optional and is configurable only in conjunction with the low threshold.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the low and high thresholds that trigger a frame-seconds error event:

```
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# link-monitor (config-eoam)# link-monitor
RP/0/0/CPU0:router(config-eoam-lm)# frame-seconds threshold low 10 high 900
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
link-monitor, on page 349	Enters Ethernet OAM link monitor configuration mode.

frame-seconds window

To configure the window size for the OAM frame-seconds error event, use the **frame-seconds window** command in Ethernet OAM link monitor or interface Ethernet OAM link monitor configuration mode. To return the window size to the default value, use the **no** form of this command.

frame-seconds window *window*

no frame-seconds window *window*

Syntax Description

<i>window</i>	Size of the window for a frame-seconds error in milliseconds. The range is 10000 to 900000.

Command Default

The default value is 60000.

Command Modes

Ethernet OAM link monitor configuration (config-eoam-lm)

Interface Ethernet OAM link monitor configuration (config-if-eoam-lm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the window size for a frame-seconds error.

```
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# link-monitor
RP/0/0/CPU0:router(config-eoam-lm)# frame-seconds window 900000
```

Related Commands

Command	Description
ethernet oam profile , on page 320	Creates an EOAM profile and enters EOAM configuration mode.
link-monitor , on page 349	Enters Ethernet OAM link monitor configuration mode.

frame threshold

To configure the thresholds that triggers an Ethernet OAM frame error event, use the **frame threshold** command in Ethernet OAM link monitor or interface Ethernet OAM link monitor configuration mode. To return the threshold to the default value, use the **no** form of this command.

frame threshold low threshold [**high threshold**]

no frame threshold low threshold [**high threshold**]

Syntax Description

low threshold	Low threshold, in symbols, that triggers a frame error event. The range is 0 to 12000000.
high threshold	(Optional) High threshold, in symbols, that triggers a frame error event. The range is 0 range is 0 to 12000000. The high threshold value can be configured only in conjunction with the low threshold value.

Command Default

The default low threshold is 1.

Command Modes

Ethernet OAM link monitor configuration (config-eoam-lm)

Interface Ethernet OAM link monitor configuration (config-if-eoam-lm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When the low threshold is passed, a frame error event notification is generated and transmitted to the OAM peer. Additionally, any registered higher level OAM protocols, such as Connectivity Fault Management (CFM), are also notified. When the high threshold is passed, the configured high threshold action is performed in addition to the low threshold actions. The high threshold is optional and is configurable only in conjunction with the low threshold.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the low and high thresholds that trigger a frame error event:

```
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# link-monitor
RP/0/0/CPU0:router(config-eoam-lm)# frame threshold low 100 high 60000
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
link-monitor, on page 349	Enters Ethernet OAM link monitor configuration mode.

frame window

To configure the frame window size of an OAM frame error event, use the **frame window** command in Ethernet OAM link monitor or interface Ethernet OAM link monitor configuration mode. To return the window size to the default value, use the **no** form of this command.

frame window *window*

no frame window *window*

Syntax Description

<i>window</i>	Size of the window for a frame error in seconds. The range is 1000 to 60000.

Command Default

The default value is 1000.

Command Modes

Ethernet OAM link monitor configuration (config-eoam-lm)

Interface Ethernet OAM link monitor configuration (config-if-eoam-lm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the window size for a frame error.

```
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# link-monitor
RP/0/0/CPU0:router(config-eoam-lm)# frame window 60
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
link-monitor, on page 349	Enters Ethernet OAM link monitor configuration mode.

hello-interval

To specify the time interval between hello packets for an Ethernet OAM session, use the **hello-interval** command in Ethernet OAM or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of the command.

hello-interval {100ms| 1s}

no hello-interval {100ms| 1s}

Syntax Description	100ms	Specifies a 100-millisecond interval between hello packets.
	1s	(Interface Ethernet OAM configuration mode only) Specifies a 1-second interval between hello packets. This is the default.

Command Default The default is 1 second.

Command Modes Ethernet OAM configuration (config-eoam)
Interface Ethernet OAM configuration (config-if-eoam)

Command History	Release	Modification
	Release 4.0.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If a profile exists on the interface, setting the mode with this command overrides the mode setting in the profile on an interface.

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples The following example shows how to set the hello interval to 100 milliseconds on a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/5/6
```

 hello-interval

```
RP/0/0/CPU0:router(config-if)# ethernet oam  
RP/0/0/CPU0:router(config-if-eoam)# profile Profile_1  
RP/0/0/CPU0:router(config-if-eoam)# hello-interval 100ms
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam interfaces, on page 438	

link-monitor

To enter Ethernet OAM link monitor configuration mode, use the **link-monitor** command in Ethernet OAM configuration mode. To enter interface Ethernet OAM link monitor configuration mode, use the **link-monitor** command in interface Ethernet OAM configuration mode.

link-monitor

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values

Command Modes

Ethernet OAM configuration (config-eoam)

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to enter the Ethernet OAM link monitor configuration mode from global configuration mode.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# link-monitor
RP/0/0/CPU0:router(config-eoam-lm)#
```

The following example shows how to enter the link monitor configuration mode from interface Ethernet OAM configuration mode.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/5/6
RP/0/0/CPU0:router(config-if)# ethernet oam
```

```
RP/0/0/CPU0:router(config-if-eoam)# link-monitor
```


log ais

To configure AIS logging for a Connectivity Fault Management (CFM) domain service to indicate when AIS or LCK packets are received, use the **log ais** command in CFM domain service configuration mode. To disable AIS logging, use the no form of this command.

log ais

no log ais

Syntax Description

This command has no keywords or arguments.

Command Default

Logging is disabled.

Command Modes

CFM domain service configuration (config-cfm-dmn-svc)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure AIS logging for a Connectivity Fault Management (CFM) domain service to indicate when AIS or LCK packets are received:

log continuity-check errors

To enable logging of continuity-check errors, use the **log continuity-check errors** command in CFM domain service configuration mode. To disable logging of continuity-check errors, use the no form of this command.

log continuity-check errors

no log continuity-check errors

Syntax Description This command has no keywords or arguments.

Command Default Logging is disabled.

Command Modes CFM domain service configuration (config-cfm-dmn-svc)

Command History	Release	Modification
	Release 4.0.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The following types of continuity-check errors are logged:

- Incorrect level (cross-connect)
- Incorrect interval
- Incorrect MA-ID (cross-connect)
- Local MAC address received (loop)
- Local MEP-ID received (mis-config)
- Invalid source MAC received
- RDI received

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples

The following example shows how to enable logging of continuity check errors:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# log continuity-check errors
```

log continuity-check mep changes

To enable logging of peer maintenance-end-point (MEP) state changes, use the **log continuity-check mep changes** command in CFM domain service configuration mode. To disable logging of peer MEP state changes, use the no form of this command.

log continuity-check mep changes

no log continuity-check mep changes

Syntax Description This command has no keywords or arguments.

Command Default Logging is disabled

Command Modes CFM domain service configuration (config-cfm-dmn-svc)

Command History	Release	Modification
	Release 4.0.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command enables logging of state changes that occur in MEPs for a particular service, such as:

- New peer MEP detected.
- Peer MEP time out (loss of continuity) detected.

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples The following example shows how to enable logging of continuity-check mep changes:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# log continuity-check mep changes
```

log crosscheck errors

To enable logging of crosscheck error events, use the **log crosscheck errors** command in CFM domain service configuration mode. To disable logging of crosscheck error events, use the no form of this command.

log crosscheck errors

no log crosscheck errors

Syntax Description This command has no keywords or arguments.

Command Default Logging is disabled.

Command Modes CFM domain service configuration (config-cfm-dmn-svc)

Command History	Release	Modification
	Release 4.0.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command enables logging of crosscheck errors, such as:

- MEPs missing
- Additional peer MEPs detected



Note Crosscheck errors are only detected and logged when crosscheck is configured using the **mep crosscheck** and **mep-id** commands.

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples The following example shows how to enable logging of crosscheck errors:

```
RP/0/0/CPU0:router# configure
```

```
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# log crosscheck errors
```

Related Commands

Command	Description
mep crosscheck, on page 361	Enters CFM MEP crosscheck configuration mode.
mep-id, on page 362	Enables crosscheck on a MEP.

log efd

To enable logging of Ethernet Fault Detection (EFD) state changes to an interface (such as when an interface is shut down or brought up via EFD), use the **log efd** command in CFM domain service configuration mode. To disable EFD logging, use the no form of this command.

log efd

no log efd

Syntax Description This command has no keywords or arguments.

Command Default EFD logging is disabled.

Command Modes CFM domain service configuration (config-cfm-dmn-svc)

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When EFD logging is enabled, a syslog is generated whenever the EFD state of an interface changes.

Task ID	Operations
ethernet-services	read, write

Examples The following example shows how to enable EFD logging:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain D1 level 1
RP/0/0/CPU0:router(config-cfm-dmn)# service S1 down-meps
RP/0/0/CPU0:router(config-cfm-dmn-svc)# log efd
```

Related Commands

Command	Description
efd, on page 313	Enables EFD on all down MEPs in a down MEPs service.
show efd interface, on page 398	Displays all interfaces that are shut down because of EFD.

maximum-meps

To configure the maximum number of maintenance end points (MEPs) for a service, use the **maximum-meps** command in CFM domain service configuration mode. To return to the default value, use the no form of this command.

maximum-meps *number*

Syntax Description

<i>number</i>	Maximum number of MEPs allowed for this service. The range is 2 to 8190.

Command Default

The default is 100.

Command Modes

CFM domain service configuration (config-cfm-dmn-svc)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command configures the maximum number of peer maintenance end points (MEPs). It does not limit the number of local MEPs. The configured **maximum-meps** *number* must be at least as great as the number of configured crosscheck MEPs.

The **maximum-meps** *number* limits the number of peer MEPs, for which local MEPs store continuity-check messages (CCMs). When the limit is reached, CCMs from any new peer MEPs are ignored, but CCMs from existing peer MEPs continue to be processed normally.

The **maximum-meps** *number* also limits the size of the CCM learning database.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the maximum number of maintenance end points (MEPs) for a service:

```
RP/0/0/CPU0:router# configure
```

```
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# maximum-meps 4000
```

Related Commands

Command	Description
domain , on page 311	
ethernet cfm (global) , on page 315	Enters CFM configuration mode.
ethernet cfm (interface) , on page 317	Enters interface CFM configuration mode.
service , on page 395	
show ethernet cfm configuration-errors , on page 402	Displays information about errors that are preventing configured CFM operations from becoming active, as well as any warnings that have occurred.
show ethernet cfm local maintenance-points , on page 409	Displays a list of local maintenance points.
show ethernet cfm local meps , on page 412	Displays information about local MEPS.
show ethernet cfm peer meps , on page 418	Displays information about maintenance end points (MEPs) for peer MEPS.

mep crosscheck

To enter CFM MEP crosscheck configuration mode, use the **mep crosscheck** command in CFM domain service configuration mode.

mep crosscheck

Syntax Description

This command has no keywords or arguments.

Command Default

Not configured, in which case no crosscheck is performed on the MEP.

Command Modes

CFM domain service configuration (config-cfm-dmn-svc)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to enter CFM MEP crosscheck configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# mep crosscheck
RP/0/0/CPU0:router(config-cfm-xcheck)#
```

mep-id

To enable crosscheck on a maintenance end point (MEP), use the **mep-id** command in CFM MEP crosscheck configuration mode. To disable crosscheck on a MEP, use the **no** form of this command.

mep-id *mep-id-number* [**mac-address** *mac-address*]

no mep-id *mep-id-number* [**mac-address** *mac-address*]

Syntax Description

mac <i>mac-address</i>	(Optional) MAC address of the interface upon which the MEP resides, in standard hexadecimal format, hh:hh:hh:hh:hh:hh.

Command Default

Not configured, in which case no crosscheck is performed on the MEP.

Command Modes

CFM MEP crosscheck configuration (config-cfm-xcheck)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command enables Crosscheck on the maintenance end point (MEP) specified by the MEP ID number (*mep-id-number*). The range for MEP ID numbers is 1 to 8191. Crosscheck is enabled when the first crosscheck MEP is entered.

Repeat this command for every MEP that you want to include in the expected set of MEPs for crosscheck.

Crosscheck detects the following two additional defects for continuity-check messages (CCMs) on peer MEPs:

- Peer MEP missing—A crosscheck MEP is configured, but has no corresponding peer MEP from which to receive CCMs.
- Peer MEP unexpected—A peer MEP is sending CCMs, but no crosscheck MEP is configured for it.



Note

If more than one local MEP is configured for a service, all the local MEPs must be included in the list of configured crosscheck MEPs.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to statically define a maintenance end point (MEP) under a service, so that it can be crosschecked.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# mep crosscheck
RP/0/0/CPU0:router(config-cfm-xcheck)# mep-id 10
```

mep domain

To create a maintenance end point (MEP) on an interface, use the **mep domain** command in interface CFM configuration mode. To remove the MEP from the interface, use the **no** form of this command.

mep domain *domain-name* **service** *service-name* **mep-id** *id-number*

no mep domain *domain-name* **service** *service-name* **mep-id** *id-number*

Syntax Description

domain <i>domain-name</i>	Domain in which to create the maintenance end point (MEP).
service <i>service-name</i>	Operation service in which to create the maintenance end point (MEP).
mep-id <i>id-number</i>	Maintenance end points (MEP) identifier to assign to this MEP. The range is 1 to 8191.

Command Default

No MEPs are configured on the interface.

Command Modes

Interface CFM configuration (config-if-cfm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

CFM Maintenance end points (MEPs) are supported on all Ethernet interfaces and VLAN subinterfaces.

This command creates MEPs in the UP MEP state, unless the specified **service** is configured with MEPs in the DOWN MEP state. See the [service, on page 395](#) command.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to create a MEP using an ID of 1 on the CFM domain named DM1 and service named Sv1:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/1
RP/0/0/CPU0:router(config-if)# ethernet cfm
RP/0/0/CPU0:router(config-if-cfm)# mep domain Dm1 service Sv1 mep-id 1
```

Related Commands

Command	Description
ethernet cfm (interface) , on page 317	Enters interface CFM configuration mode.
show ethernet cfm configuration-errors , on page 402	Displays information about errors that are preventing configured CFM operations from becoming active, as well as any warnings that have occurred.

mib-retrieval

To enable MIB retrieval in an Ethernet OAM profile or on an Ethernet OAM interface, use the **mib-retrieval** command in Ethernet OAM or interface Ethernet OAM configuration mode. To return the interface to the default (disabled), use the **disable** keyword.

mib-retrieval [disable]

Syntax Description

disable	Disables MIB retrieval the Ethernet OAM interface.

Command Default

MIB retrieval is disabled by default.

Command Modes

Ethernet OAM configuration (config-eoam)
Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When MIB retrieval is enabled on an Ethernet OAM interface, the OAM client advertises support for MIB retrieval to the peer.

When MIB retrieval is disabled (the default), only the enable form of the **mib-retrieval** command is available in interface Ethernet OAM configuration mode. The **disable** keyword is provided to override the profile when needed.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to enable MIB retrieval on a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/5/6
RP/0/0/CPU0:router(config-if)# ethernet oam
```



```
RP/0/0/CPU0:router(config-if-eoam)# mib-retrieval
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam interfaces, on page 438	

mip auto-create

To enable the automatic creation of MIPs in a cross-connect, use the **mip auto-create** command in CFM domain service configuration mode. To disable automatic creation of MIPs, use the **no** form of this command.

mip auto-create {all| lower-mep-only}

no mip auto-create {all| lower-mep-only}

Syntax Description

all	Enables automatic creation of MIPs on all interfaces.
lower-mep-only	Enables automatic creation of MIPs only on interfaces with a MEP at a lower level.

Command Default

No default behavior or values

Command Modes

CFM domain service configuration (config-cfm-dmn-svc)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The MIP auto-creation feature is only configured for services associated with cross-connects.

Unlike MEPs, MIPs are not explicitly configured on each interface. MIPs are created automatically according to the algorithm specified in the CFM 802.1ag standard. The algorithm, in brief, operates as follows for each interface:

- The cross-connect for the interface is found, and all services associated with that cross-connect are considered for MIP auto-creation.
- The level of the highest-level MEP on the interface is found. From among the services considered above, the service in the domain with the lowest level that is higher than the highest MEP level is selected. If there are no MEPs on the interface, the service in the domain with the lowest level is selected.
- The MIP auto-creation configuration for the selected service is examined to determine whether a MIP should be created.

**Note**

Configuring a MIP auto-creation policy for a service does not guarantee that a MIP will automatically be created for that service. The policy is only considered if that service is selected by the algorithm first.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to enable the automatic creation of MIPs for all interfaces in a cross-connect:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)# mip auto-create all
```

Related Commands

Command	Description
domain , on page 311	
ethernet cfm (global) , on page 315	Enters CFM configuration mode.
service , on page 395	
show ethernet cfm configuration-errors , on page 402	Displays information about errors that are preventing configured CFM operations from becoming active, as well as any warnings that have occurred.
show ethernet cfm local maintenance-points , on page 409	Displays a list of local maintenance points.
show ethernet cfm local meps , on page 412	Displays information about local MEPs.
show ethernet cfm peer meps , on page 418	Displays information about maintenance end points (MEPs) for peer MEPs.

mode (Ethernet OAM)

To configure the Ethernet OAM mode on an interface, use the **mode** command in Ethernet OAM or interface Ethernet OAM configuration mode. To return to the default, use the **no** form of the command.

mode {**active**|**passive**}

Syntax Description

passive	Specifies that the interface operates in passive mode, where it cannot initiate the discovery process, generate a retrieval PDU, or request loopback.
active	(Interface Ethernet OAM configuration only) Specifies that the interface operates in active mode to initiate processes and make requests.

Command Default

The default is active.

Command Modes

Ethernet OAM configuration (config-eoam)
Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If a profile exists on the interface, setting the mode with this command overrides the mode setting in the profile on an interface.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to enable Ethernet OAM passive mode on a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/5/6
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# profile Profile_1
```

```
RP/0/0/CPU0:router(config-if-eoam)# mode passive
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam interfaces, on page 438	

monitoring

To enable Ethernet OAM link monitoring, use the **monitoring** command in Ethernet OAM link monitor or interface Ethernet OAM link monitor configuration mode. To return link monitoring to its default state of enabled, use the **no** form of this command.

monitoring [disable]

no monitoring [disable]

Syntax Description

disable	(Optional) Disables Ethernet OAM link monitoring.
Note	When configuring on a profile, only the monitoring disable form of the command is supported.

Command Default

Link monitoring is enabled by default.

Command Modes

Ethernet OAM link monitor configuration (config-eoam-lm)
Interface Ethernet OAM link monitor configuration (config-if-eoam-lm)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Monitoring is enabled by default. To disable it either on a profile or an interface, use the **monitoring disable** form of the command.

If monitoring is disabled on a profile, but you want to override the configuration and enable it for an interface, use the **monitoring** command in interface Ethernet OAM link monitor configuration mode.

You cannot configure the **monitoring** command without the **disable** keyword on a profile.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to disable link-monitoring on an Ethernet OAM interface:

```
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1  
RP/0/0/CPU0:router(config-eoam)# link-monitor  
RP/0/0/CPU0:router(config-eoam-lm)# monitoring disable
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
link-monitor, on page 349	Enters Ethernet OAM link monitor configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam statistics, on page 441	Displays the local and remote Ethernet OAM statistics for interfaces.
show ethernet oam interfaces, on page 438	

packet size

To configure the minimum size (in bytes) for outgoing probe packets, including padding when necessary, use the **packet size** command in SLA profile probe configuration mode. To remove this configuration, use the no form of this command.

packet size *bytes* [**test pattern** {**hex 0x** *HHHHHHHH*} **pseudo-random**}]

no packet size *bytes* [**test pattern** {**hex 0x** *HHHHHHHH*} **pseudo-random**}]

Syntax Description

<i>bytes</i>	Minimum size of the packet including padding when necessary. The range is 1 to 9000 bytes. This value is the total frame size including the Layer 2 or Layer 3 packet header.
test pattern hex 0x <i>HHHHHHHH</i>	(Optional) Specifies a 4-byte string (8 hexadecimal characters) to repeat as many times as required to fill the outgoing probe packet to the specified minimum packet size. The default is all 0s.
test pattern pseudo-random	(Optional) Specifies a pseudo-random bit sequence determined by the protocol to fill the outgoing probe packet to the specified minimum packet size.

Command Default

The minimum packet size is not configured. When a minimum packet size is configured and padding is required, the default padding is all 0s.

Command Modes

SLA profile probe configuration (config-sla-prof-pb)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For supported packet types, this configuration determines the minimum size of all outgoing SLA probe packets, including the size to which they are padded. The amount of padding that is added to a packet depends on the type of frame that is sent and the amount of data in the frame.

When the packet size is not configured, packets are sent at the minimum size required to fit all the required information. Even when the packet size is configured, the packets may be larger than the configured size if the required information exceeds the configured value.

**Note**

If a probe packet is too large, it may get dropped somewhere in the network.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the minimum size of outgoing probe packets using default padding of all 0s as needed:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# probe
RP/0/0/CPU0:router(config-sla-prof-pb)# packet size 9000
RP/0/0/CPU0:router(config-sla-prof-pb)# commit
```

The following example shows how to configure a hexadecimal test pattern to pad packets with to reach the minimum packet size:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# probe
RP/0/0/CPU0:router(config-sla-prof-pb)# packet size 9000 test pattern hex 0xabcdabcd
RP/0/0/CPU0:router(config-sla-prof-pb)# commit
```

ping ethernet cfm

To send Ethernet connectivity fault management (CFM) loopback messages to a maintenance end point (MEP) or MAC address destination from the specified source MEP, and display a summary of the responses, use the **ping ethernet cfm** command in EXEC mode.

ping ethernet cfm domain *domain-name* **service** *service-name* {**mac-address** *mac*| **mep-id** *id*} **source** [**mep-id** *source-id*] **interface** *interface-path-id* [**cos** *cos-val*] [**count** *n*] [**frame-size** *size*] [**data-pattern** *hex*] [**interval** *seconds*] [**timeout** *time*]

Syntax Description

domain <i>domain-name</i>	String of a maximum of 80 characters that identifies the domain in which the maintenance points reside. Note For more information about the syntax, use the question mark (?) online help function.
service <i>service-name</i>	String of a maximum of 80 characters that identifies the maintenance association to which the maintenance points belong.
mac-address <i>mac</i>	6-byte ID number of the MAC address of the destination MEP.
mep-id <i>id</i>	Maintenance end point (MEP) ID number of the destination MEP. The range for MEP ID numbers is 1 to 8191.
source	Source information.
mep-id <i>source-id</i>	(Optional) Maintenance end point (MEP) ID number of the source MEP. The range for MEP ID numbers is 1 to 8191.
interface <i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
cos <i>cos-val</i>	(Optional) Class of Service (CoS) value that identifies the class of traffic of the source MEP. The valid values are from 0 to 7.
count <i>n</i>	(Optional) Number of pings as an integer value. The default is 5.
frame-size <i>size</i>	(Optional) Size, as an integer, of the ping frames. Frames are padded to reach the specified size. The default is 0 (no padding).
data-pattern <i>hex</i>	(Optional) Hexadecimal value to be used as the data pattern for padding within a ping frame, when padding is required due to the frame-size configuration. The default is 0.
interval <i>seconds</i>	(Optional) Specifies, in seconds, the time between pings. The <i>n</i> argument is entered in seconds. The default is 1 second.

timeout <i>time</i>	(Optional) Timeout, in seconds, for the ping packet. The default is 2.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Before you can use this command, a local MEP must be configured for the domain and the interface.

The command displays the following information:

- Number of loopback message being sent
- Timeout period
- Domain name
- Domain level
- Service name
- Source MEP ID
- Interface
- Target MAC address
- MEP ID – If no MEP ID is specified, “No MEP ID specified” is displayed.
- Running time for the current ping operation to complete



Note The remaining information is not displayed until the current ping operation is complete. If the user interrupts the operation during this time (by pressing control-C), the prompt is returned and no further information is displayed. However, all loopback messages continue to be sent.

- Success rate of responses received – displayed as a percentage followed by the actual number of responses
- The round trip time minimum/maximum/average in milliseconds
- Out-of-sequence responses – displayed as a percentage followed by the actual number of out-of-sequence responses when at least one response is received. An out-of-sequence response occurs if the first response does not correspond with the first message sent, or a subsequent response is not the expected next response after a previously received response.

- Bad data responses – displayed as a percentage followed by the actual number of bad data responses when at least one response is received. A bad data response occurs if the padding data in the response does not match the padding data that in the sent message. This can only happen if the sent message is padded using the **frame-size** option.
- Received packet rate – displayed in packets per second when at least two responses are received. This approximate rate of response is the time between the first response received and the last response received, divided by the total number of responses received.

Task ID

Task ID	Operations
basic-services	execute
ethernet-services	execute

Examples

The following example shows how to send an Ethernet CFM loopback message:

```
RP/0/0/CPU0:router# ping ethernet cfm domain D1 service S1 mep-id 16 source
interface GigabitEthernet 0/0/0/0

Type escape sequence to abort.
Sending 5 CFM Loopbacks, timeout is 2 seconds -
Domain foo (level 2), Service foo
Source: MEP ID 1, interface GigabitEthernet0/0/0/0
Target: 0001.0002.0003 (MEP ID 16):
Running (5s) ...
Success rate is 60.0 percent (3/5), round-trip min/avg/max = 1251/1349/1402 ms
Out-of-sequence: 0.0 percent (0/3)
Bad data: 0.0 percent (0/3)
Received packet rate: 1.4 pps
```

priority (SLA)

To configure the priority of outgoing SLA probe packets, use the **priority** command in SLA profile probe configuration mode. To return the priority to the default value, use the no form of this command.

priority *priority*

no priority *priority*

Syntax Description

<i>priority</i>	Priority level. The range is 0 to 7.

Command Default

When the priority is not configured by SLA, the default is the Class of Service (CoS) priority for the egress interface.

Command Modes

SLA profile probe configuration (config-sla-prof-pb)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The default priority for all CFM operation types is the Class of Service (CoS) priority for the egress interface. SLA operations that are configured on Maintenance End Points (MEPs) do not use the Class of Service (CoS) settings that are configured independently on Maintenance End Points (MEPs). Use this command to change the priority level of SLA probe packets.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to configure the priority of outgoing SLA probe packets.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# probe
```

```
RP/0/0/CPU0:router(config-sla-prof-pb)# priority 7
```

probe

To enter SLA profile probe configuration mode, use the **probe** command in SLA profile configuration mode. To exit to the previous mode, use the no form of this command.

probe

no probe

Syntax Description This command has no keywords or arguments.

Command Default If no items are configured in the probe mode, all items in the probe mode use their default values.

Command Modes SLA profile configuration (config-sla-prof)

Command History	Release	Modification
	Release 4.1.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Each profile may optionally have 1 probe submode.

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples The following example shows how to enter the SLA profile probe configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# probe
RP/0/0/CPU0:router(config-sla-prof-pb)#
```

profile (EOAM)

To attach an Ethernet OAM profile to an interface, use the **profile** command in interface Ethernet OAM configuration mode. To remove the profile from the interface, use the no form of this command.

profile *name*

no profile *name*

Syntax Description

<i>name</i>	Text name of the Ethernet OAM profile to attach to the interface.

Command Default

No profile is attached.

Command Modes

Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When an Ethernet OAM profile is attached to an interface using this command, all of the parameters configured for the profile are applied to the interface.

Individual parameters that are set by the profile configuration can be overridden by configuring them directly on the interface.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to attach an Ethernet OAM profile to a Gigabit Ethernet interface.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/5/6
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# profile Profile_1
```


Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam interfaces, on page 438	

profile (SLA)

To create an SLA operation profile and enter the SLA profile configuration mode, use the **profile** command in SLA configuration mode. To remove the profile, use the **no** form of this command.

profile *profile-name* **type** {{**cfm-delay-measurement**}}| **cfm-loopback**
no profile *profile-name*

Syntax Description

<i>profile-name</i>	Profile name, case-sensitive string up to 31 characters in length. The name “all” cannot be used.
type	Specifies the type of packets sent by operations in this profile. Valid types are: • cfm-delay-measurement: CFM delay measurement packets • cfm-loopback: CFM loopback packets

Command Default

No default behavior or values

Command Modes

Ethernet SLA configuration (config-sla)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

Each profile is uniquely identified by its name. Changing the packet **type** for the profile removes all stored data from the profile and is equivalent to deleting the profile and creating a new profile.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

This example shows how to configure an SLA operation profile and enter the SLA profile configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)#
```

require-remote

To require that certain features are enabled before an OAM session can become active, or to disable a requirement that is part of an active OAM profile, use the **require-remote** command in Ethernet OAM configuration or interface Ethernet OAM configuration mode. To remove the configuration and return to the default, use the **no** form of this command.

require-remote {mode {active| passive}}| mib-retrieval| link-monitoring [disabled]}

no require-remote {mode {active| passive}}| mib-retrieval| link-monitoring [disabled]}

Syntax Description

mode {active passive}	Requires that active or passive mode is configured on the peer device before the OAM profile can become active.
mib-retrieval	Requires that MIB-retrieval is configured on the peer device before the OAM profile can become active.
link-monitoring	Requires that link-monitoring feature is configured on the peer device before the OAM profile can become active.
disabled	(Optional—Interface Ethernet OAM configuration only) Overrides the Ethernet OAM profile configuration for this option and disables the feature at the specified interface.

Command Default

No default behavior or values

Command Modes

Ethernet OAM configuration (config-eoam)
Interface Ethernet OAM configuration (config-if-eoam)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **disabled** keyword is available only when you are configuring Ethernet OAM on an interface, and is used to override the configuration that is part of an active OAM profile.

The **disabled** keyword does not remove the configuration of the command. Use the **no** form of this command to do that.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to require that specific features are enabled before an OAM session can become active

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet oam profile Profile_1
RP/0/0/CPU0:router(config-eoam)# require-remote mode active
RP/0/0/CPU0:router(config-eoam)# require-remote mib-retrieval
RP/0/0/CPU0:router(config-eoam)# require-remote link-monitoring
```

The following example shows how to disable requirements on a particular interface that is part of an active OAM profile:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/6/5/0
RP/0/0/CPU0:router(config-if)# ethernet oam
RP/0/0/CPU0:router(config-if-eoam)# require-remote mode active disabled
RP/0/0/CPU0:router(config-if-eoam)# require-remote mib-retrieval disabled
RP/0/0/CPU0:router(config-if-eoam)# require-remote link-monitoring disabled
```

Related Commands

Command	Description
ethernet oam profile, on page 320	Creates an EOAM profile and enters EOAM configuration mode.
ethernet oam, on page 319	Enables Ethernet Link OAM, with default values, on an interface and enter interface Ethernet OAM configuration mode.
profile (EOAM), on page 382	Attaches an Ethernet OAM profile to an interface.
action capabilities-conflict, on page 249	Configures what action is taken on an interface when a capabilities-conflict event occurs.
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam discovery, on page 435	Displays the currently configured OAM information of Ethernet OAM sessions on interfaces.
show ethernet oam interfaces, on page 438	

schedule (SLA)

To schedule an operation probe in a profile, use the **schedule** command in SLA profile configuration mode. To disable a schedule, use the **no** form of this command.

Hourly Scheduling

schedule every number {hours| minutes} [first at hh:mm[:ss]] [for duration {seconds| minutes| hours}]

no schedule every number {hours| minutes} [first at hh:mm[:ss]] [for duration {seconds| minutes| hours}]

Daily Scheduling

schedule every day [at hh:mm] [for duration {seconds| minutes| hours| days}]

no schedule every day [at hh:mm] [for duration {seconds| minutes| hours| days}]

Weekly Scheduling

schedule every week on day [at hh:mm] [for duration {seconds| minutes| hours| days| week}]

no schedule every week on day [at hh:mm] [for duration {seconds| minutes| hours| days| week}]

Syntax Description

every week on day [at hh:mm][f or <i>duration</i> {seconds minutes hours days week}]	Schedules a probe one day per week, on the specified <i>day</i> , at the specified time (<i>hh:mm</i>), for the specified <i>duration</i> .
every day [at hh:mm][f or <i>duration</i> {seconds minutes hours days}	Schedules a probe every day, at the specified time (<i>hh:mm</i>), for the specified <i>duration</i> .
every number {hours minutes} first at hh:mm[:ss]	Schedules a probe every specified <i>number</i> of hours or minutes , starting at the specified time after midnight (<i>hh:mm[:ss]</i>).
every number {hours minutes} [f or <i>duration</i> {seconds minutes hours}]	Schedules a probe every specified <i>number</i> of hours or minutes , for the specified <i>duration</i> .

<i>day</i>	Day of the week. Valid values are: • Monday • Tuesday • Wednesday • Thursday • Friday • Saturday • Sunday
<i>hh:mm hh:mm[:s s]</i>	Time of day in 24 hour time: • <i>hh:mm</i> = hour:minutesexample: 22:30 • <i>hh:mm:ss</i> = hour:minutes:seconds example: 12:30:10(seconds are optional)
<i>duration</i>	Duration of probe. The ranges are : • 1 to 3600 seconds • 1 to 1440 minutes • 1 to 24 hours • 1 day • 1 week
<i>number</i>	Number of hours or minutes . • Valid values for hours are the factors of 24: 1, 2, 3, 4, 6, 8, 12 • Valid values for minutes are the factors of 1440 (up to 90): 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 30, 32, 36, 40, 45, 48, 60, 80, 90

Command Default

The default is every hour. If the **at** keyword is not specified, the start time of each operation is distributed uniformly within the duration of the probe. If the **for** keyword is not specified, only one single burst is sent.

Command Modes

SLA profile configuration (config-sla-prof)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Schedules are optional, but a profile may contain only one schedule.

**Note**

Any change to a schedule causes all stored data for that operation to be deleted.

Changing a schedule is equivalent to deleting an operation and creating a new operation.

The **for duration** option must be specified if (and only if) the probe is configured to send multiple packets (or bursts of packets), using the **send packet every** or **send burst every** configuration of the **send (SLA)** command. If the **send (SLA)** command is not configured for the probe, or if **send burst once** is configured, the **for duration** option must not be used. If it is used in those cases, an error is returned.

The **for duration** option must not exceed the **schedule every {week | day | number}** option.

When the “**first at hh:hh[:ss]**” option is used, the configured time is used to calculate an offset after midnight when the first probe should be sent each day. The offset is calculated by taking the configured time plus the interval. Thus, probes may be sent before the configured time.

For example, if you configure “**schedule every 6 hours first at 11:15,**” then the offset after midnight will be 5:15 (11:15 plus 6:00) and probes will be sent each day at 05:15, 11:15, 17:15 and 23:15.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following examples show how to schedule operation probes in a profile:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# schedule every week on Monday at 23:30 for 1 hour
```

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# schedule every day at 11:30 for 5 minutes
```

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# schedule every 2 hours first at 13:45:01
```

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# schedule every 6 hours for 2 hours
```


Related Commands

Command	Description
send (SLA) , on page 392	Configures the number and timing of packets sent by a probe in an operations profile.

send (SLA)

To configure the number and timing of packets sent by a probe in an operations profile, use the **send** command in SLA profile probe configuration mode. To return to the default, use the **no** form of the command.

send burst {every *number* {seconds| minutes| hours}| once} **packet count** *packets* **interval** *number* {seconds| milliseconds}

no send burst {every *number* {seconds| minutes| hours}| once} **packet count** *packets* **interval** *number* {seconds| milliseconds}

send packet {every *number* {milliseconds| seconds| minutes| hours}| once}

no send packet {every *number* {milliseconds| seconds| minutes| hours}| once}

Syntax Description

burst every <i>number</i> {seconds minutes hours}	Sends a burst of packets every specified number of seconds, minutes, or hours, where <i>number</i> is in the following range: • 1–3600 seconds • 1–1440 minutes • 1–168 hours
burst once	Sends a single burst one time.
packet count <i>packets</i>	Specifies the number of <i>packets</i> in each burst. The range is 2 to 600.
interval <i>number</i> {seconds milliseconds}	Specifies the time interval (in seconds or milliseconds) between each packet in a burst, where <i>number</i> is in the following range: • 1–30 seconds • 50–30000 milliseconds
packet every <i>number</i> {milliseconds seconds minutes hours}	Sends one packet every specified number of milliseconds, seconds, minutes, or hours, where <i>number</i> is in the following range: • 1–3600 seconds • 1–1440 minutes • 1–168 hours • 50–10000 milliseconds
packet once	Sends a single packet one time.

Command Default

If the operation is configured to measure jitter or data packet loss, the default is to send a single burst of 2 packets with a second interval between the packets.

If the operation is configured to measure synthetic packet loss, the default is to send a single burst of 10 packets with a 100 millisecond interval between the packets.

If the operation does not calculate jitter, data, or synthetic packet loss, the default is to send a single packet one time.

Command Modes

SLA profile probe configuration (config-sla-prof-pb)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

The total length of a burst is the packet count multiplied by the interval and must not exceed 1 minute.

The minimum **interval** supported is platform and packet-type dependent, so certain a configuration may cause an error even if it falls within the specified limits. In the case of Ethernet SLA, the shortest interval for packet types not used for synthetic loss measurement is 100ms.

When **burst once** is sent, a single burst is sent at the start of the probe. If the schedule defines a duration for the probe, a configuration warning is flagged. The same is true if the default is in effect.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

These examples show how to configure the types of packets sent by a probe in an operations profile:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# probe
RP/0/0/CPU0:router(config-sla-prof-pb)# send burst every 60 seconds packet count 30 interval
1 second
RP/0/0/CPU0:router(config-sla-prof-pb)#
```

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# probe
RP/0/0/CPU0:router(config-sla-prof-pb)# send burst once packet count 2 interval 1 second
RP/0/0/CPU0:router(config-sla-prof-pb)#
```

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# probe
RP/0/0/CPU0:router(config-sla-prof-pb)# send packet every 1 second
```

service

To associate a service with a domain and enter CFM domain service configuration mode, use the **service** command in CFM domain configuration mode. To remove a service from a domain, use the **no** form of this command.

service *service-name* {**down-meps**| **xconnect group** *xconnect-group-name* **p2p** *xconnect-name*} [**id** | [**string** *text*]] [**number** *number*]] [**vlan-id** *id-number*]] [**vpn-id** *oui-vpnid*]]

no service *service-name* {**down-meps**| **xconnect group** *xconnect-group-name* **p2p** *xconnect-name*} [**id** | [**string** *text*]] [**number** *number*]] [**vlan-id** *id-number*]] [**vpn-id** *oui-vpnid*]]

Syntax Description

<i>service-name</i>	Administrative name for the service. Case sensitive ASCII string up to 80 characters. Used in conjunction with one of the following service types: • down-meps • xconnect
down-meps	Specifies that all MEPs are down and no MIPs are permitted.
xconnect	Specifies the use of a cross connect. Used in conjunction with group and p2p . Note When xconnect is specified, all MEPs are up and MIPs are permitted.
group <i>xconnect-group-name</i>	Specifies the name of the cross connect group.
p2p <i>xconnect-name</i>	Specifies the name of the point-to-point cross connect and enters the Ethernet CFM domain service mode.
id	(Optional) Service identifier. Valid service identifiers are: • number <i>number</i>—Number from 0 to 65535. • string <i>text</i>—String length no longer than 46 minus MDID length. • vlan-id <i>id-number</i>—Number from 1 to 4094. • vpn-id <i>oui-vpnid</i> —VPN ID in RFC 2685 format (HHH:HHHH)

Command Default

If **id** is not specified, the service name is used as the Short MA name.

Command Modes

CFM domain configuration (config-cfm-dmn)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The Short MA Name is the second part of the Maintenance Association Identifier (MAID) in CFM frames. If the Short MA Name (service id) is not specified, the service administrative name is used by default.

When configuring the **service** command, consider the following restrictions:

- The **bridge group** and **bridge-domain** keyword options appear in the software, but they are unsupported.
- The **service xconnect group p2p** form of the command is not supported for L2TPv3 cross-connect types. The following example shows a sample L2TPv3 configuration that is not supported when used with the **service xconnect group** command:

```
l2vpn
 pw-class l2tpv3_class2
   encapsulation l2tpv3
   protocol l2tpv3
   ipv4 source 10.110.110.110
!
!
xconnect group 1
 p2p 1
  interface GigabitEthernet0/2/5/6.1
  neighbor 10.120.120.120 pw-id 1
  pw-class l2tpv3_class2
```

In this example, a corresponding CFM configuration of the **service xconnect group 1 p2p 1** command will not work.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to specify that all MEPs are down and no MIPs are permitted, and enter CFM domain service configuration mode.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Serv_1 down-meps
RP/0/0/CPU0:router(config-cfm-dmn-svc)#
```

The following example shows how to associate a cross connect service to a domain and enter CFM domain service configuration mode.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# domain Domain_One level 1 id string D1
RP/0/0/CPU0:router(config-cfm-dmn)# service Cross_Connect_1 xconnect group XG1 p2p X1
RP/0/0/CPU0:router(config-cfm-dmn-svc)#
```

Related Commands

Command	Description
domain , on page 311	Creates and names a container for all domain configurations and enter the CFM domain configuration mode.
ethernet cfm (global) , on page 315	Enters Ethernet CFM configuration mode.
p2p	Enters p2p configuration mode to configure point-to-point cross-connects.
show ethernet cfm configuration-errors , on page 402	Displays information about errors that are preventing configured cfm operations from becoming active, as well as any warnings that have occurred.
show ethernet cfm local maintenance-points , on page 409	Displays all the maintenance points that have been created.
show ethernet cfm local meps , on page 412	Displays information about local MEPs.
show ethernet cfm peer meps , on page 418	Displays other MEPs detected by a local MEP.
xconnect group	Configures a cross-connect group.

show efd interface

To display all interfaces that are shut down because of Ethernet Fault Detection (EFD), or to display whether a specific interface is shut down because of EFD, use the **show efd interface** command in EXEC mode.

show efd interface [*type interface-path-id*]

Syntax Description

<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

If no parameters are specified, all interfaces that are shut down because of EFD are displayed.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If this command is issued when no EFD errors are detected, the system displays the following message:

```
< date time >
No matching interfaces with EFD-shutdown triggered
```

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to display all interfaces that are shut down because of Ethernet Fault Detection (EFD):

```
RP/0/0/CPU0:router# show efd interfaces
```

```
Server VLAN MA
=====
Interface      Clients
-----
GigE0/0/0/0.0  CFM
```

Related Commands

Command	Description
efd , on page 313	Enables EFD on all down MEPs in a down MEPs service.
log efd , on page 357	Enables logging of EFD state changes to an interface (such as when an interface is shut down or brought up via EFD).

show ethernet cfm ccm-learning-database

To display the Continuity Check Message (CCM) learning database, use the **show ethernet cfm ccm-learning-database** command in EXEC configuration mode.

show ethernet cfm ccm-learning-database [*location node-id*]

Syntax Description

location <i>node-id</i>	(Optional) Displays the CFM CCM learning database for the designated node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.

Command Default

All CFM ccm-learning-databases on all interfaces are displayed.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The CCM Learning Database is populated by MEPs and MIPs that have received continuity-check messages (CCMs). The information in the CCM Learning Database is used to reply to traceroutes when no applicable entries are found in the main MAC learning table.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows how to display all the CFM CCM learning databases on all interfaces:

```
RP/0/0/CPU0:router# show ethernet cfm ccm-learning-database
```

```
Location 0/0/CPU0:
```

Domain/Level	Service	Source MAC	Interface
foo/2	foo	0001.0203.0401	Gi0/0/0/0
foo/2	foo	0001.0203.0402	PW

Location 0/1/CPU0:

Domain/Level	Service	Source MAC	Interface
foo/2	foo	0001.0203.0401	XC ID: 0xff000002

Table 22: show ethernet cfm ccm-learning-database Field Descriptions

Domain/Level	The domain name and the level of the domain for the maintenance point that received the CCM that caused this entry to be created. This entry will be used to respond to traceroute messages received by maintenance points in this domain.
Service	The name of the service for the maintenance point that received the CCM that caused this entry to be created. This entry will be used to respond to traceroute messages received by maintenance points in this domain.
Source MAC	Source MAC address in the CCM that caused this entry to be created. This entry will be used to respond to traceroute messages targeted at this MAC address.
Interface	The interface through which the CCM entered the router. This will be one of the following: • An interface or sub-interface name • A pseudowire identification (neighbor address and PW ID) • PW – Indicates the CCM was received through the PW in a cross-connect • XC ID – the internal cross-connect ID value, indicating that the CCM was received through an interface that no longer exists, or is no longer in L2 mode.

show ethernet cfm configuration-errors

To display information about errors that are preventing configured CFM operations from becoming active, as well as any warnings that have occurred, use the **show ethernet cfm configuration-errors** command in EXEC mode.

show ethernet cfm configuration-errors [**domain** *domain-name*] [**interface** *type interface-path-id*]

Syntax Description

domain <i>domain-name</i>	(Optional) Displays information about the specified CFM domain name.
interface <i>type</i>	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

All CFM configuration errors on all domains are displayed.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read

Examples

RP/0/0/CPU0:router# **show ethernet cfm configuration-errors**

Domain fig (level 5), Service bay
* MIP creation configured using bridge-domain blort, but bridge-domain blort does not exist.
* An Up MEP is configured for this domain on interface GigabitEthernet0/1/2/3.234 and an Up MEP is also configured for domain blort, which is at the same level (5).
* A MEP is configured on interface GigabitEthernet0/3/2/1.1 for this domain/service, which has CC interval 100ms, but the lowest interval supported on that interface is 1s.

The following example shows how to display all the CFM configuration errors on all domains:

```
RP/0/0/CPU0:router# show ethernet cfm configuration-errors
```

Domain fig (level 5), Service bay
* An Up MEP is configured for this domain on interface GigabitEthernet0/1/2/3.234 and an Up MEP is also configured for domain blort, which is at the same level (5).
* A MEP is configured on interface GigabitEthernet0/3/2/1.1 for this domain/service, which has CC interval 100ms, but the lowest interval supported on that interface is 1s.

Related Commands

Command	Description
ethernet cfm (global), on page 315	Enters CFM configuration mode.
ethernet cfm (interface), on page 317	Enters interface CFM configuration mode.
traceroute ethernet cfm, on page 462	Sends Ethernet CFM traceroute messages to generate a basic.

show ethernet cfm interfaces ais

To display the information about interfaces that are currently transmitting Alarm Indication Signal (AIS), use the **show ethernet cfm interfaces ais** command in EXEC mode.

show ethernet cfm interfaces [*type interface-path-id*] **ais** [**location** *node-id*]

Syntax Description

<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location <i>node-id</i>	(Optional) Displays information about the node location specified as <i>rack / slot / module</i> . Location cannot be specified if you configure an interface type.

Command Default

If no parameters are specified, information for all AIS interfaces is displayed.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

The **location** keyword cannot be specified if an interface has been specified.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to display the information published in the Interface AIS table:

```
RP/0/0/CPU0:router# show ethernet cfm interfaces ais
```

Defects (from at least one peer MEP):

```
A - AIS received           I - Wrong interval
R - Remote Defect received V - Wrong Level
L - Loop (our MAC received) T - Timed out (archived)
C - Config (our ID received) M - Missing (cross-check)
X - Cross-connect (wrong MAID) U - Unexpected (cross-check)
P - Peer port down         D - Local port down
```

Interface (State)	AIS Dir	Trigger		Via Levels	Transmission		
		L	Defects		L	Int	Last started
Gi0/1/0/0.234 (Up)	Dn	5	RPC	6	7	1s	01:32:56 ago
Gi0/1/0/0.567 (Up)	Up	0	M	2,3	5	1s	00:16:23 ago
Gi0/1/0/1.1 (Dn)	Up		D		7	60s	01:02:44 ago
Gi0/1/0/2 (Up)	Dn	0	RX	1!			

Table 23: show ethernet cfm interfaces ais Field Descriptions

Interface (State)	The name and state of the interface.
AIS dir	The direction that the AIS packets are transmitted, up or down.
Trigger L	The level of the lowest MEP that is transmitting AIS. The field is blank if there are no down MEPs on the interface, and AIS is being transmitted due to configuration on the interface itself.
Trigger Defects	Defects detected by the lowest MEP transmitting AIS.
Via Levels	The levels of any MEPs on the interface that are receiving AIS from a lower MEP, and potentially re-transmitting the signal. If the highest MEP is not re-transmitting the signal, the list of levels is ended using an exclamation point.
Transmission L	The level at which AIS is being transmitted outside of the interface, via a MIP. The field is blank if this is not occurring.
Transmission Int	The interval at which AIS is being transmitted outside of the interface via a MIP. The field is blank if this is not occurring.
Transmission last started	If AIS is being transmitted outside of the interface, the time that the signal started. The field is blank if this is not occurring.

Transmission packets	If AIS is being transmitted outside of the interface, the number of packets sent by the transmitting MEP since it was created or since its counters were last cleared. The field is blank if this is not occurring.

Related Commands

Command	Description
ais transmission, on page 271	Configures AIS transmission for a CFM domain service.
log ais, on page 351	Configures AIS logging for a CFM domain service to indicate when AIS or LCK packets are received.
ais transmission up, on page 273	Configures AIS transmission on a CFM interface.
show ethernet cfm local meps, on page 412	Displays information about local MEPs.

show ethernet cfm interfaces statistics

To display the per-interface counters for Ethernet Connectivity Fault Management (CFM), use the **show ethernet cfm interfaces statistics** command in EXEC mode.

show ethernet cfm interfaces [*type interface-path-id*] **statistics** [**location** *node-id*]

Syntax Description

<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
location <i>node-id</i>	(Optional) Displays information about the node location specified as <i>rack / slot / module</i> . Location cannot be specified if you configure an interface type.

Command Default

All CFM counters from all interfaces are displayed.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Note

The location cannot be specified if a particular interface is specified.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows all the CFM counters on all interfaces:

```
RP/0/0/CPU0:router# show ethernet cfm interfaces statistics
Location 0/1/CPU0:
```

Interface	Malformed	Dropped	Last Malformed Reason
-----	-----	-----	-----
Gi0/1/0/3.185	0	0	
Gi0/1/0/7.185	0	0	
Gi0/1/0/7.187	0	0	

Table 24: show ethernet cfm statistics Field Descriptions

Interface	Name of the interface.
Malformed	Number of packets that have been received at this interface that have been found to be non-compliant with the packet formats specified in IEEE 802.1ag and ITU-T Y.1731.
Dropped	Number of valid (well-formed) packets that have been received at this interface, that have been dropped in software. Packets may be dropped for the following reasons: • Packet has an unknown operation code, and reached a MEP. • Packet dropped at a MEP because it has a lower CFM level than the MEP. • Packet could not be forwarded because the interface is STP blocked. • Packet could not be forwarded because it is destined for this interface.
Last Malformed Reason	Operation code for the last malformed packet received, and the reason that it was found to be malformed. If no malformed packets have been received, this field is blank.

Related Commands

Command	Description
clear ethernet cfm interface statistics , on page 280	Clears the counters for an Ethernet CFM interface.

show ethernet cfm local maintenance-points

To display a list of local maintenance points, use the **show ethernet cfm local maintenance-points** command in EXEC mode.

show ethernet cfm local maintenance-points [**domain** *domain-name* [**service** *service-name*]] **interface** *type* *interface-path-id* [**mep**| **mip**]

Syntax Description

domain <i>domain-name</i>	(Optional) Displays information about the specified domain, where <i>domain-name</i> is a string of a maximum of 80 characters that identifies the domain in which the maintenance points reside.
service <i>service-name</i>	(Optional) Displays information about the specified service, where <i>service-name</i> is a string of a maximum of 80 characters that identifies the maintenance association to which the maintenance points belong.
interface <i>type</i>	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
mep	(Optional) Displays information about maintenance end points (MEPs).
mip	(Optional) Displays information about maintenance intermediate points (MIPs).

Command Default

All maintenance points from all interfaces are displayed.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows how to display maintenance points:

```
RP/0/0/CPU0:router# show ethernet cfm local maintenance-points
```

Domain/Level	Service	Interface	Type	ID	MAC
bar/0	bar	Gi0/0/0/0	Dn MEP	1	03:04:00
baz/4	baz	Gi0/0/0/1.1	MIP		03:04:01
baz/4	baz	Gi0/0/0/2	MIP		03:04:02
foo/?	foo	Gi0/0/0/3	MEP	1	03:04:03!
qux/2	qux	Gi0/0/0/1.1	Up MEP	10	03:04:01
qux/2	qux	Gi0/0/0/2	Up MEP	11	03:04:02

Table 25: show ethernet cfm local maintenance-points Field Descriptions

Domain/Level	The domain name and the level of the domain. If the domain is not configured globally, a question mark (?) is displayed for the Level.
Service	The name of the service.
Interface	The interface containing the maintenance point.
Type	The type of maintenance point: • MIP • Up MEP • Down MEP • MEP—If the MEP belongs to a service that is not configured globally, the type cannot be determined and just MEP is displayed.
ID	The configured MEP ID. Note Since MIPs do not have an ID, this column is blank for MIPs.
MAC	The last 3 octets of the interface MAC address. Note The first three octets are typically the Cisco OUI.
Note	If the MEP has a configuration error, an exclamation point (!) is displayed at the end of the line in the display output.

Related Commands

Command	Description
show ethernet cfm local meps, on page 412	Displays information about local MEPs.
show ethernet cfm peer meps, on page 418	Displays information about maintenance end points (MEPs) for peer MEPs.
traceroute cache, on page 460	Sets the maximum limit of traceroute cache entries or the maximum time limit to hold the traceroute cache entries.
traceroute ethernet cfm, on page 462	Sends Ethernet CFM traceroute messages to generate a basic.

show ethernet cfm local meps

To display information about local maintenance end points (MEPs), use the **show ethernet cfm local meps** command in EXEC mode.

show ethernet cfm local meps [**domain** *domain-name* [**service** *service-name* [**mep-id** *id*]]] **interface** *type* *interface-path-id* [**domain** *domain-name*]] [**errors** [**detail**| **verbose**]] **detail**| **verbose**]

Syntax Description

domain <i>domain-name</i>	(Optional) Displays information about the specified CFM domain, where <i>domain-name</i> is a string of a maximum of 80 characters that identifies the domain in which the maintenance points reside.
service <i>service-name</i>	(Optional) Displays information about the specified service, where <i>service-name</i> is a string of a maximum of 80 characters that identifies the maintenance association to which the maintenance points belong.
interface <i>type</i>	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
mep-id <i>id</i>	(Optional) Displays information about the specified MEP, where <i>id</i> is a number of a local maintenance end point (MEP). The range is 1 to 8191.
errors	(Optional) Displays information about peer MEPs with errors.
detail	(Optional) Displays detailed information.
verbose	(Optional) Displays detailed information, plus counters for each type of CFM packet.

Command Default

Brief information is displayed for all local MEPs.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

All MEPs are displayed in the **show ethernet cfm local meps** command output, unless they have configuration errors.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows sample output of the default statistics for local MEPs without any filtering:

```
RP/0/0/CPU0:router# show ethernet cfm local meps
```

```

A - AIS received           I - Wrong interval
R - Remote Defect received V - Wrong Level
L - Loop (our MAC received) T - Timed out (archived)
C - Config (our ID received) M - Missing (cross-check)
X - Cross-connect (wrong MAID) U - Unexpected (cross-check)
P - Peer port down

```

```

Domain foo (level 6), Service bar
  ID Interface (State)   Dir MEPs/Err RD Defects AIS
-----
  100 Gi1/1/0/1.234 (Up) Up    0/0   N   A       L7

```

```

Domain fred (level 5), Service barney
  ID Interface (State)   Dir MEPs/Err RD Defects AIS
-----
  2 Gi0/1/0/0.234 (Up)  Up    3/2   Y  RPC      L6

```

```
RP/0/0/CPU0:router# show ethernet cfm local meps
```

```

A - AIS received           I - Wrong interval
R - Remote Defect received V - Wrong Level
L - Loop (our MAC received) T - Timed out (archived)
C - Config (our ID received) M - Missing (cross-check)
X - Cross-connect (wrong MAID) U - Unexpected (cross-check)
P - Peer port down

```

```

Domain foo (level 6), Service bar
  ID Interface (State)   Dir MEPs/Err RD Defects AIS
-----
  100 Gi1/1/0/1.234 (Up) Up    0/0   N   A

```

```

Domain fred (level 5), Service barney
  ID Interface (State)   Dir MEPs/Err RD Defects AIS
-----
  2 Gi0/1/0/0.234 (Up)  Up    3/2   Y  RPC

```

Table 26: show ethernet cfm local meps Field Descriptions

ID	Configured MEP ID of the MEP.

Interface (State)	Interface that the MEP is configured under, and the state of the interface. The states are derived from the interface state, the Ethernet Link OAM interworking state, and the Spanning Tree Protocol (STP) state. The following states are reported: • Up – Interface Up, Ethernet Link OAM Up, STP Up • Down – Interface Down or Admin Down • Test – Interface Up, Ethernet Link OAM loopback mode • Blkd – Interface Up, Ethernet Link OAM Up, STP Blocked • Otherwise, the interface state.
Dir	Direction of the MEP.
RD	Remote Defect. Y (yes) indicates that a remote defect is detected on at least one peer MEP. In which case, the RDI bit is set in outgoing CCM messages. Otherwise, N (no).
MEPs	Total number of peer MEPs sending CCMs to the local MEP.
Err	Number of peer MEPs for which at least one error has been detected.
Defects	Types of errors detected. Each error is listed as a single character. Multiple errors are listed if they are from the same MEP. Possible errors are listed at the top of the display output of the command.
AIS	Alarm Indication Signal. If AIS is configured for the service, the configured level is displayed when an alarm is signaled. If AIS is not configured for the service, or if no alarm is currently signaled, this field is blank. Note In Cisco IOS XR Release 4.0, AIS is not supported, so this field will always be blank.

The following example shows sample output of the statistics for MEPs in a specified domain and service:

```
RP/0/0/CPU0:router# show ethernet cfm local meps domain foo service bar
```

```

A - AIS received           I - Wrong interval
R - Remote Defect received V - Wrong Level
L - Loop (our MAC received) T - Timed out (archived)
```


C - Config (our ID received) M - Missing (cross-check)
 X - Cross-connect (wrong MAID) U - Unexpected (cross-check)
 P - Peer port down

```
Domain foo (level 6), Service bar
  ID Interface (State)      Dir MEPS/Err RD Defects AIS
-----
  100 Gi1/1/0/1.234 (Up)    Up    0/0   N   A      L7
```

RP/0/0/CPU0:router# show ethernet cfm local meps domain foo service bar

A - AIS received I - Wrong interval
 R - Remote Defect received V - Wrong Level
 L - Loop (our MAC received) T - Timed out (archived)
 C - Config (our ID received) M - Missing (cross-check)
 X - Cross-connect (wrong MAID) U - Unexpected (cross-check)
 P - Peer port down

```
Domain foo (level 6), Service bar
  ID Interface (State)      Dir MEPS/Err RD Defects AIS
-----
  100 Gi1/1/0/1.234 (Up)    Up    0/0   N   X
```

The following example shows sample output of detailed statistics for local MEPs:



Note

The Discarded CCMs field is not displayed when the number is zero (0). It is unusual for the count of discarded CCMs to be anything other than zero, since CCMs are only discarded when the limit on the number of peer MEPs is reached. The Peer MEPs field is always displayed, but the counts are always zero when continuity check is not enabled.

RP/0/0/CPU0:router# show ethernet cfm local meps detail

```
Domain foo (level 6), Service bar
Up MEP on GigabitEthernet0/1/0/0.234, MEP-ID 100
=====
Interface state: Up      MAC address: 1122.3344.5566
Peer MEPs: 0 up, 0 with errors, 0 timed out (archived)

CCM generation enabled: No
AIS generation enabled: Yes (level: 7, interval: 1s)
Sending AIS:           Yes (started 01:32:56 ago)
Receiving AIS:         Yes (from lower MEP, started 01:32:56 ago)

Domain fred (level 5), Service barney
Up MEP on GigabitEthernet0/1/0/0.234, MEP-ID 2
=====
Interface state: Up      MAC address: 1122.3344.5566
Peer MEPs: 3 up, 2 with errors, 0 timed out (archived)
Cross-check defects: 0 missing, 0 unexpected

CCM generation enabled: Yes (Remote Defect detected: Yes)
CCM defects detected:   R - Remote Defect received
                       P - Peer port down
                       C - Config (our ID received)
AIS generation enabled: Yes (level: 6, interval: 1s)
Sending AIS:           Yes (to higher MEP, started 01:32:56 ago)
Receiving AIS:         No
```

RP/0/0/CPU0:router# show ethernet cfm local meps detail

```
Domain foo (level 6), Service bar
Up MEP on GigabitEthernet0/1/0/0.234, MEP-ID 100
=====
Interface state: Up      MAC address: 1122.3344.5566
Peer MEPs: 0 up, 0 with errors, 0 timed out (archived)

CCM generation enabled: No
```

show ethernet cfm local meps

```

AIS generation enabled: No
Sending AIS:           No
Receiving AIS:         No

```

```

Domain fred (level 5), Service barney
Up MEP on GigabitEthernet0/1/0/0.234, MEP-ID 2

```

```

=====
Interface state: Up      MAC address: 1122.3344.5566
Peer MEPS: 3 up, 2 with errors, 0 timed out (archived)
Cross-check defects: 0 missing, 0 unexpected

CCM generation enabled: Yes (Remote Defect detected: Yes)
CCM defects detected:   R - Remote Defect received
                       P - Peer port down
                       C - Config (our ID received)

AIS generation enabled: No
Sending AIS:           No
Receiving AIS:         No

```

```
RP/0/0/CPU0:router# show ethernet cfm local meps verbose
```

```

Domain foo (level 6), Service bar
Up MEP on GigabitEthernet0/1/0/0.234, MEP-ID 100

```

```

=====
Interface state: Up      MAC address: 1122.3344.5566
Peer MEPS: 0 up, 0 with errors, 0 timed out (archived)

CCM generation enabled: No
AIS generation enabled: Yes (level: 7, interval: 1s)
Sending AIS:           Yes (started 01:32:56 ago)
Receiving AIS:         Yes (from lower MEP, started 01:32:56 ago)

```

Packet	Sent	Received
CCM	0	0 (out of seq: 0)
LBM	0	0
LBR	0	0 (out of seq: 0, with bad data: 0)
AIS	5576	0
LCK	-	0

```

Domain fred (level 5), Service barney
Up MEP on GigabitEthernet0/1/0/0.234, MEP-ID 2

```

```

=====
Interface state: Up      MAC address: 1122.3344.5566
Peer MEPS: 3 up, 2 with errors, 0 timed out (archived)
Cross-check defects: 0 missing, 0 unexpected

CCM generation enabled: Yes (Remote Defect detected: Yes)
CCM defects detected:   R - Remote Defect received
                       P - Peer port down
                       C - Config (our ID received)

AIS generation enabled: Yes (level: 6, interval: 1s)
Sending AIS:           Yes (to higher MEP, started 01:32:56 ago)
Receiving AIS:         No

```

Packet	Sent	Received
CCM	12345	67890 (out of seq: 6, discarded: 10)
LBM	5	0
LBR	0	5 (out of seq: 0, with bad data: 0)
AIS	0	46910
LCK	-	0

The following example shows sample output of detailed statistics for local MEPS:

```
RP/0/0/CPU0:router# show ethernet cfm local meps verbose
```

```

Domain foo (level 6), Service bar
Up MEP on GigabitEthernet0/1/0/0.234, MEP-ID 100

```

```

=====
Interface state: Up      MAC address: 1122.3344.5566

```

Peer MEPS: 0 up, 0 with errors, 0 timed out (archived)

CCM generation enabled: No
 AIS generation enabled: No
 Sending AIS: No
 Receiving AIS: No

Packet	Sent	Received
CCM	0	0 (out of seq: 0)
LBM	0	0
LBR	0	0 (out of seq: 0, with bad data: 0)
AIS	-	-
LCK	-	-

Domain fred (level 5), Service barney
 Up MEP on GigabitEthernet0/1/0/0.234, MEP-ID 2

Interface state: Up MAC address: 1122.3344.5566
 Peer MEPS: 3 up, 2 with errors, 0 timed out (archived)
 Cross-check defects: 0 missing, 0 unexpected

CCM generation enabled: Yes (Remote Defect detected: Yes)
 CCM defects detected: R - Remote Defect received
 P - Peer port down
 C - Config (our ID received)

AIS generation enabled: No
 Sending AIS: No
 Receiving AIS: No

Packet	Sent	Received
CCM	12345	67890 (out of seq: 6, discarded: 10)
LBM	5	0
LBR	0	5 (out of seq: 0, with bad data: 0)
AIS	-	-
LCK	-	-

Related Commands

Command	Description
show ethernet cfm local maintenance-points, on page 409	Displays a list of local maintenance points.
show ethernet cfm peer meps, on page 418	Displays information about maintenance end points (MEPs) for peer MEPS.
traceroute ethernet cfm, on page 462	Sends Ethernet CFM traceroute messages to generate a basic.

show ethernet cfm peer meps

To display information about maintenance end points (MEPs) for peer MEPs, use the **show ethernet cfm peer meps** command in EXEC mode.

show ethernet cfm peer meps [**domain** *domain-name* [**service** *service-name* [**local mep-id** *id* [**peer** {**mep-id** *id*|**mac-address** *H . H . H*}]]]]|**interface** *type interface-path-id* [**domain** *domain-name* [**peer** {**mep-id** *id*|**mac-address** *H . H . H*}]]]] [**cross-check** [**missing**|**unexpected**]|**errors**] [**detail**]

Syntax Description

cross-check	(Optional) Displays information about peer MEPs with cross-check errors.
detail	(Optional) Displays detailed information.
domain <i>domain-name</i>	(Optional) Displays information about a CFM domain, where <i>domain-name</i> is a string of a maximum of 80 characters that identifies the domain in which the maintenance points reside.
errors	(Optional) Displays information about peer MEPs with errors.
interface <i>type</i>	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
local mep-id <i>id</i>	(Optional) Displays information about a local MEP, where <i>id</i> is the number of the MEP.
<i>missing</i>	(Optional) Displays information about peer MEPs that are missing.
peer mep-id <i>id</i>	(Optional) Displays information about a peer MEP, where <i>id</i> is the number of the MEP.
peer mac-address <i>H.H.H</i>	(Optional) Displays information about a peer MEP, where <i>H.H.H</i> is the hexadecimal address of the MEP.
service <i>service-name</i>	(Optional) Displays information about a CFM service, where <i>service-name</i> is a string of a maximum of 154 characters that identifies the maintenance association to which the maintenance points belong.
unexpected	(Optional) Displays information about unexpected peer MEPs.

Command Default

Peer MEPs for all domains are displayed.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows sample output of MEPs detected by a local MEP:

```
RP/0/0/CPU0:router# show ethernet cfm peer meps

Flags:
> - Ok                      I - Wrong interval
R - Remote Defect received  V - Wrong level
L - Loop (our MAC received) T - Timed out
C - Config (our ID received) M - Missing (cross-check)
X - Cross-connect (wrong MAID) U - Unexpected (cross-check)
* - Multiple errors received

Domain dom3 (level 5), Service ser3
Down MEP on GigabitEthernet0/0/0/0 MEP-ID 1
=====
St   ID MAC Address   Port   Up/Downtime   CcmRcvd SeqErr   RDI Error
--   -
V    10 0001.0203.0403 Up      00:01:35      2       0       0       2

Domain dom4 (level 2), Service ser4
Down MEP on GigabitEthernet0/0/0/0 MEP-ID 1
=====
St   ID MAC Address   Port   Up/Downtime   CcmRcvd SeqErr   RDI Error
--   -
>    20 0001.0203.0402 Up      00:00:03      4       1       0       0
>    21 0001.0203.0403 Up      00:00:04      3       0       0       0

Domain dom5 (level 2), Service dom5
```

Table 27: show ethernet cfm peer meps Field Descriptions

St	Status: one or two characters, representing the states listed at the top of the output.
ID	Peer MEP ID

MAC address	Peer MAC Address. If this entry is a configured cross-check MEP, with no MAC address specified, and no CCMs are currently being received from a peer MEP with a matching MEP ID, then this field is blank.
Port	Port state of the peer, based on the Port Status and Interface Status TLVs. If no TLVs or CCMs have been received, this field is blank. Otherwise, the port status is displayed—unless it is Up. If the port status is Up, then the interface status is displayed.
Up/Downtime	Time since the peer MEP last came up or went down. If CCMs are currently being received, it is the time since the peer MEP last came up, which is the time since the first CCM was received. If CCMs are not currently being received, it is the time since the peer MEP last went down, which is the time since the loss threshold was exceeded and a loss of continuity was detected.
CcmRcvd	Total number of CCMs received from this peer MEP.
SeqErr	Number of CCMs received out-of-sequence.
RDI	Number of CCMs received with the RDI bit set.
Error	Number of CCMs received with CCM defects, such as: • Invalid level error • Maintenance Association Identifier (MAID) error • Interval error • Received with out MEP ID error • Invalid source MAC error

The following example shows sample detailed output of MEPs detected by a local MEP:

```
RP/0/0/CPU0:router# show ethernet cfm peer meps detail
```

```
Domain dom3 (level 5), Service ser3
Down MEP on GigabitEthernet0/0/0/0 MEP-ID 1
=====
Peer MEP-ID 10, MAC 0001.0203.0403
  CFM state: Wrong level, for 00:01:34
  Port state: Up
  CCM defects detected:    V - Wrong Level
  CCMs received: 5
```

```

Out-of-sequence:          0
Remote Defect received:    5
Wrong Level:              0
Cross-connect (wrong MAID): 0
Wrong Interval:           5
Loop (our MAC received):   0
Config (our ID received):  0
Last CCM received 00:00:06 ago:
Level: 4, Version: 0, Interval: 1min
Sequence number: 5, MEP-ID: 10
MAID: String: dom3, String: ser3
Port status: Up, Interface status: Up

Domain dom4 (level 2), Service ser4
Down MEP on GigabitEthernet0/0/0/0 MEP-ID 1
=====
Peer MEP-ID 20, MAC 0001.0203.0402
CFM state: Ok, for 00:00:04
Port state: Up
CCMs received: 7
Out-of-sequence:          1
Remote Defect received:    0
Wrong Level:              0
Cross-connect (wrong MAID): 0
Wrong Interval:           0
Loop (our MAC received):   0
Config (our ID received):  0
Last CCM received 00:00:04 ago:
Level: 2, Version: 0, Interval: 10s
Sequence number: 1, MEP-ID: 20
MAID: String: dom4, String: ser4
Chassis ID: Local: ios; Management address: 'Not specified'
Port status: Up, Interface status: Up

Peer MEP-ID 21, MAC 0001.0203.0403
CFM state: Ok, for 00:00:05
Port state: Up
CCMs received: 6
Out-of-sequence:          0
Remote Defect received:    0
Wrong Level:              0
Cross-connect (wrong MAID): 0
Wrong Interval:           0
Loop (our MAC received):   0
Config (our ID received):  0
Last CCM received 00:00:05 ago:
Level: 2, Version: 0, Interval: 10s
Sequence number: 1, MEP-ID: 21
MAID: String: dom4, String: ser4
Port status: Up, Interface status: Up

Domain dom5 (level 2), Service ser5
Up MEP on Standby Bundle-Ether 1 MEP-ID 1
=====
Peer MEP-ID 600, MAC 0001.0203.0401
CFM state: Ok (Standby), for 00:00:08, RDI received
Port state: Down
CCM defects detected:      Defects below ignored on local standby MEP
                           I - Wrong Interval
                           R - Remote Defect received

CCMs received: 5
Out-of-sequence:          0
Remote Defect received:    5
Wrong Level:              0
Cross-connect W(wrong MAID): 0
Wrong Interval:           5
Loop (our MAC received):   0
Config (our ID received):  0
Last CCM received 00:00:08 ago:
Level: 2, Version: 0, Interval: 10s
Sequence number: 1, MEP-ID: 600

```

show ethernet cfm peer meps

```

MAID: DNS-like: dom5, String: ser5
Chassis ID: Local: ios; Management address: 'Not specified'
Port status: Up, Interface status: Down

Peer MEP-ID 601, MAC 0001.0203.0402
CFM state: Timed Out (Standby), for 00:15:14, RDI received
Port state: Down
CCM defects detected:      Defects below ignored on local standby MEP
                          I - Wrong Interval
                          R - Remote Defect received
                          T - Timed Out
                          P - Peer port down

CCMs received: 2
  Out-of-sequence:          0
  Remote Defect received:    2
  Wrong Level:              0
  Cross-connect (wrong MAID): 0
  Wrong Interval:           2
  Loop (our MAC received):   0
  Config (our ID received):  0
Last CCM received 00:15:49 ago:
  Level: 2, Version: 0, Interval: 10s
  Sequence number: 1, MEP-ID: 600
  MAID: DNS-like: dom5, String: ser5
  Chassis ID: Local: ios; Management address: 'Not specified'
  Port status: Up, Interface status: Down

```

Table 28: show ethernet cfm peer meps detail Field Descriptions

CFM state	State of the peer MEP, how long it has been up or down, and whether the RDI bit was set in the last received CCM. The following possible states are shown if CCMs are currently being received: • Missing • Timed out—No CCMs have been received for the loss time • Ok • Indication of a defect
Port state	Port state of the peer, based on the Port Status and Interface Status TLVs. If no TLVs or CCMs have been received, this field is blank. Otherwise, the port status is displayed—unless it is Up. If the port status is Up, then the interface status is displayed.

CCM defects detected	Types of CCM defects that have been detected. The possible defects are: • Remote Defect received—The last CCM received from the peer had the RDI bit set. • Loop (our MAC received)—CCMs were received from a peer with the same MAC address as the local MEP. • Config (our ID received)—CCMs were received from a peer with the same MEP ID as the local MEP. • Cross-connect (wrong MAID)—The last CCM received from the peer contained a domain/service identifier that did not match the locally configured domain/service identifier. • Peer port down—The last CCM received from the peer contained an Interface Status indicating that the interface on the peer was not up. • Wrong interval—The last CCM received contained a CCM interval that did not match the locally configured CCM interval. • Wrong level—The last CCM received was for a lower level than the level of the local MEP. • Timed out—No CCMs have been received within the loss time. • Missing (cross-check)—Cross-check is configured and lists this peer MEP, but no CCMs have been received within the loss time. • Unexpected (cross-check)—Cross check is configured for this service and does not list this peer MEP, but CCMs have been received from it within the loss time.
CCMs received	Number of CCMs received in total, by defect type.
Last CCM received	How long ago the last CCM was received, and a full decode of its contents. Any unknown TLVs are displayed in hexadecimal.

Related Commands

Command	Description
show ethernet cfm local maintenance-points , on page 409	Displays a list of local maintenance points.

Command	Description
show ethernet cfm local meps, on page 412	Displays information about local MEPs.
traceroute ethernet cfm, on page 462	Sends Ethernet CFM traceroute messages to generate a basic.

show ethernet cfm traceroute-cache

To display the contents of the traceroute cache, use the **show ethernet cfm traceroute-cache** command in EXEC mode.

```
{show ethernet cfm traceroute-cache [[domain domain-name] [service service-name] [local mep-id id]
[transaction-id id]] interface type interface-path-id [[domain domain-name] [transaction-id id]]
[exploratory|targeted] [status {complete|incomplete}] [detail]}
```

Syntax Description

domain <i>domain-name</i>	(Optional) Displays information about a CFM domain, where <i>domain-name</i> is a string of a maximum of 80 characters that identifies the domain in which the maintenance points reside.
service <i>service-name</i>	(Optional) Displays information about a CFM service, where <i>service-name</i> is a string of a maximum of 80 characters that identifies the maintenance association to which the maintenance points belong.
local mep-id <i>id</i>	(Optional) Displays information for the specified local maintenance end point (MEP). The range for MEP ID numbers is 1 to 8191.
transaction-id <i>id</i>	(Optional) Displays information for the specified transaction.
interface <i>type</i>	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	(Optional) Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
exploratory	(Optional) Displays information for exploratory traceroutes.
targeted	(Optional) Displays information for traceroutes that are not exploratory, but explicitly mapped.
status	(Optional) Displays status information.
complete	(Optional) Displays status information for traceroutes that have received all replies.
incomplete	(Optional) Displays status information for traceroutes that are still receiving replies.
detail	(Optional) Displays detailed information.

Command Default Shows output for the default traceroute.

Command Modes EXEC (#)

Command History	Release	Modification
	Release 4.0.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **show ethernet cfm traceroute-cache** command to display the contents of the traceroute cache; for example, to see the maintenance intermediate points (MIPs) and maintenance end points (MEPs) of a domain as they were discovered. The data is historic. The traceroute cache stores entries from previous traceroute operations.

In the output, the traceroutes sourced from each local MEP are listed. The heading for the local MEP contains the domain name and level, service name, MEP ID and interface name.

Task ID	Task ID	Operations
	ethernet-services	read

Examples The following example shows sample output for the **show ethernet cfm traceroute-cache** command:

```
RP/0/0/CPU0:router# show ethernet cfm traceroute-cache
```

```
Traceroutes in domain bar (level 4), service bar
Source: MEP-ID 1, interface GigabitEthernet0/0/0/0
=====
Traceroute at 2009-05-18 12:09:10 to 0001.0203.0402,
TTL 64, Trans ID 2:
```

Hop	Hostname/Last	Ingress MAC/name	Egress MAC/Name	Relay
1	ios	0001.0203.0400 [Down]		FDB
	0000-0001.0203.0400	Gi0/0/0/0		
2	abc		0001.0203.0401 [Ok]	FDB
	ios		Not present	
3	bcd	0001.0203.0402 [Ok]		Hit
	abc	GigE0/0		

Replies dropped: 0

```
Traceroutes in domain foo (level 2), service foo
Source: MEP-ID 1, interface GigabitEthernet0/0/0/0
=====
Traceroute at 2009-05-18 12:03:31 to 0001.0203.0403,
TTL 64, Trans ID 1:
```

```

Hop  Hostname/Last          Ingress MAC/name      Egress MAC/Name      Relay
-----
  1  abc                    0001.0203.0401 [Ok]
      0000-0001.0203.0400  Not present
  2  bob                    0001.0203.0402 [Ok]
      abc                  Gi0/1/0/2.3
  3  cba                    0001.0203.0403 [Ok]
      bob                  Gi0/2/0/3.45
Replies dropped: 0

```

Traceroute at 2009-05-18 12:15:47 to 0001.0203.0409,
TTL 64, Trans ID 3, automatic:
00:00:05 remaining

Traceroute at 2009-05-18 12:20:10 explore to ffff.ffff.ffff,
TTL 64, Trans ID 4, Timeout auto, Reply Filter Default:

```

Hop      Hostname/Last          Ingr/Egr MAC/name      Relay
-----
  1      abc                    Ingress  0015.0000.323f [Ok]  FDB
      0000-0001.0203.0400  Gi0/0/0/0.1
  2      abc                    Egress   0015.0000.323e [Ok]  FDB
      abc                  Te0/1/0/0.1
  3      0002-0016.eeee.1234    Ingress  0016.eeee.1234 [Ok]  FDB
      abc                  Te0/4.23
  4      0000-0016.eeee.4321    Egress   0016.eeee.4321 [Ok]  FDB
      0002-0016.eeee.1234  Gi1/2.23
  5      rtr                      Ingress  0015.0000.f123 [Ok]  FDB
      0002-00.16.eeee.4321  Gi0/0/0/0
  2      abc                    Egress   0015.0000.323d [Ok]  FDB
      abc                  Te0/1/0/1.1
  3      pe2                     Ingress  0017.0000.cf01 [Ok]  FDB
      abc                  Te0/0/2/0/1.450
  4      pe2                     Egress   0017.0000.cf01 [Ok]  Drop
      pe2                  Gi0/0/0/0.451
  4      pe2                     Egress   0017.0000.cf01 [Ok]  FDB
      pe2                  Gi0/0/0/1.452
  5      ce2                     Ingress  0015.0000.8830 [Ok]  FDB
      pe2                  Gi0/1/0/0
Replies dropped: 0

```

Table 29: show ethernet cfm traceroute-cache Field Descriptions

Field	Description
Traceroute at	Date and time the traceroute was started.
to	Destination MAC address.
explore to	(Exploratory traceroutes) MAC address of the target for the exploratory traceroute.
TTL	Initial Time To Live used for the traceroute operation.
Trans ID	Transaction ID
Timeout	(Exploratory traceroutes) If no timeout was configured, "Timeout auto" is shown.
Reply Filter	(Exploratory traceroutes) Type of filter.

Field	Description
automatic	Indicates that the traceroute was triggered automatically (for example, as a result of a peer MEP exceeding the loss threshold, or if Continuity-Check Auto-traceroute is configured).
00:00:00 remaining	If the traceroute is in progress, the time remaining until it completes.
No replies received	Traceroute has completed but no replies were received.
Replies dropped	Number of replies dropped.
FDB only	Indicates FDB-only was configured for a standard traceroute.
Hop	Number of hops between the source MEP and the Maintenance Point that sent the reply. (Exploratory traceroutes) The display is indented by an extra character as the hop increases, so that the tree of responses can be seen.
Hostname/Last	On the first line, the hostname of the Maintenance Point that sent the reply. On the second line, the hostname of the previous Maintenance Point in the path. If either of the hostnames is unknown, the corresponding Egress ID is displayed instead.
Ingr/Egr	(Exploratory traceroutes) Indicates whether the reply is for an ingress or egress interface, but never both.
Ingress MAC/Name	If the reply includes information about the ingress interface, then the first line displays the ingress interface MAC address and the ingress action. The ingress interface name, if known, is displayed on the second line.
Egress MAC/Name	If the reply includes information about the egress interface, then the first line displays the egress interface MAC address and the egress action. The egress interface name, if known, is displayed on the second line.

Field	Description
MAC/Name	(Exploratory traceroutes) The MAC address of the interface from which the reply was sent, and the ingress/egress action, are displayed on the first line. If the interface name was present in the reply, it is displayed on the second line.
Relay	Type of relay action performed. For standard traceroutes, the possible values are: • Hit—The target MAC address was reached. • FDB—The target MAC address was found in the Filtering Database (the MAC learning table on the switch) and will be forwarded by the interface. • MPDB—The target MAC address was found in the MP Database (the CCM Learning database on the switch). In addition, “MEP” is displayed on the second line if a terminal MEP was reached. For exploratory traceroutes, the possible values are: • Hit—The target MAC address was reached. • FDB—The target MAC address was found in the Filtering Database and will be forwarded at this interface. • Flood—The target MAC address was not found in the Filtering database, and will be flooded at this interface. • Drop—The target MAC address will not be forwarded at this interface.

The following example shows sample output for the **show ethernet cfm traceroute-cache detail** command:

```
RP/0/0/CPU0:router# show ethernet cfm traceroute-cache domain bar detail

Traceroutes in domain bar (level 4), service bar
Source: MEP-ID 1, interface GigabitEthernet0/0/0/0
=====
Traceroute at 2009-05-18 12:09:10 to 0001.0203.0402,
TTL 64, Trans ID 2:

Hop Hostname                Ingress MAC                Egress MAC                Relay
-----
 1 ios                      0001.0203.0400 [Down]
   Level: 4, version: 0, Transaction ID: 2
   TTL: 63, Relay Action: RlyFDB
   Forwarded, Terminal MEP not reached
   Last egress ID: 0000-0001.0203.0400
```

show ethernet cfm traceroute-cache

```

Next egress ID: 0000-0001.0203.0400
Ingress interface:
  Action: IngDown, MAC: 0001.0203.0400
  ID: Local: Gi0/0/0/0
Hostname: Local: ios, address Not specified

2 abc                                0001.0203.0401 [Ok]    FDB
Level: 4, version: 0, Transaction ID: 2
TTL: 62, Relay Action: RlyFDB
Forwarded, Terminal MEP not reached
Last egress ID: 0000-0001.0203.0400
Next egress ID: 0000-0001.0203.0401
Egress interface:
  Action: EgOk, MAC: 0001.0203.0401
  ID: Not present
Hostname: Local: abc, address Not specified

3 bcd                                0001.0203.0402 [Ok]    Hit
Level: 4, version: 0, Transaction ID: 2
TTL: 61, Relay Action: RlyHit
Not Forwarded, Terminal MEP not reached
Last egress ID: 0000-0001.0203.0401
Next egress ID: Not Forwarded
Ingress interface:
  Action: IngOk, MAC: 0001.0203.0402
  ID: Local: GigE0/0
Hostname: Local: bcd, address Not specified

Replies dropped: 0

```

Traceroute at 2009-05-18 12:30:10 explore to ffff.ffff.ffff from 0204.0608.0a0c, TTL 255, Trans ID 5, Timeout auto, Reply Filter Spanning Tree:

Hop	Hostname	Ingr/Egr	MAC	Relay
1	0000-0015.0000.ffff	Ingress	0015.0000.ffff [Ok]	FDB
Level: 2, version: 0, Transaction ID: 5 TTL: 254, Relay Action: RlyFDB Forwarded, Terminal MEP not reached Next-Hop Timeout: 5 seconds Delay Model: Logarithmic Last egress ID: 0000-0002.0002.0002 Next egress ID: 0000-0015.0000.ffff Ingress interface: Action: ELRIngOk, MAC: 0015.0000.ffff ID: Local: Gi0/0/0/0.1				
2	0001-0030.0000.ffff	Egress	0030.0000.ffff [Ok]	Drop
Level: 2, version: 0, Transaction ID: 5 TTL: 253, Relay Action: RlyDrop Not Forwarded, Terminal MEP not reached Next-Hop Timeout: 5 seconds Delay Model: Logarithmic Last egress ID: 0000-0015.0000.ffff Next egress ID: 0030-0000.0000.ffff Egress interface: Action: ELREgrOk, MAC: 0030.0000.ffff ID: Local: Gi0/1/0/1.2				

Related Commands

Command	Description
traceroute cache, on page 460	Sets the maximum limit of traceroute cache entries or the maximum time limit to hold the traceroute cache entries.
clear ethernet cfm traceroute-cache, on page 286	Removes the contents of the traceroute cache.

Command	Description
traceroute ethernet cfm, on page 462	Sends Ethernet CFM traceroute messages to generate a basic.

show ethernet oam configuration

To display the current active Ethernet OAM configuration on an interface, use the **show ethernet oam configuration** command in EXEC mode.

show ethernet oam configuration [*interface type interface-path-id*]

Syntax Description

interface type	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
interface-path-id	(Optional) Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

If no parameters are specified, the configurations for all Ethernet OAM interfaces is displayed.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced. The “Uni-directional link-fault detection enabled” field is not supported in this release. Therefore, the field will always display “N.”

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command displays the Ethernet OAM configuration information for all interfaces, or a specified interface.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows how to display Ethernet OAM configuration information for a specific interface:

```
RP/0/0/CPU0:router# show ethernet oam configuration interface gigabitethernet 0/4/0/0
Thu Aug 5 21:54:34.050 DST
GigabitEthernet0/4/0/0:
  Hello interval: 1s
  Link monitoring enabled: Y
  Remote loopback enabled: N
  Mib retrieval enabled: N
  Uni-directional link-fault detection enabled: N
  Configured mode: Active
  Connection timeout: 5
  Symbol period window: 0
  Symbol period low threshold: 1
  Symbol period high threshold: None
  Frame window: 1000
  Frame low threshold: 1
  Frame high threshold: None
  Frame period window: 1000
  Frame period low threshold: 1
  Frame period high threshold: None
  Frame seconds window: 60000
  Frame seconds low threshold: 1
  Frame seconds high threshold: None
  High threshold action: None
  Link fault action: Log
  Dying gasp action: Log
  Critical event action: Log
  Discovery timeout action: Log
  Capabilities conflict action: Log
  Wiring conflict action: Error-Disable
  Session up action: Log
  Session down action: Log
  Remote loopback action: Log
  Require remote mode: Ignore
  Require remote MIB retrieval: N
  Require remote loopback support: N
  Require remote link monitoring: N
```

The following example shows how to display the configuration for all EOAM interfaces:

```
RP/0/0/CPU0:router# show ethernet oam configuration
Thu Aug 5 22:07:06.870 DST
GigabitEthernet0/4/0/0:
  Hello interval: 1s
  Link monitoring enabled: Y
  Remote loopback enabled: N
  Mib retrieval enabled: N
  Uni-directional link-fault detection enabled: N
  Configured mode: Active
  Connection timeout: 5
  Symbol period window: 0
  Symbol period low threshold: 1
  Symbol period high threshold: None
  Frame window: 1000
  Frame low threshold: 1
  Frame high threshold: None
  Frame period window: 1000
  Frame period low threshold: 1
  Frame period high threshold: None
  Frame seconds window: 60000
  Frame seconds low threshold: 1
  Frame seconds high threshold: None
  High threshold action: None
  Link fault action: Log
  Dying gasp action: Log
  Critical event action: Log
  Discovery timeout action: Log
```

show ethernet oam configuration

```
Capabilities conflict action:           Log
Wiring conflict action:               Error-Disable
Session up action:                    Log
Session down action:                  Log
Remote loopback action:               Log
Require remote mode:                  Ignore
Require remote MIB retrieval:         N
Require remote loopback support:      N
Require remote link monitoring:       N
```

Related Commands

Command	Description
show ethernet oam discovery, on page 435	Displays the currently configured OAM information of Ethernet OAM sessions on interfaces.
show ethernet oam statistics, on page 441	Displays the local and remote Ethernet OAM statistics for interfaces.
show ethernet oam interfaces, on page 438	

show ethernet oam discovery

To display the currently configured OAM information of Ethernet OAM sessions on interfaces, use the **show ethernet oam discovery** command in EXEC mode.

show ethernet oam discovery [**brief**] **interface** *type interface-path-id* [**remote**]

Syntax Description

brief	Displays minimal, currently configured OAM information in table form.
interface <i>type</i>	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
remote	(Optional) Retrieves and displays information from a remote device, as if the command was run on the remote device.

Command Default

Displays detailed information for Ethernet OAM sessions on all interfaces.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows how to display the minimal, currently configured OAM information for Ethernet OAM sessions on all interfaces:

```
RP/0/0/CPU0:router# show ethernet oam discovery brief
```

```
Sat Jul  4 13:52:42.949 PST
```

```
Flags:
```

```
  L - Link Monitoring support
  M - MIB Retrieval support
  R - Remote Loopback support
  U - Unidirectional detection support
  * - data is unavailable
```

Local Interface	Remote MAC Address	Remote Vendor	Mode	Capability
Gi0/1/5/1	0010.94fd.2bfa	00000A	Active	L
Gi0/1/5/2	0020.95fd.3bfa	00000B	Active	M
Gi0/1/6/1	0030.96fd.6bfa	00000C	Passive	L R
Fa0/1/3/1	0080.09ff.e4a0	00000C	Active	L R

The following example shows how to display detailed, currently configured OAM information for the Ethernet OAM session on a specific interface:

```
RP/0/0/CPU0:router# show ethernet oam discovery interface gigabitethernet 0/1/5/1
```

```
Sat Jul  4 13:56:49.967 PST
```

```
GigabitEthernet0/1/5/1:
```

```
Local client
```

```
-----
```

```
Administrative configuration:
```

```
  PDU revision:                1
  Mode:                        Active
  Unidirectional support:      N
  Link monitor support:        Y
  Remote loopback support:     N
  MIB retrieval support:       N
  Maximum PDU size:            1500
  Mis-wiring detection key:    5E9D
```

```
Operational status:
```

```
  Port status:                Active send
  Loopback status:             None
  Interface mis-wired:         N
```

```
Remote client
```

```
-----
```

```
MAC address:                   0030.96fd.6bfa
Vendor (OUI):                   00.00.0C (Cisco)
```

```
Administrative configuration:
```

```
  PDU revision:                5
  Mode:                        Passive
  Unidirectional support:      N
  Link monitor support:        Y
  Remote loopback support:     Y
  MIB retrieval support:       N
  Maximum PDU size:            1500
```

Related Commands

Command	Description
show ethernet oam configuration , on page 432	Displays the current active Ethernet OAM configuration on an interface.

Command	Description
show ethernet oam statistics, on page 441	Displays the local and remote Ethernet OAM statistics for interfaces.
show ethernet oam interfaces, on page 438	

show ethernet oam interfaces

To display the current state of Ethernet OAM interfaces, use the **show ethernet oam interfaces** command in EXEC mode.

show ethernet oam interfaces [*interface type interface-path-id*]

Syntax Description

interface type	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

No parameters displays the current state for all Ethernet OAM interfaces.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows how to display the current state of a specific Ethernet OAM interface.

```
RP/0/0/CPU0:router# show ethernet oam interfaces interface gigabitethernet 0/1/5/1  
  
Sat Jul  4 15:01:21.625 PST  
GigabitEthernet0/1/5/1
```



```
In ACTIVE_SEND_LOCAL state
Local MWD key: 005E9D
```

```
RP/0/0/CPU0:router# show ethernet oam interfaces
GigabitEthernet0/0/0/0
In REMOTE_OK state
Local MWD key: 80081234
Remote MWD key: 8F08ABCC
EFD triggered: Yes (link-fault)
```

Table 30: show ethernet oam interfaces Field Descriptions

Field	Description
In <i>type</i> state	The possible discovery state <i>type</i> values are: • ACTIVE_SEND_LOCAL—The interface is configured in active mode (the default), but no Information PDUs have been received from the peer (except possibly link-fault PDUs). Information PDUs are sent. • FAULT—A local unidirectional link fault has been detected. Link-fault PDUs are sent. • INACTIVE—The interface is down. • PASSIVE_WAIT—The interface is configured in passive mode (mode passive command) but no Information PDUs have been received from the peer (except possibly link-fault PDUs). No PDUs are sent. • REMOTE—(Also known as SEND_LOCAL_REMOTE). Information PDUs are being sent and received, but the local device is not satisfied with the remote peer's capabilities (for example, because there is a 'require-remote' configuration and the peer does not have the required capabilities). • REMOTE_OK—(Also known as SEND_LOCAL_REMOTE_OK). Information PDUs are being sent and received, and the local device is satisfied with the peer's capabilities, but the remote peer is not satisfied with the local device capabilities (for example, because there is a 'require-remote' configuration on the peer device). • SEND_ANY—The discovery process has completed, both devices are satisfied with the configuration and the session is up. All types of PDU can be sent and received.

Related Commands

Command	Description
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam discovery, on page 435	Displays the currently configured OAM information of Ethernet OAM sessions on interfaces.
show ethernet oam statistics, on page 441	Displays the local and remote Ethernet OAM statistics for interfaces.

show ethernet oam statistics

To display the local and remote Ethernet OAM statistics for interfaces, use the **show ethernet oam statistics** command in EXEC mode.

show ethernet oam statistics [*interface type interface-path-id*] [**remote**]

Syntax Description

<i>interface type</i>	(Optional) Displays information about the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
<i>remote</i>	(Optional) Retrieves and displays information from a remote device, as if the command was run on the remote device.

Command Default

No parameters displays statistics for all Ethernet OAM interfaces.

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.0.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read

Examples

The following example shows how to display Ethernet OAM statistics for a specific interface:

```
RP/0/0/CPU0:router# show ethernet oam statistics interface gigabitethernet 0/1/5/1
```

show ethernet oam statistics

```

Sat Jul  4 14:34:52.320 PST
GigabitEthernet0/1/5/1:
Counters
-----
    Information OAMPDU Tx          161177
    Information OAMPDU Rx          151178
    Unique Event Notification OAMPDU Tx      0
    Unique Event Notification OAMPDU Rx      0
    Duplicate Event Notification OAMPDU Tx    0
    Duplicate Event Notification OAMPDU Rx    0
    Loopback Control OAMPDU Tx              0
    Loopback Control OAMPDU Rx              0
    Variable Request OAMPDU Tx              0
    Variable Request OAMPDU Rx              0
    Variable Response OAMPDU Tx             0
    Variable Response OAMPDU Rx             0
    Organization Specific OAMPDU Tx          0
    Organization Specific OAMPDU Rx          0
    Unsupported OAMPDU Tx                  45
    Unsupported OAMPDU Rx                  0
    Frames Lost due to OAM                  23
    Fixed frames Rx                         1

Local event logs
-----
    Errored Symbol Period records          0
    Errored Frame records                   0
    Errored Frame Period records            0
    Errored Frame Second records            0

Remote event logs
-----
    Errored Symbol Period records          0
    Errored Frame records                   0
    Errored Frame Period records            0
    Errored Frame Second records            0

```

Related Commands

Command	Description
show ethernet oam configuration, on page 432	Displays the current active Ethernet OAM configuration on an interface.
show ethernet oam discovery, on page 435	Displays the currently configured OAM information of Ethernet OAM sessions on interfaces.
show ethernet oam interfaces, on page 438	

show ethernet sla configuration-errors

To display information about errors that are preventing configured Ethernet Service Level Agreement (SLA) operations from becoming active, as well as any warnings that have occurred, use the **show ethernet sla configuration-errors** command in EXEC mode.

show ethernet sla configuration-errors [**domain** *domain-name*] [**interface** *type interface-path-id*] [**profile** *profile-name*]

Syntax Description

domain <i>domain-name</i>	Displays information for the specified domain, where <i>domain-name</i> is a string of a maximum of 80 characters that identifies the domain where the SLA operation is configured.
interface <i>type</i>	(Optional) Displays information for the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or virtual interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
profile <i>profile-name</i>	(Optional) Displays information for the specified profile name.

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to display information about errors that are preventing configured SLA operations from becoming active:

```
RP/0/0/CPU0:router# show ethernet sla configuration-errors
```

```
Errors:
```

```
-----
```

```
Profile 'gold' is not defined but is used on Gi0/0/0/0.0
```

```
Profile 'red' defines a test-pattern, which is not supported by the type
```

show ethernet sla operations

To display information about configured Ethernet Service Level Agreement (SLA) operations, use the **show ethernet sla operations** command in EXEC mode.

show ethernet sla operations [**detail**] [**domain** *domain-name*] [**interface** *type interface-path-id*] [**on-demand** {**all** | *id*} | **profile** {*profile-name* | **all**}]

Syntax Description

detail	(Optional) Displays detailed information.
domain <i>domain-name</i>	(Optional) Displays information for the specified domain, where <i>domain-name</i> is a string of a maximum of 80 characters that identifies the domain where the SLA operation is configured.
interface <i>type</i>	(Optional) Displays information for the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Displays information for the specified interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
on-demand all	(Optional) Displays information for all on-demand operations.
on-demand <i>id</i>	(Optional) Displays information for the specified on-demand operation, where <i>id</i> is the number of the operation.
profile <i>profile-name</i>	(Optional) Displays information for the specified profile name.
profile all	(Optional) Displays information for all profiles.

Command Default

No default behavior or values

Command Modes

EXEC (#)

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Task ID	Operations
ethernet-services	read, write

Examples

The following example shows how to display information about configured SLA operations in brief:

```
RP/0/0/CPU0:router# show ethernet sla operations
```

```

Profile          Instance
-----
business-gold    Gi0/0/0/0, dom mydom, to 00ab.cdef.1234
business-gold    Gi0/0/0/0, dom mydom, to MEP-ID 2

```

The following example shows how to display information about configured SLA operations in detail:

```
RP/0/0/CPU0:router# show ethernet sla operations detail
```

```

Source: Interface GigabitEthernet0/0/0/0, Domain mydom
Destination: Target MAC Address 00ab.cdef.1234
=====
Profile 'business-gold'
Probe type 'cfm-delay-measurement':
    burst sent every 1min, each of 20 packets sent every 100ms
Measures RT Delay: 5 bins; 1 buckets/probe; 75 of 100 archived
Measures RT Jitter (interval 1): no aggregation; 5 probes/bucket; 10 of 10 archived
Scheduled to run every 5min first at 00:02:00 UTC for 2min (2 bursts)
    last run at 07:32:00 PST Tue 19 January 2010

Source: Interface GigabitEthernet0/0/0/0, Domain mydom
Destination: Target MEP-ID 2
=====
Profile 'business-gold'
Probe type 'cfm-delay-measurement':
    burst sent every 1min, each of 20 packets sent every 100ms
Measures RT Delay: 5 bins; 1 buckets/probe; 75 of 100 archived
Measures RT Jitter (interval 1): no aggregation; 5 probes/bucket; 10 of 10 archived
Scheduled to run every 5min first at 00:02:00 UTC for 2min (2 bursts)
    last run at 07:32:00 PST Tue 19 January 2010

```

The following example shows how to display information about on-demand SLA operations in detail:

```
RP/0/0/CPU0:router# show ethernet sla operations detail on-demand
```

```

Source: Interface GigabitEthernet0/0/0/0.0, Domain mydom
Destination: Target MAC Address 00ab.cdef.1234
=====
On-demand operation ID #6
Probe type 'cfm-loopback':
    burst sent every 10s, each of 10 packets sent every 1s
    packets padded to 1024 bytes with pattern 0xabcd56ef
    packets use priority value of 3
Measures RT Delay: no aggregation; 1 buckets/probe; 1 of 100 archived
Started at 12:01:49 GMT Tue 02 March 2010, runs every 1hr for 1hr (360 bursts)
    repeats 10 times, ends at 22:01:49 GMT Tue 02 March 2010

```


The following example shows how to display information about configured and on-demand SLA operations on a specific interface:

```
RP/0/0/CPU0:router# show ethernet sla operations interface gigabitethernet 0/0/0/0.0 detail
```

```
Interface GigabitEthernet 0/0/0/0.0
Domain mydom Service myser to 00AB.CDEF.1234
-----
Profile 'business-gold'
Probe type CFM-delay-measurement:
  bursts sent every 1min, each of 20 packets sent every 100ms
  packets padded to 1500 bytes with zeroes
  packets use priority value of 7
Measures RTT: 5 bins 20ms wide; 2 buckets/ probe; 75/100 archived
Measures Jitter (interval 1): 3 bins 40ms wide; 2 buckets/probe; 50 archived
Scheduled to run every Sunday at 4am for 2 hours:
  last run at 04:00 25/05/2008
```

show ethernet sla statistics

To display the contents of buckets containing Ethernet Service Level Agreement (SLA) metrics collected by probes, use the **show ethernet sla statistics** command in EXEC mode.

show ethernet sla statistics [**current**|**history**] [**detail**] [**domain** *domain-name*] [**interface type** *interface-path-id*] [**on-demand** {**all**|*id*}|**profile** {*profile-name*|**all**}] [**statistic** *stat-type*]

Syntax Description

current	(Optional) Displays the content of buckets currently being filled.
history	(Optional) Displays the content of all full buckets.
detail	(Optional) Displays detailed content of buckets.
domain <i>domain-name</i>	(Optional) Displays the content of buckets for the specified domain, where <i>domain-name</i> is a string of a maximum of 80 characters that identifies the domain where the SLA operation is configured.
interface type	(Optional) Displays the content of buckets for the specified interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Displays the content of buckets for the specified interface. Note Use the show interfaces command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
on-demand all	(Optional) Displays the content of buckets for all on-demand operations.
on-demand <i>id</i>	(Optional) Displays the content of buckets for the specified on-demand operation, where <i>id</i> is the number of the operation.
profile <i>profile-name</i>	(Optional) Displays the content of buckets for the specified profile name.
profile all	(Optional) Displays the content of buckets for all profiles.
statistic <i>stat-type</i>	(Optional) Displays only the specified type of statistic. Valid values are: • one-way-delay-ds—Displays only one-way (destination-to-source) delay. • one-way-delay-sd—Displays only one-way (source-to-destination) delay. • one-way-jitter-ds—Displays only one-way (destination-to-source) jitter. • one-way-jitter-sd—Displays only one-way (source-to-destination) jitter. • round-trip-delay—Displays only round-trip delay. • round-trip-jitter—Displays only round-trip jitter.

Command Default No default behavior or values

Command Modes EXEC (#)

Command History	Release	Modification
	Release 4.1.0	This command was introduced.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

See the Usage Guidelines in the **buckets size** command for a description of buckets.

Task ID	Task ID	Operations
	ethernet-services	read, write

Examples This example shows how to display the current contents of buckets containing SLA metrics collected by probes in brief:

```
RP/0/0/CPU0:router# show ethernet sla statistics

Source: Interface GigabitEthernet0/0/0/0, Domain mydom
Destination: Target MEP-ID 2
=====
Profile 'business-gold', packet type 'cfm-delay-measurement'
Scheduled to run every 5min first at 00:02:00 UTC for 2min

Round Trip Delay
~~~~~
1 buckets per probe

Bucket started at 07:47:00 PST Tue 19 January 2010 lasting 2min
  Pkts sent: 20; Lost: 0 (0.0%); Corrupt: 0 (0.0%); Misordered: 0 (0.0%)
  Min: 0.24ms; Max: 0.49ms; Mean: 0.34ms; StdDev: 0.05ms

Bucket started at 07:52:00 PST Tue 19 January 2010 lasting 2min
  Pkts sent: 20; Lost: 0 (0.0%); Corrupt: 0 (0.0%); Misordered: 0 (0.0%)
  Min: 0.24ms; Max: 0.69ms; Mean: 0.34ms; StdDev: 0.12ms

Round Trip Jitter
~~~~~
1 buckets per probe

Bucket started at 07:47:00 PST Tue 19 January 2010 lasting 2min
  Pkts sent: 20; Lost: 0 (0.0%); Corrupt: 0 (0.0%); Misordered: 0 (0.0%)
  Min: -0.25ms; Max: 0.13ms; Mean: -0.01ms; StdDev: 0.08ms

Bucket started at 07:52:00 PST Tue 19 January 2010 lasting 2min
```

```
Pkts sent: 20; Lost: 0 (0.0%); Corrupt: 0 (0.0%); Misordered: 0 (0.0%)
Min: -0.38ms; Max: 0.38ms; Mean: -0.02ms; StdDev: 0.14ms
```

This example shows how to display the current contents of buckets containing SLA metrics collected by probes in detail:

**Note**

In this example, the round-trip-delay measurement is configured with aggregation (and hence bins are displayed), whereas the round-trip-jitter measurement is configured with no aggregation (and hence individual samples are displayed).

```
RP/0/0/CPU0:router# show ethernet sla statistics detail
Source: Interface GigabitEthernet0/0/0/0, Domain mydom
Destination: Target MEP-ID 2
=====
Profile 'business-gold', packet type 'cfm-delay-measurement'
Scheduled to run every 5min first at 00:02:00 UTC for 2min

Round Trip Delay
~~~~~
1 buckets per probe

Bucket started at 07:47:00 PST Tue 19 January 2010 lasting 2min
  Pkts sent: 20; Lost: 0 (0.0%); Corrupt: 0 (0.0%); Misordered: 0 (0.0%)
  Min: 0.24ms, occurred at 07:47:29 on Tue 19 Jan 2010 UTC
  Max: 0.49ms, occurred at 07:48:04 on Tue 19 Jan 2010 UTC
  Mean: 0.34ms; StdDev: 0.05ms

  Bins:
  Range      Samples    Cum. Count    Mean
  -----
    0 to 20 ms 20 (100.0%) 20 (100.0%) 0.34ms
    20 to 40 ms 0  (0.0%) 20 (100.0%) -
    40 to 60 ms 0  (0.0%) 20 (100.0%) -
    60 to 80 ms 0  (0.0%) 20 (100.0%) -
    > 80      ms 0  (0.0%) 20 (100.0%) -

Bucket started at 07:52:00 PST Tue 19 January 2010 lasting 2min
  Pkts sent: 20; Lost: 0 (0.0%); Corrupt: 0 (0.0%); Misordered: 0 (0.0%)
  Min: 0.24ms, occurred at 07:53:10 on Tue 19 Jan 2010 UTC
  Max: 0.69ms, occurred at 07:53:42 on Tue 19 Jan 2010 UTC
  Mean: 0.34ms; StdDev: 0.12ms

  Bins:
  Range      Samples    Cum. Count    Mean
  -----
    0 to 20 ms 20 (100.0%) 20 (100.0%) 0.34ms
    20 to 40 ms 0  (0.0%) 20 (100.0%) -
    40 to 60 ms 0  (0.0%) 20 (100.0%) -
    60 to 80 ms 0  (0.0%) 20 (100.0%) -
    > 80      ms 0  (0.0%) 20 (100.0%) -

Round Trip Jitter
~~~~~
1 buckets per probe

Bucket started at 07:47:00 PST Tue 19 January 2010 lasting 2min
  Pkts sent: 20; Lost: 0 (0.0%); Corrupt: 0 (0.0%); Misordered: 0 (0.0%)
  Min: -0.25ms, occurred at 07:47:53 on Tue 19 Jan 2010 UTC
  Max: 0.13ms, occurred at 07:48:11 on Tue 19 Jan 2010 UTC
  Mean: -0.01ms; StdDev: 0.08ms

  Samples:
  Time sent  Result  Notes
  -----
    07:47:00.0    ...
    07:47:00.1 -0.12ms
```

```

07:47:00.2 0.06ms
07:47:00.3 0.00ms
07:47:00.4 -0.06ms
07:47:00.5 0.00ms
07:47:00.6 0.00ms
07:47:00.7 0.00ms
07:47:00.8 0.06ms
07:47:00.9 0.00ms
07:48:00.0 0.11ms
07:48:00.1 -0.25ms
07:48:00.2 0.13ms
07:48:00.3 0.00ms
07:48:00.4 -0.06ms
07:48:00.5 0.00ms
07:48:00.6 0.06ms
07:48:00.7 -0.06ms
07:48:00.8 0.00ms
07:48:00.9 0.00ms

```

```

Bucket started at 07:52:00 PST Tue 19 January 2010 lasting 2min
Pkts sent: 20; Lost: 0 (0.0%); Corrupt: 0 (0.0%); Misordered: 0 (0.0%)
Min: -0.38ms, occurred at 07:52:13 on Tue 19 Jan 2010 UTC
Max: 0.38ms, occurred at 07:53:26 on Tue 19 Jan 2010 UTC
Mean: -0.02ms; StdDev: 0.14ms

```

```

Samples:
Time sent      Result      Notes
-----
07:52:00.0    ...
07:52:00.1   -0.38ms
07:52:00.2    0.00ms
07:52:00.3   -0.05ms
07:52:00.4    0.00ms
07:52:00.5    0.05ms
07:52:00.6    0.00ms
07:52:00.7    0.00ms
07:52:00.8    0.00ms
07:52:00.9    0.00ms
07:53:00.0    0.38ms
07:53:00.1   -0.32ms
07:53:00.2    0.00ms
07:53:00.3   -0.13ms
07:53:00.4    0.06ms
07:53:00.5    0.00ms
07:53:00.6    0.00ms
07:53:00.7    0.00ms
07:53:00.8    0.06ms
07:53:00.9    0.00ms

```

This example shows how to display the current contents of buckets containing SLA metrics collected by probes on a specific interface:

```
RP/0/0/CPU0:router# show ethernet sla statistics current interface GigabitEthernet 0/0/0/0.0
```

```

Interface GigabitEthernet 0/0/0/0.0
Domain mydom Service myser to 00AB.CDEF.1234
=====
Profile 'business-gold', packet type 'cfm-superpacket'
Scheduled to run every Sunday at 4am for 2 hours

Round Trip Delay
~~~~~
2 buckets per probe

Bucket started at 04:00 Sun 17 Feb 2008 lasting 1 hour:
Pkts sent: 2342; Lost 2 (0%); Corrupt: 0 (0%); Misordered: 0 (0%)
Min: 13ms; Max: 154ms; Mean: 28ms; StdDev: 11ms

Round Trip Jitter
~~~~~

```

2 buckets per probe

Bucket started at 04:00 Sun 17 Feb 2008 lasting 1 hour:
 Pkts sent: 2342; Lost: 2 (0%); Corrupt: 0 (0%); Misordered: 0 (0%)
 Min: -5ms; Max: 8ms; Mean: 0ms; StdDev: 3.6ms

This example shows how to display a history detail of buckets containing SLA metrics collected by probes on a specific interface:

RP/0/0/CPU0:router# **show ethernet sla history detail GigabitEthernet 0/0/0/0.0**

Interface GigabitEthernet 0/0/0/0.0
 Domain mydom Service myser to 00AB.CDEF.1234
 =====
 Profile 'business-gold', packet type 'cfm-loopback'
 Scheduled to run every Sunday at 4am for 2 hours

Round Trip Delay
 ~~~~~  
 2 buckets per probe

Bucket started at 04:00 Sun 17 Feb 2008 lasting 1 hour:  
 Pkts sent: 2342; Lost: 2 (0%); Corrupt: 0 (0%); Misordered: 0 (0%)  
 Min: 13ms, occurred at 04:43:29 on Sun 22 Aug 2010 UTC  
 Max: 154ms, occurred at 05:10:32 on Sun 22 Aug 2010 UTC  
 Mean: 28ms; StdDev: 11ms

Results suspect as more than 10 seconds time drift detected  
 Results suspect as scheduling latency prevented some packets being sent

Samples:  

| Time sent    | Result | Notes     |
|--------------|--------|-----------|
| 04:00:01.324 | 23ms   |           |
| 04:00:01.425 | 36ms   |           |
| 04:00:01.525 | -      | Timed Out |
| ...          |        |           |

Round Trip Jitter  
 ~~~~~  
 2 buckets per probe

Bucket started at 04:00 Sun 17 Feb 2008, lasting 1 hour:
 Pkts sent: 2342; Lost: 2 (0%); Corrupt: 0 (0%); Misordered: 0 (0%)
 Min: -5ms, occurred at 04:15:03 on Sun 22 Aug 2010 UTC
 Max: 10ms, occurred at 05:29:15 on Sun 22 Aug 2010 UTC
 Mean: 0ms; StdDev: 3.6ms

Samples:

Time sent	Result	Notes
04:00:01.324	-	
04:00:01.425	13ms	
04:00:01.525	-	Timed out
...		

This example shows how to display statistics for all full buckets for on-demand operations in detail:

RP/0/0/CPU0:router# **show ethernet sla statistics history detail on-demand**

Interface GigabitEthernet0/0/0/0.1
 Domain mydom Service myser to 0123.4567.890A
 =====
 On-demand operation ID #1, packet type 'cfm-delay-measurement'
 Started at 15:38 on 06 July 2010 UTC, runs every 1 hour for 1 hour

Round Trip Delay
 ~~~~~  
 1 bucket per probe

Bucket started at 15:38 on Tue 06 Jul 2010 UTC, lasting 1 hour:  
 Pkts sent: 1200; Lost: 4 (0%); Corrupt: 600 (50%); Misordered: 0 (0%)  
 Min: 13ms, occurred at 15:43:29 on Tue 06 Jul 2010 UTC  
 Max: 154ms, occurred at 16:15:34 on Tue 06 Jul 2010 UTC  
 Mean: 28ms; StdDev: 11ms

| Range      | Samples   | Cum. Count | Mean |
|------------|-----------|------------|------|
| 0 - 20 ms  | 194 (16%) | 194 (16%)  | 17ms |
| 20 - 40 ms | 735 (61%) | 929 (77%)  | 27ms |
| 40 - 60 ms | 212 (18%) | 1141 (95%) | 45ms |
| > 60 ms    | 55 (5%)   | 1196       | 70ms |

Bucket started at 16:38 on Tue 01 Jul 2008 UTC, lasting 1 hour:  
 Pkts sent: 3600; Lost: 12 (0%); Corrupt: 1800 (50%); Misordered: 0 (0%)  
 Min: 19ms, occurred at 17:04:08 on Tue 06 Jul 2010 UTC  
 Max: 70ms, occurred at 16:38:00 on Tue 06 Jul 2010 UTC  
 Mean: 28ms; StdDev: 11ms

| Range      | Samples   | Cum. Count | Mean |
|------------|-----------|------------|------|
| 0 - 20 ms  | 194 (16%) | 194 (16%)  | 19ms |
| 20 - 40 ms | 735 (61%) | 929 (77%)  | 27ms |
| 40 - 60 ms | 212 (18%) | 1141 (95%) | 45ms |
| > 60 ms    | 55 (5%)   | 1196       | 64ms |

## Related Commands

| Command                                   | Description                                                           |
|-------------------------------------------|-----------------------------------------------------------------------|
| <a href="#">buckets size, on page 277</a> | Configures the size of the buckets in which statistics are collected. |

# sla operation

To create an operation instance from a maintenance end point (MEP) to a specified destination, use the **sla operation** command in interface CFM MEP configuration mode. To remove the operation, use the **no** form of this command.

**sla operation profile** *profile-name* **target** {**mep-id** *id*| **mac-address** *mac-address*}

**no sla operation profile** *profile-name* **target** {**mep-id** *id*| **mac-address** *mac-address*}

## Syntax Description

|                                       |                                                                            |
|---------------------------------------|----------------------------------------------------------------------------|
| <b>profile</b> <i>profile-name</i>    | Name of the profile to assign this operation.                              |
| <b>target mep-id</b> <i>id</i>        | Destination MEP ID. The range is 1 to 8191.                                |
| <b>mac-address</b> <i>mac-address</i> | Destination MAC address in standard hexadecimal format, hh:hh:hh:hh:hh:hh. |

## Command Default

No operations are configured

## Command Modes

Interface CFM MEP configuration (config-if-cfm-mep)

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 4.1.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **sla operation** command is supported on all Ethernet interfaces.

Multiple SLA operation instances may be configured under each MEP, and may have different targets, and may be assigned to different profiles.

If an operation is assigned to a nonexistent profile, a warning message is issued, and the offending configuration is shown in the output of the related show commands.

Changing the configuration of an SLA operation is equivalent to deleting the operation and creating a new operation. All stored data for the operation is discarded.

When **target mep-id** is specified, the operation is activated only if that MEP is in the peer MEP database. You can verify that a MEP is in the database, using the **show ethernet cfm peer meps** command.



**Task ID**

| Task ID           | Operations  |
|-------------------|-------------|
| ethernet-services | read, write |

**Examples**

The following example shows how to create an SLA operation instance using a profile named “Profile\_1” to a destination MEP with the specified MAC address:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/1
RP/0/0/CPU0:router(config-if)# ethernet cfm
RP/0/0/CPU0:router(config-if-cfm)# mep domain Dm1 service Sv1 mep-id 1
RP/0/0/CPU0:router(config-if-cfm-mep)# sla operation profile Profile_1 target mac-address
01:23:45:67:89:ab
```

**Related Commands**

| Command                                                  | Description                                                             |
|----------------------------------------------------------|-------------------------------------------------------------------------|
| <a href="#">show ethernet cfm peer meps, on page 418</a> | Displays information about maintenance end points (MEPs) for peer MEPs. |

## snmp-server traps ethernet cfm

To enable SNMP traps for Ethernet Connectivity Fault Management (CFM), use the **snmp-server traps ethernet cfm** command in global configuration mode.

**snmp-server traps ethernet cfm**

**Syntax Description** This command has no keywords or arguments.

**Command Default** Ethernet OAM event traps are not enabled.

**Command Modes** Global configuration (config)

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 4.0.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | snmp    | read, write |

**Examples** The following example shows how to enable SNMP server traps on an Ethernet OAM interface.

```
RP/0/0/CPU0:router #configure
RP/0/0/CPU0:router(config)# snmp-server traps ethernet cfm
```

## snmp-server traps ethernet oam events

To enable SNMP traps for Ethernet OAM events, use the **snmp-server traps ethernet oam events** command in global configuration mode.

**snmp-server traps ethernet oam events**

**Syntax Description** This command has no keywords or arguments.

**Command Default** Ethernet OAM event traps are not enabled.

**Command Modes** Global configuration (config)

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 4.0.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | snmp    | read, write |

**Examples** The following example shows how to enable SNMP server traps on an Ethernet OAM interface.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# snmp-server traps ethernet oam events
```

## statistics measure

To enable the collection of Ethernet Service Level Agreement (SLA) statistics, and enter the SLA profile statistics configuration mode, use the **statistics measure** command in SLA profile configuration mode. To disable statistics collection, use the **no** form of this command.

**statistics measure** {**one-way-delay-ds**| **one-way-delay-sd**| **one-way-jitter-ds**| **one-way-jitter-sd**| **round-trip-delay**| **round-trip-jitter**}

**no statistics measure** {**one-way-delay-ds**| **one-way-delay-sd**| **one-way-jitter-ds**| **one-way-jitter-sd**| **round-trip-delay**| **round-trip-jitter**}

### Syntax Description

|                          |                                                                                                                                                                           |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>one-way-delay-ds</b>  | (CFM delay measurement profile type only) Enables the collection of statistics that measure delay in one direction, from destination to source.                           |
| <b>one-way-delay-sd</b>  | (CFM delay measurement profile type only) Enables the collection of statistics that measure delay in one direction, from source to destination.                           |
| <b>one-way-jitter-ds</b> | (CFM delay measurement profile type only) Enables the collection of statistics that measure delay variance in one direction, from destination to source.                  |
| <b>one-way-jitter-sd</b> | (CFM delay measurement profile type only) Enables the collection of statistics that measure delay variance in one direction, from source to destination.                  |
| <b>round-trip-delay</b>  | (CFM delay measurement and CFM loopback profile types only) Enables the collection of statistics that measure the delay in the round trip of a packet.                    |
| <b>round-trip-jitter</b> | (CFM delay measurement and CFM loopback profile types only) Enables the collection of statistics that measure the amount of delay variance in the round trip of a packet. |

### Command Default

No statistics are collected

### Command Modes

SLA profile configuration (config-sla-prof)

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 4.1.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For statistics to be collected, at least one statistics entry must be present in each profile. To measure more than one type of statistic, this command may be configured more than once in a single profile.

The one-way delay and jitter statistics are available for CFM delay measurement profile types only (**profile (SLA)** command with the **type cfm-delay-measurement** keywords).

### Task ID

| Task ID           | Operations  |
|-------------------|-------------|
| ethernet-services | read, write |

### Examples

This example shows how to enable the collection of round-trip-delay statistics, and enter the SLA profile statistics configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet sla
RP/0/0/CPU0:router(config-sla)# profile Prof1 type cfm-loopback
RP/0/0/CPU0:router(config-sla-prof)# statistics measure round-trip-delay
RP/0/0/CPU0:router(config-sla-prof-stat-cfg)#
```

### Related Commands

| Command                                     | Description                                                                    |
|---------------------------------------------|--------------------------------------------------------------------------------|
| <a href="#">ethernet sla</a> , on page 321  | Enters the Ethernet SLA configuration mode.                                    |
| <a href="#">profile (SLA)</a> , on page 384 | Creates an SLA operation profile and enter the SLA profile configuration mode. |

# traceroute cache

To set the maximum limit of traceroute cache entries or the maximum time limit to hold the traceroute cache entries, use the **traceroute cache** command in CFM configuration mode. To return the traceroute cache to its default limits, use the **no** form of this command.

**traceroute cache hold-time** *minutes* **size** *entries*

**no traceroute cache hold-time** *minutes* **size** *entries*

## Syntax Description

|                                 |                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>hold-time</b> <i>minutes</i> | Timeout value in minutes that entries are held in the Ethernet CFM traceroute cache table before being cleared. Range is 1 minute or greater.    |
| <b>size</b> <i>entries</i>      | Maximum number of entries that are stored in the Ethernet CFM traceroute cache table. An entry is a single traceroute reply. Range is 1 to 5000. |

## Command Default

**hold-time:** 100

**size:** 100

## Command Modes

CFM configuration (config-cfm)

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

A separate cache is managed for each node that sends a traceroute request. All replies to a single traceroute request are cached at once. The **hold-time** begins when the last reply to a request is received. When the **hold-time** limit is reached, all replies to that request are cleared. The size of each traceroute reply is limited by the MTU of the interface.

When the maximum number of entries (**size entries**) is exceeded, all replies for the oldest request are deleted.

## Task ID

| Task ID           | Operations  |
|-------------------|-------------|
| ethernet-services | read, write |

## Examples

The following example shows how to set the **hold-time** and the **size** of a traceroute cache.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# ethernet cfm
RP/0/0/CPU0:router(config-cfm)# traceroute cache hold-time 1 size 3000
```

## Related Commands

| Command                                              | Description                                                 |
|------------------------------------------------------|-------------------------------------------------------------|
| <a href="#">ethernet cfm (global), on page 315</a>   | Enters CFM configuration mode.                              |
| <a href="#">traceroute ethernet cfm, on page 462</a> | Sends Ethernet CFM traceroute messages to generate a basic. |

## traceroute ethernet cfm

To send Ethernet connectivity fault management (CFM) traceroute messages to generate a basic, targeted, or exploratory traceroute, use the **traceroute ethernet** command in EXEC mode.

**traceroute ethernet cfm domain** *domain-name* **service** *service-name* [**mac-address** *target-mac-address* | **mep-id** *target-mep-id*] **explore** [**all-ports**] [**from** *from-mac-address*] **source** [**mep-id** *source-mep-id*] **interface** *type interface-path-id* [**asynchronous**] [**timeout** *seconds*] [**filtering-db-only**] [**cos** *cos-no*] [**ttl** *ttl*] [**detail**]

### Syntax Description

|                                              |                                                                                                                                                                                                                                                                                 |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>domain</b> <i>domain-name</i>             | String of a maximum of 80 characters that identifies the domain in which the destination MEP resides. (Basic traceroute)                                                                                                                                                        |
| <b>service</b> <i>service-name</i>           | String of a maximum of 80 characters that identifies the maintenance association to which the destination MEP belongs. (Basic traceroute)                                                                                                                                       |
| <b>mac-address</b> <i>target-mac-address</i> | Identifies the 6-byte MAC address (in hexadecimal H.H.H format) of the destination MEP. (Targeted traceroute)                                                                                                                                                                   |
| <b>mep-id</b> <i>target-mepid</i>            | Destination maintenance end point (MEP) ID number. The range for MEP ID numbers is 1 to 8191. (Targeted traceroute)                                                                                                                                                             |
| <b>explore</b>                               | (Optional) Specifies that an exploratory traceroute is performed.                                                                                                                                                                                                               |
| <b>all-ports</b>                             | (Optional) Specifies an exploratory traceroute of all ports.                                                                                                                                                                                                                    |
| <b>from</b> <i>from-mac-address</i>          | (Optional) Specifies an exploratory traceroute beginning at the specified MAC address (in hexadecimal H.H.H format).                                                                                                                                                            |
| <b>source</b>                                | Specifies source information for the traceroute.                                                                                                                                                                                                                                |
| <b>mep-id</b> <i>source-mep-id</i>           | (Optional) Source maintenance end point (MEP) ID number. The range for MEP ID numbers is 1 to 8191.                                                                                                                                                                             |
| <b>interface</b> <i>type</i>                 | Source interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                    |
| <i>interface-path-id</i>                     | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>asynchronous</b>                          | (Optional) Specifies that the traceroute is performed asynchronously, where control is returned to the command prompt immediately, and no results are displayed. The results can be displayed later using the <b>show ethernet cfm traceroute-cache</b> command.                |



|                               |                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>timeout</b> <i>seconds</i> | (Optional) Timeout value (in seconds) for the specified interface. For a basic traceroute, the timeout is a fixed value that defaults to 5 seconds. For an exploratory traceroute, a logarithmic algorithm is used unless this value is specified.                                                                                                                                        |
| <b>filtering-db-only</b>      | (Optional) Sets whether or not the remote maintenance points should base their responses on the filtering database only. The default is no—use both the filtering and MIP-CCM databases.<br><br><b>Note</b> The <b>filtering-db-only</b> option is only available for basic traceroute (when the MAC address or MEP ID is specified). It is not available with the <b>explore</b> option. |
| <b>cos</b> <i>cos-no</i>      | (Optional) Identifies the class of traffic of the source MEP by setting a Class of Service (CoS) value. The valid values are from 0 to 7.                                                                                                                                                                                                                                                 |
| <b>ttl</b> <i>tll</i>         | Specifies the initial time-to-live (TTL) value (from 1 to 255) for the traceroute message. The default is 64.                                                                                                                                                                                                                                                                             |
| <b>detail</b>                 | (Optional) Specifies that details are displayed in the output for the traceroute.                                                                                                                                                                                                                                                                                                         |

**Command Default**

No default behavior or values

**Command Modes**

EXEC (#)

**Command History**

| Release       | Modification                 |
|---------------|------------------------------|
| Release 4.0.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

By default, this command pauses until the traceroute operation is complete, then displays the results. If the **asynchronous** option is used, this command returns immediately and no results are displayed. Results are placed placed the traceroute cache and can be retrieved using the **show ethernet cfm traceroute-cache** command.

An exploratory traceroute, by default uses a **timeout** value that is calculated by a logarithmic delay algorithm. If the **timeout** value is specified, the specified value is used.

The display output of this command is similar to the output of the **show ethernet cfm traceroute-cache** command.

**Task ID**

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

**Examples**

The following example shows how generate a basic traceroute:

```
RP/0/0/CPU0:router# tracroute ethernet cfm domain bar service bar mep-id 1 source interface gigabitethernet 0/0/0/0
```

```
Traceroutes in domain bar (level 4), service bar
Source: MEP-ID 1, interface GigabitEthernet0/0/0/0
```

```
=====
Traceroute at 2009-05-18 12:09:10 to 0001.0203.0402,
TTL 64, Trans ID 2:
```

| Hop | Hostname/Last              | Ingress MAC/name                   | Egress MAC/Name                    | Relay |
|-----|----------------------------|------------------------------------|------------------------------------|-------|
| 1   | ios<br>0000-0001.0203.0400 | 0001.0203.0400 [Down]<br>Gi0/0/0/0 |                                    | FDB   |
| 2   | abc<br>ios                 |                                    | 0001.0203.0401 [Ok]<br>Not present | FDB   |
| 3   | bcd<br>abc                 | 0001.0203.0402 [Ok]<br>GigE0/0     |                                    | Hit   |

Replies dropped: 0

**Related Commands**

| Command                                                          | Description                                                                                                        |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <a href="#">tracroute cache, on page 460</a>                     | Sets the maximum limit of traceroute cache entries or the maximum time limit to hold the traceroute cache entries. |
| <a href="#">clear ethernet cfm traceroute-cache, on page 286</a> | Removes the contents of the traceroute cache.                                                                      |
| <a href="#">show ethernet cfm traceroute-cache, on page 425</a>  | Displays the contents of the traceroute cache.                                                                     |



# Frame Relay Commands on the Cisco IOS XR Software

---

This module provides CLI commands for configuring Frame Relay services on the Cisco XR 12000 Series Router.

- [clear frame-relay multilink interface, page 467](#)
- [clear frame-relay lmi interface, page 469](#)
- [encap \(PVC\), page 471](#)
- [encapsulation frame-relay, page 473](#)
- [frame-relay intf-type, page 475](#)
- [frame-relay lmi disable, page 476](#)
- [frame-relay lmi-n391dte, page 477](#)
- [frame-relay lmi-n392dce, page 479](#)
- [frame-relay lmi-n392dte, page 481](#)
- [frame-relay lmi-n393dce, page 482](#)
- [frame-relay lmi-n393dte, page 484](#)
- [frame-relay lmi-t391dte, page 485](#)
- [frame-relay lmi-t392dce, page 487](#)
- [frame-relay lmi-type, page 489](#)
- [frame-relay multilink ack, page 491](#)
- [frame-relay multilink bandwidth-class, page 493](#)
- [frame-relay multilink bid, page 495](#)
- [frame-relay multilink hello, page 497](#)
- [frame-relay multilink lid, page 499](#)
- [frame-relay multilink retry, page 501](#)
- [pvc \(frame relay\), page 503](#)

- [show frame-relay lmi, page 505](#)
- [show frame-relay lmi-info, page 508](#)
- [show frame-relay multilink, page 511](#)
- [show frame-relay pvc, page 518](#)
- [show frame-relay vcm-info interface, page 522](#)
- [show interfaces \(frame relay\), page 524](#)
- [snmp-server traps frame-relay pvc, page 529](#)

# clear frame-relay multilink interface

To clear the multilink frame-relay (MFR) statistics for the given interface or location, use the **clear frame-relay multilink interface** command in EXEC mode.

**clear frame-relay multilink interface** {*type interface-path-id*} **all** [**location node id**]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>              | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | Clears MFR statistics for all interfaces                                                                                                                                                                                                                                        |
| <b>location node-id</b>  | (Optional) Clears MFR statistics for all interfaces at the location specified by <i>node-id</i> . The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                               |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---------|------------|
| fr      | execute    |

## Examples

The following example shows how to use the **clear frame-relay multilink interface** command to clear the multilink frame-relay protocol and internal statistics on an interface:

```
RP/0/0/CPU0:router# clear frame-relay multilink interface serial 0/1/0/0
```

## Related Commands

| Command                                                 | Description                                       |
|---------------------------------------------------------|---------------------------------------------------|
| <a href="#">show frame-relay lmi-info</a> , on page 508 | Displays Frame Relay information for the LMI.     |
| <a href="#">show interfaces multilink</a> , on page 655 | Displays information about a multilink interface. |

# clear frame-relay lmi interface

To clear the LMI statistics for the given interface or location, use the **clear frame-relay lmi** command in EXEC mode.

**clear frame-relay lmi interface** {*type interface-path-id*} **all** [**location** *node id*]

## Syntax Description

|                                |                                                                                                                                                                                                                                                                                 |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>                    | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i>       | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>                     | Clears LMI statistics for all interfaces                                                                                                                                                                                                                                        |
| <b>location</b> <i>node-id</i> | (Optional) Clears LMI statistics for all interfaces at the location specified by <i>node-id</i> . The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                               |

## Command Default

No default behavior or values

## Command Modes

EXEC (#)

## Command History

| Release       | Modification                      |
|---------------|-----------------------------------|
| Release 3.5.0 | This command was introduced.      |
| Release 3.6.0 | The keyword <b>all</b> was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---------|------------|
| fr      | execute    |

## Examples

The following example shows how to use the **clear frame-relay lmi** command to clear the LMI counters on an interface:

```
RP/0/0/CPU0:router# clear frame-relay lmi interface pos 0/1/0/0
```

## Related Commands

| Command                                            | Description                                  |
|----------------------------------------------------|----------------------------------------------|
| <a href="#">show frame-relay lmi</a> , on page 505 | Displays Frame Relay statistics for the LMI. |



## encap (PVC)

To change the encapsulation for a Frame Relay permanent virtual circuit (PVC), use the **encap** command in Frame Relay PVC configuration mode. To restore default encapsulation from the Frame Relay main interface, use the **no** form of this command.

**encap** {cisco|ietf}

**no encap** {cisco|ietf}

### Syntax Description

|              |                                                                                                                                                                                                                                               |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>cisco</b> | (Optional) Uses Cisco encapsulation, which is a 4-byte header, with 2 bytes to identify the data-link connection identifier (DLCI) and 2 bytes to identify the packet type.                                                                   |
| <b>ietf</b>  | (Optional) Sets the encapsulation method to comply with the Internet Engineering Task Force (IETF) standard (RFC 1490). Use this keyword when connecting to equipment that belongs to a vendor other than Cisco across a Frame Relay network. |

### Command Default

The default encapsulation keyword is Cisco.

When this command is not configured, encapsulation is inherited from the Frame Relay main interface.

### Command Modes

Frame Relay PVC configuration (config-fr-vc)

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

### Usage Guidelines

Use the **encap** command to configure encapsulation for a Frame Relay PVC. If this command is not configured, encapsulation is inherited from the Frame Relay subinterface.

This command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows how to set encapsulation on PVC data-link connection identifier (DLCI) 16 for Packet-over-SONET/SDH (POS) subinterface 0/4/0/1.1:

```
RP/0/0/CPU0:router(config)# interface POS 0/4/0/1.1 12transport
RP/0/0/CPU0:router(config-subif)# pvc 16
RP/0/0/CPU0:router(config-fr-vc)# encap ietf
```

## Related Commands

| Command                                                | Description                        |
|--------------------------------------------------------|------------------------------------|
| <a href="#">encapsulation frame-relay, on page 473</a> | Enables Frame Relay encapsulation. |

# encapsulation frame-relay

To enable Frame Relay encapsulation, use the **encapsulation frame-relay** command in interface configuration mode. To disable Frame Relay encapsulation, use the **no** form of this command.

**encapsulation frame-relay [ietf]**

**no encapsulation frame-relay [ietf]**

## Syntax Description

|             |                                                                                                                                                                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ietf</b> | (Optional) Sets the encapsulation method to comply with the Internet Engineering Task Force (IETF) standard (RFC 1490). Use this keyword when connecting to equipment from another vendor across a Frame Relay network. |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default encapsulation method is Cisco.

## Command Modes

Interface configuration (config-if)

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **encapsulation frame-relay** command to connect an interface to a Frame Relay network. When this command is configured, outgoing packets are encapsulated with a Frame Relay header and Frame Relay headers are removed from incoming packets to the interface.

A Cisco or IETF encapsulation method controls the Network Layer Protocol Identifier (NLPID) that is added to outgoing packets on the interface. The encapsulation method enabled for an outgoing packet can be changed for each data-link connection identifier (DLCI) per subinterface by using the **encap (PVC)** command in Frame Relay PVC configuration mode.

When the **encapsulation frame-relay** command is configured, LMI is enabled by default. To disable LMI use the **frame-relay lmi disable** command.

The following restrictions apply to the **encapsulation frame-relay** command upon configuration or removal of the command on an interface:

- When configuring this command, Layer 3 and Layer 2 configurations are not allowed on the interface.
- Before removing this command, all Frame Relay subinterfaces and LMI configuration should be deleted from the interface.

The **encapsulation frame-relay** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |
| fr        | read, write |

**Examples**

The following example shows Frame Relay encapsulation configured on Packet-over-SONET/SDH (POS) 0/3/0/1:

```
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation frame-relay ietf
```

**Related Commands**

| Command                                              | Description                                      |
|------------------------------------------------------|--------------------------------------------------|
| <a href="#">encap (PVC), on page 471</a>             | Changes the encapsulation for a Frame Relay PVC. |
| <a href="#">frame-relay lmi disable, on page 476</a> | Disables the Frame Relay LMI.                    |

# frame-relay intf-type

To configure the interface type of the User-Network Interface (UNI), use the **frame-relay intf-type** command in interface configuration mode. To change the configuration, use the **no** form of this command.

**frame-relay intf-type** {dce| dte}

**no frame-relay intf-type** {dce| dte}

## Syntax Description

|            |                                                     |
|------------|-----------------------------------------------------|
| <b>dce</b> | Router functions as a switch connected to a router. |
| <b>dte</b> | Router is connected to a Frame Relay network.       |

## Command Default

DTE

## Command Modes

Interface configuration (config-if)

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **frame-relay intf-type** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows how to configure a DCE switch type on the interface:

```
RP/0/0/CPU0:router(config)# interface pos 0/4/0/0
RP/0/0/CPU0:router(config-if)# frame-relay intf-type dce
```

## frame-relay lmi disable

To disable the Frame Relay Local Management Interface (LMI), use the **frame-relay lmi disable** command in interface configuration mode. To reenable LMI, use the **no** form of this command.

**frame-relay lmi disable**

**no frame-relay lmi disable**

**Syntax Description** This command has no keywords or arguments.

**Command Default** LMI is enabled.

**Command Modes** Interface configuration (config-if)

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **frame-relay lmi disable** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

**Examples** The following example shows how to configure a DCE switch type on the interface:

```
RP/0/0/CPU0:router(config)# interface pos 0/4/0/0
RP/0/0/CPU0:router(config-if)# frame-relay lmi disable
```

## frame-relay lmi-n391dte

To set the full status polling interval, use the **frame-relay lmi-n391dte** command in interface configuration mode. To restore the default interval value, use the **no** form of this command.

**frame-relay lmi-n391dte** *polling-cycles*

**no frame-relay lmi-n391dte** *polling-cycles*

### Syntax Description

|                       |                                                                                                                                                    |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>polling-cycles</i> | Number of Line Integrity Verification (LIV) exchanges performed before requesting a full status message. Range is from 1 to 255. The default is 6. |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|

### Command Default

The full status polling interval is 6.

### Command Modes

Interface configuration (config-if)

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **frame-relay lmi-n391dte** command to set the full status message polling interval. This command is relevant only when the interface type is data terminal equipment (DTE).

Two message types are supported: status inquiry and status. Status inquiry messages are sent from DTE to DCE. Status messages are sent from DCE to DTE (in response to a status inquiry). The Status (Full) and LIV report types are contained within these messages, and typically there is one status transaction for every five LIV transactions.

This command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows that one out of every four status inquiries generated requests a full status response from the DCE on the interface:

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/1
RP/0/0/CPU0:router(config-if)# frame-relay intf-type dte
RP/0/0/CPU0:router(config-if)# frame-relay lmi-n391dte 4
```



# frame-relay lmi-n392dce

To set the error threshold on a DCE interface, use the **frame-relay lmi-n392dce** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**frame-relay lmi-n392dce threshold**

**no frame-relay lmi-n392dce threshold**

| Syntax Description |                                                             |
|--------------------|-------------------------------------------------------------|
| <i>threshold</i>   | Error threshold value. Range is from 1 to 10. Default is 3. |

| Command Default | The DCE error threshold is 3. |
|-----------------|-------------------------------|
|-----------------|-------------------------------|

| Command Modes | Interface configuration (config-if) |
|---------------|-------------------------------------|
|---------------|-------------------------------------|

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.4.0 | This command was introduced. |

| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

N392 errors must occur within the number defined by the N393 event count for the link to be declared down. Therefore, the threshold value for this command must be less than the count value defined in the **frame-relay lmi-n393dce** command.

The **frame-relay lmi-n392dce** command is relevant only when the interface type is data communication equipment (DCE).

This command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | fr      | read, write |

| Examples | The following example shows how to set the Local Management Interface (LMI) failure threshold to 4. The router acts as a Frame Relay DCE switch: |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/1
RP/0/0/CPU0:router(config-if)# frame-relay intf-type dce
```

```
RP/0/0/CPU0:router(config-if)# frame-relay lmi-n392dce 4
```

**Related Commands**

| Command                                              | Description                          |
|------------------------------------------------------|--------------------------------------|
| <a href="#">frame-relay lmi-n393dce, on page 482</a> | Sets the DCE monitored events count. |

# frame-relay lmi-n392dte

To set the error threshold on a DTE interface, use the **frame-relay lmi-n392dte** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**frame-relay lmi-n392dte threshold**

**no frame-relay lmi-n392dte threshold**

| Syntax Description |                                                                 |
|--------------------|-----------------------------------------------------------------|
| <i>threshold</i>   | Error threshold value. Range is from 1 to 10. The default is 3. |

| Command Default | The DTE error threshold is 3. |
|-----------------|-------------------------------|
|-----------------|-------------------------------|

| Command Modes | Interface configuration (config-if) |
|---------------|-------------------------------------|
|---------------|-------------------------------------|

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.4.0 | This command was introduced. |

| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The **frame-relay lmi-n392dte** command is relevant only when the interface type is data terminal equipment (DTE).

This command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | fr      | read, write |

| Examples | The following example shows how to set the Local Management Interface (LMI) failure threshold to 4. The router acts as a Frame Relay DTE switch. |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/1
RP/0/0/CPU0:router(config-if)# frame-relay intf-type dte
RP/0/0/CPU0:router(config-if)# frame-relay lmi-n392dte 4
```

## frame-relay lmi-n393dce

To set the DCE monitored events count, use the **frame-relay lmi-n393dce** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**frame-relay lmi-n393dce** *events*

**no frame-relay lmi-n393dce** *events*

### Syntax Description

|               |                                                                  |
|---------------|------------------------------------------------------------------|
| <i>events</i> | Monitored events count. Range is from 1 to 10. The default is 4. |
|---------------|------------------------------------------------------------------|

### Command Default

The number of DCE monitored events is 4.

### Command Modes

Interface configuration (config-if)

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **frame-relay lmi-n393dce** command is used along with the **frame-relay lmi-n392dce** command to define the condition that causes the link to be declared down.

N392 errors must occur within the *events* argument count in order for the link to be declared down. Therefore, the events value defined in this command must be greater than the threshold value defined in the **frame-relay lmi-n392 dce** command.

The **frame-relay lmi-n393dce** command is relevant only when the interface type is data communication equipment (DCE).

This **frame-relay lmi-n393dce** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows how to set the Local Management Interface (LMI) monitored events count to 5.

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/1
RP/0/0/CPU0:router(config-if)# frame-relay intf-type dce
RP/0/0/CPU0:router(config-if)# frame-relay lmi-n393dce 5
```

## Related Commands

| Command                                              | Description                                  |
|------------------------------------------------------|----------------------------------------------|
| <a href="#">frame-relay lmi-n392dce, on page 479</a> | Sets the error threshold on a DCE interface. |

## frame-relay lmi-n393dte

To set the monitored event count on a DTE interface, use the **frame-relay lmi-n393dte** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**frame-relay lmi-n393dte** *events*

**no frame-relay lmi-n393dte** *events*

### Syntax Description

|               |                                                                  |
|---------------|------------------------------------------------------------------|
| <i>events</i> | Monitored events count. Range is from 1 to 10. The default is 4. |
|---------------|------------------------------------------------------------------|

### Command Default

The number of DTE monitored events is 4.

### Command Modes

Interface configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **frame-relay lmi-n393dte** command is relevant only when the interface type is data terminal equipment (DTE).

This **frame-relay lmi-n393dte** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

### Examples

The following example shows how to set the Local Management Interface (LMI) monitored events count to 5.

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/1
RP/0/0/CPU0:router(config-if)# frame-relay intf-type dte
RP/0/0/CPU0:router(config-if)# frame-relay lmi-n393dte 5
```

## frame-relay lmi-t391dte

To set the Local Management Interface (LMI) polling interval, use the **frame-relay lmi-t391dte** command in interface configuration mode. To restore the default interval value, use the **no** form of this command.

**frame-relay lmi-t391dte** *seconds*

**no frame-relay lmi-t391dte** *seconds*

### Syntax Description

|                |                                                                                                                      |
|----------------|----------------------------------------------------------------------------------------------------------------------|
| <i>seconds</i> | Polling interval between each status inquiry from the DTE end, in seconds. Range is from 5 to 30. The default is 10. |
|----------------|----------------------------------------------------------------------------------------------------------------------|

### Command Default

The LMI polling interval is 10 seconds.

### Command Modes

Interface configuration (config-if)

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This **frame-relay lmi-t391dte** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

The *seconds* value defined in this command must be less than the polling verification timer defined in the **frame-relay lmi-t392 dce** command.

The **frame-relay lmi-t391dte** command is relevant only when the interface type is data terminal equipment (DCE).

### Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

### Examples

The following example shows how to set the LMI polling timer interval to 15 seconds:

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/1
RP/0/0/CPU0:router(config-if)# frame-relay intf-type dte
```

```
RP/0/0/CPU0:router(config-if)# frame-relay lmi-t391dte 15
```



## frame-relay lmi-t392dce

To set the Local Management Interface (LMI) polling verification timer on the DCE, use the **frame-relay lmi-t392dce** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**frame-relay lmi-t392dce** *seconds*

**no frame-relay lmi-t392dce** *seconds*

### Syntax Description

|                |                                                                                       |
|----------------|---------------------------------------------------------------------------------------|
| <i>seconds</i> | Polling verification timer, in seconds. The range is from 5 to 30. The default is 15. |
|----------------|---------------------------------------------------------------------------------------|

### Command Default

The LMI polling verification timer is 15 seconds.

### Command Modes

Interface configuration (config-if)

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **frame-relay lmi-t392dce** command is used along with the **frame-relay lmi-t391dte** command to define the condition that causes the link to be declared down.

The *seconds* value defined in this command must be greater than the polling verification timer defined in the **frame-relay lmi-t391 dte** command.

This **frame-relay lmi-n392dce** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows how to set the Local Management Interface (LMI) polling timer interval to 30 seconds:

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/1
RP/0/0/CPU0:router(config-if)# frame-relay intf-type dce
RP/0/0/CPU0:router(config-if)# frame-relay lmi-t392dce 30
```

## frame-relay lmi-type

To select the Local Management Interface (LMI) type, use the **frame-relay lmi-type** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**frame-relay lmi-type** [**ansi**| **cisco**| **q933a**]

**no frame-relay lmi-type** [**ansi**| **cisco**| **q933a**]

### Syntax Description

|              |                                                                  |
|--------------|------------------------------------------------------------------|
| <b>ansi</b>  | (Optional) Uses LMI as defined by ANSI T1.617a-1994 Annex D.     |
| <b>cisco</b> | (Optional) Uses LMI as defined by Cisco (not standard).          |
| <b>q933a</b> | (Optional) Uses LMI as defined by ITU-T Q.933 (02/2003) Annex A. |

### Command Default

The default is **cisco**.

### Command Modes

Interface configuration (config-if)

### Command History

| Release       | Modification                                                         |
|---------------|----------------------------------------------------------------------|
| Release 3.4.0 | This command was introduced.                                         |
| Release 3.5.0 | The <b>ccitt</b> keyword was replaced with the <b>q933a</b> keyword. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the DTE is not explicitly configured or the **no** form is not used after explicit configuration, then the DTE automatically senses the LMI type of the DCE and use that type of LMI.

This **frame-relay lmi-type** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows how to set the Local Management Interface (LMI) type to Q.933, Annex A:

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/1
RP/0/0/CPU0:router(config-if)# frame-relay lmi-type q933a
```

# frame-relay multilink ack

To configure the MFR acknowledge timeout value for a Frame Relay multilink bundle link, use the **frame-relay multilink ack** command in interface configuration mode. To revert to the default settings, use the **no** form of this command.

**frame-relay multilink ack** *ack-timeout*

**no frame-relay multilink ack**

## Syntax Description

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <i>ack-timeout</i> | Ack timeout value, in seconds. The range is from 1 to 10. |
|--------------------|-----------------------------------------------------------|

## Command Default

The default MFR acknowledge timeout value is 4 seconds.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.5.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

The **frame-relay multilink ack** command is supported only on serial interfaces. The **frame-relay multilink ack** command is not supported on Packet-over-SONET/SDH (POS) or multilink frame relay interfaces.

The **frame-relay multilink ack** command can be configured only on bundle link interfaces that have been associated with a bundle using the **encapsulation frame-relay mfr** command.



### Note

You can enter the **frame-relay multilink ack** command at any time without affecting the current state of the interface; however, the configured timeout value does not go into effect until the interface has gone from the down state to the up state. One way to bring the interface down and back up again is by using the **shutdown** and **no shutdown** commands in interface configuration mode.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

**Examples**

The following example shows how to configure the MFR acknowledge timeout value as 2 seconds. for the serial interface 0/3/1/0:

```
RP/0/0/CPU0:router(config)# interface serial 0/3/1/0
RP/0/0/CPU0:router(config-if)# frame-relay multilink ack 2
```

**Related Commands**

| Command                                                | Description                                           |
|--------------------------------------------------------|-------------------------------------------------------|
| <a href="#">encapsulation frame-relay, on page 473</a> | Enables Frame Relay encapsulation.                    |
| <a href="#">frame-relay multilink bid, on page 495</a> | Assigns a BID name to a multilink Frame Relay bundle. |
| <a href="#">show frame-relay lmi-info, on page 508</a> | Displays frame relay information for the LMI.         |
| <b>shutdown (interface)</b>                            | Disables an interface.                                |

# frame-relay multilink bandwidth-class

To configure the bandwidth class for a Frame Relay multilink bundle interface, use the **frame-relay multilink bid bandwidth-class** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**frame-relay multilink bandwidth-class** {a| b| c *threshold*}

**no frame-relay multilink bandwidth-class**

## Syntax Description

|                  |                                                                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>a</b>         | Configures bandwidth class A. When one or more member links are up, the bundle interface is up. When all the member links are down, the bundle interface is down. |
| <b>b</b>         | Configures bandwidth class B. When all the member links are up, the bundle interface is up. When any member link is down, the bundle interface is down.           |
| <b>c</b>         | Configures bandwidth class C. The bundle link <i>threshold</i> must be configured.                                                                                |
| <i>threshold</i> | Minimum number of links that must be up for the bundle interface to be up. The range is 1 to 255.                                                                 |

## Command Default

The default is a (Bandwidth Class A).

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Bandwidth class is configurable only under Frame Relay Forum 16.1 (FRF 16.1).



### Note

The **frame-relay multilink bandwidth-class** command is supported only on multilink frame relay interfaces. The **frame-relay multilink bandwidth-class** command is not supported on Packet-over-SONET/SDH (POS) or serial interfaces.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

**Examples**

The following example shows how to set a multilink frame relay interface to bandwidth Class C with a threshold of 3:

```
RP/0/0/CPU0:router(config)# interface Multilink 0/3/1/0/100  
RP/0/0/CPU0:router(config-if)# frame-relay multilink bandwidth-class c 3
```

**Related Commands**

| Command                                                | Description                                   |
|--------------------------------------------------------|-----------------------------------------------|
| <a href="#">show frame-relay lmi-info, on page 508</a> | Displays Frame Relay information for the LMI. |



# frame-relay multilink bid

To create a name for a Frame Relay multilink bundle interface, use the **frame-relay multilink bid** command in interface configuration mode. To restore the default setting, use the **no** form of this command.

**frame-relay multilink bid bundle-id-name**

**no frame-relay multilink bid**

## Syntax Description

*bundle-id-name* Name for the Frame Relay multilink bundle. The bundle identifier (**bid**) name identifies the bundle interface at both endpoints. The **bid** name is exchanged in the information elements to ensure consistent link assignments. The **bid** name can be up to 50 characters including the null termination character. The **bid** name is configured at the bundle interface level and is applied to each member link.

## Command Default

By default, the interface name, for example, Multilink 0/4/1/0/1, is used as the bundle identifier.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

The **frame-relay multilink bid** command is supported only on multilink frame relay interfaces. The **frame-relay multilink bid** command is not supported on Packet-over-SONET/SDH (POS) or serial interfaces.

Regardless of whether you create a bundle identifier name using the **frame-relay multilink bid** command or whether the system uses the default name for the interface, each bundle should have a unique name.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows how to create a Frame Relay multilink interface bundle identifier name:

```
RP/0/0/CPU0:router(config)# interface Multilink 0/3/1/0/100  
RP/0/0/CPU0:router(config-if)# frame-relay multilink bid MFRBundle
```

## Related Commands

| Command                                                | Description                                   |
|--------------------------------------------------------|-----------------------------------------------|
| <a href="#">show frame-relay lmi-info, on page 508</a> | Displays Frame Relay information for the LMI. |

# frame-relay multilink hello

To configure the hello interval used by a Frame Relay multilink bundle link, use the **frame-relay multilink hello** command in interface configuration mode. To reset the name to the default, use the **no** form of this command.

**frame-relay multilink hello** *hello-interval*  
**no frame-relay multilink hello**

## Syntax Description

|                       |                                                                                                   |
|-----------------------|---------------------------------------------------------------------------------------------------|
| <i>hello-interval</i> | Hello interval for the Frame Relay multilink bundle link, in seconds. The range is from 1 to 180. |
|-----------------------|---------------------------------------------------------------------------------------------------|

## Command Default

The default hello interval is 10 seconds.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.5.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

The **frame-relay multilink hello** command is supported only on serial interfaces. The **frame-relay multilink hello** command is not supported on Packet-over-SONET/SDH (POS) or multilink frame relay interfaces.

The **frame-relay multilink hello** command can be configured only on bundle link interfaces that have been associated with a bundle using the **encapsulation frame-relay mfr** command.



### Note

You can enter the **frame-relay multilink hello** command at any time without affecting the current state of the interface; however, the configured hello interval value does not go into effect until the interface has gone from the down state to the up state. One way to bring the interface down and back up again is by using the **shutdown** and **no shutdown** commands in interface configuration mode.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

**Examples**

The following example shows how to configure the hello interval value as 10 seconds. for the serial interface 0/3/1/0:

```
RP/0/0/CPU0:router(config)# interface serial 0/3/1/0
RP/0/0/CPU0:router(config-if)# frame-relay multilink hello 10
```

**Related Commands**

| Command                                                | Description                                           |
|--------------------------------------------------------|-------------------------------------------------------|
| <a href="#">encapsulation frame-relay, on page 473</a> | Enables Frame Relay encapsulation.                    |
| <a href="#">frame-relay multilink bid, on page 495</a> | Assigns a BID name to a multilink Frame Relay bundle. |
| <a href="#">show frame-relay lmi-info, on page 508</a> | Displays frame relay information for the LMI.         |
| shutdown (interface)                                   | Disables an interface.                                |

# frame-relay multilink lid

To create a name for a Frame Relay multilink bundle link, use the **frame-relay multilink lid** command in interface configuration mode. To reset the name to the default, use the **no** form of this command.

**frame-relay multilink lid** *link-id name*

**no frame-relay multilink lid**

## Syntax Description

|                     |                                                                                                                               |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <i>link-id name</i> | Specifies the name for the Frame Relay multilink bundle link. The link identifier (lid) name can be up to 49 characters long. |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The name of the physical interface, for example, Serial 0/3/0/0/1/2:0, is used as the lid.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

The **frame-relay multilink lid** command is supported only on serial interfaces. The **frame-relay multilink lid** command is not supported on Packet-over-SONET/SDH (POS) or multilink frame relay interfaces.

The **frame-relay multilink lid** command can be configured only on bundle link interfaces that have been associated with a bundle using the **encapsulation frame-relay mfr** command.



### Note

You can enter the **frame-relay multilink lid** command at any time without affecting the current state of the interface; however, the link identifier name does not go into effect until the interface has gone from the down state to the up state. One way to bring the interface down and back up again is by using the **shutdown** and **no shutdown** commands in interface configuration mode.

The lid name is used to identify the bundle link to peer devices and to enable the devices to identify which bundle links are associated with which bundles. The lid name can also be assigned when the bundle link is created using the **encapsulation frame-relay mfr** command with the *name* argument. If a lid name is not assigned, the default lid is the name of the physical interface.

The local and peer lid names do not have to be unique. However, regardless of whether you create a lid name using the **frame-relay multilink lid** command or the system uses the default name for the bundle link, each link within a bundle must have a unique name. If the same name is used by different links in the same bundle, the bundles will flap indefinitely.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows how to configure the lid name as 'BL1' for the serial interface 0/3/1/0:

```
RP/0/0/CPU0:router(config)# interface serial 0/3/1/0
RP/0/0/CPU0:router(config-if)# frame-relay multilink lid BL1
```

## Related Commands

| Command                                                | Description                                           |
|--------------------------------------------------------|-------------------------------------------------------|
| <a href="#">encapsulation frame-relay, on page 473</a> | Enables Frame Relay encapsulation.                    |
| <a href="#">frame-relay multilink bid, on page 495</a> | Assigns a BID name to a multilink Frame Relay bundle. |
| <a href="#">show frame-relay lmi-info, on page 508</a> | Displays frame relay information for the LMI.         |
| shutdown (interface)                                   | Disables an interface.                                |

## frame-relay multilink retry

To configure the retry count for retransmissions for a Frame Relay multilink bundle link, use the **frame-relay multilink retry** command in interface configuration mode. To reset the name to the default, use the **no** form of this command.

**frame-relay multilink retry** *retry-count*  
**no frame-relay multilink retry**

### Syntax Description

|                    |                                                            |
|--------------------|------------------------------------------------------------|
| <i>retry-count</i> | Retry count for retransmissions. The range is from 1 to 5. |
|--------------------|------------------------------------------------------------|

### Command Default

The default retry count for retransmissions is 2.

### Command Modes

Interface configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.5.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



#### Note

The **frame-relay multilink retry** command is supported only on serial interfaces. The **frame-relay multilink retry** command is not supported on Packet-over-SONET/SDH (POS) or multilink frame relay interfaces.

The **frame-relay multilink retry** command can be configured only on bundle link interfaces that have been associated with a bundle using the **encapsulation frame-relay mfr** command.



#### Note

You can enter the **frame-relay multilink retry** command at any time without affecting the current state of the interface; however, the configured retry count value does not go into effect until the interface has gone from the down state to the up state. One way to bring the interface down and back up again is by using the **shutdown** and **no shutdown** commands in interface configuration mode.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

**Examples**

The following example shows how to configure the retry count for retransmissions as 2 on the serial interface 0/3/1/0:

```
RP/0/0/CPU0:router(config)# interface serial 0/3/1/0  
RP/0/0/CPU0:router(config-if)# frame-relay multilink retry 2
```

**Related Commands**

| Command                                                | Description                                           |
|--------------------------------------------------------|-------------------------------------------------------|
| <a href="#">encapsulation frame-relay, on page 473</a> | Enables Frame Relay encapsulation.                    |
| <a href="#">frame-relay multilink bid, on page 495</a> | Assigns a BID name to a multilink Frame Relay bundle. |
| <a href="#">show frame-relay lmi-info, on page 508</a> | Displays frame relay information for the LMI.         |
| shutdown (interface)                                   | Disables an interface.                                |



## pvc (frame relay)

To associate a data-link connection identifier (DLCI) number to a permanent virtual circuit (PVC), and to enter Frame Relay PVC configuration mode, use the **pvc** command in subinterface configuration mode. To delete the PVC, use the **no** form of this command.

**pvc** *dlci-number*

**no pvc** *dlci-number*

### Syntax Description

|                    |                                                                     |
|--------------------|---------------------------------------------------------------------|
| <i>dlci-number</i> | DLCI number used to identify the PVC. The range is from 16 to 1007. |
|--------------------|---------------------------------------------------------------------|

### Command Default

No PVC is defined.

### Command Modes

Subinterface configuration (config-subif)

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Commands available in Frame Relay PVC configuration mode are:

```
RP/0/0/CPU0:router(config-fr-vc)# ?
```

|          |                                                |
|----------|------------------------------------------------|
| commit   | Commit the configuration changes to running    |
| describe | Describe a command without taking real actions |
| do       | Run an exec command                            |
| encap    | Set the Encapsulation of this PVC              |
| exit     | Exit from this submode                         |
| no       | Negate a command or set its defaults           |
| show     | Show contents of configuration                 |

The **pvc** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

## Examples

The following example shows how to create a PVC with DLCI 16:

```
RP/0/0/CPU0:router(config)# interface pos 0/4/0/0.1 12transport  
RP/0/0/CPU0:router(config-subif)# pvc 16  
RP/0/0/CPU0:router(config-fr-vc)#
```

# show frame-relay lmi

To display Frame Relay statistics for the Local Management Interface (LMI), use the **show frame-relay lmi** EXEC command.

**show frame-relay lmi** [**interface** *type interface-path-id*] **location** *node-id*]

## Syntax Description

|                                |                                                                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>interface</b>               | (Optional) Interface for which information is to be displayed. Use the <i>interface-path-id</i> argument to specify the interface.                                                                                                                                                         |
| <i>type</i>                    | (Optional) Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i>       | (Optional) Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>location</b> <i>node-id</i> | (Optional) Displays information about all interfaces on the specified node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                                |

## Command Default

Frame Relay LMI statistics are displayed for all interfaces enabled for LMI.

## Command Modes

EXEC (#)

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **show frame-relay lmi** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

This command is used to check the status enquiry and status message between DCE and DTE.

## Task ID

| Task ID | Operations |
|---------|------------|
| fr      | read       |

## Examples

The following example shows the output from the **show frame-relay lmi** command:

```
RP/0/0/CPU0:router# show frame-relay lmi
```

```
LMI Statistics for interface POS0/1/0/0/ (Frame Relay DCE) LMI TYPE = ANSI
  Invalid Unnumbered Info 0      Invalid Prot Disc 0
  Invalid Dummy Call Ref 0      Invalid Msg Type 0
  Invalid Status Message 0      Invalid Lock Shift 9
  Invalid Information ID 0       Invalid Report IE Len 0
  Invalid Report Request 0      Invalid Keep IE Len 0
  Num Status Enq. Rcvd 9444     Num Status Msgs Sent 9444
  Num Full Status Sent 1578     Num St Enq. Timeouts 41
  Num Link Timeouts 7

LMI Statistics for interface POS0/1/0/1/ (Frame Relay DCE) LMI TYPE = CISCO
  Invalid Unnumbered Info 0      Invalid Prot Disc 0
  Invalid Dummy Call Ref 0      Invalid Msg Type 0
  Invalid Status Message 0      Invalid Lock Shift 0
  Invalid Information ID 0       Invalid Report IE Len 0
  Invalid Report Request 0      Invalid Keep IE Len 0
  Num Status Enq. Rcvd 9481     Num Status Msgs Sent 9481
  Num Full Status Sent 1588     Num St Enq. Timeouts 16
  Num Link Timeouts 4
```

**Table 31: show frame-relay lmi Field Descriptions**

| Field                   | Description                                                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| LMI Statistics          | Signaling or LMI specification: CISCO, ANSI, or CCITT.<br><b>Note</b> CCITT is LMI as defined by ITU-T Q.933 (02/2003) Annex A. |
| Invalid Unnumbered Info | Number of received LMI messages with invalid unnumbered information field.                                                      |
| Invalid Dummy Call      | Number of received LMI messages with invalid dummy calls.                                                                       |
| Invalid Status Message  | Number of received LMI messages with invalid status message.                                                                    |
| Invalid Information ID  | Number of received LMI messages with invalid information identifier.                                                            |
| Invalid Report Request  | Number of received LMI messages with invalid report request.                                                                    |

| Field                 | Description                                                                                  |
|-----------------------|----------------------------------------------------------------------------------------------|
| Num Status Enq. Rcvd  | Number of LMI status enquiry messages received.                                              |
| Num Link Timeouts     | Number of link timeouts.                                                                     |
| Invalid Prot Disc     | Number of received LMI messages with invalid protocol discriminator.                         |
| Invalid Msg Type      | Number of received LMI messages with invalid message type.                                   |
| Invalid Lock Shift    | Number of received LMI messages with invalid lock shift type.                                |
| Invalid Report IE Len | Number of received LMI messages with invalid report IE Length.                               |
| Invalid Keep IE Len   | Number of received LMI messages with invalid report request.                                 |
| Num Status Msgs Sent  | Number of LMI status enquiry messages sent.                                                  |
| Num St Enq. Timeouts  | Number of times the status enquiry message was not received within the T392 DCE timer value. |

# show frame-relay lmi-info

To display Frame Relay information for the Local Management Interface (LMI), use the **show frame-relay lmi-info** command in EXEC mode.

**show frame-relay lmi-info** [*interface type interface-path-id*] **location** *node-id*] [**detail**]

## Syntax Description

|                                |                                                                                                                                                                                                                                                                                 |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>interface</b>               | (Optional) Displays information on the the interface specified by the <i>type interface-path-id</i> argument.                                                                                                                                                                   |
| <i>type</i>                    | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i>       | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>location</b> <i>node-id</i> | (Optional) Displays information about all interfaces on the specified node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                     |
| <b>detail</b>                  | (Optional) Displays managed dcli list.                                                                                                                                                                                                                                          |

## Command Default

Displays LMI information for all Frame Relay interfaces enabled for LMI.

## Command Modes

EXEC (#)

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **show frame-relay lmi-info** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

This command is used to check the status enquiry and status message between DCE and DTE.

**Task ID**

| Task ID | Operations |
|---------|------------|
| fr      | read       |

**Examples**

The following example shows sample output for the **show frame-relay lmi-info** command:

```
RP/0/0/CPU0:router# show frame-relay lmi-info
```

```
LMI IDB Info for interface Multilink0/3/0/0/2
ifhandle:          0x6176840
Interface type:     DTE
Interface state:    UP
Line Protocol:      UP
LMI type (cnf/oper): AUTO/CISCO
LMI type autosense: OFF
Interface MTU:      1504
----- DTE -----
T391:               10s
N391: (cnf/oper):    6/5
N392: (cnf/oper):    3/0
N393:               4
My seq#:            83
My seq# seen:       83
Your seq# seen:     82
----- DCE -----
T392:               15s
N392: (cnf/oper):    3/0
N393:               4
My seq#:            0
My seq# seen:       0
Your seq# seen:     0
LMI IDB Info for interface Multilink0/3/0/0/1
ifhandle:          0x6186240
Interface type:     DTE
Interface state:    UP
Line Protocol:      UP
LMI type (cnf/oper): AUTO/CISCO
LMI type autosense: OFF
Interface MTU:      1504
----- DTE -----
T391:               10s
N391: (cnf/oper):    6/5
N392: (cnf/oper):    3/0
N393:               4
My seq#:            83
My seq# seen:       83
Your seq# seen:     82
----- DCE -----
T392:               15s
N392: (cnf/oper):    3/0
N393:               4
My seq#:            0
My seq# seen:       0
Your seq# seen:     0
```

**Table 32: show frame-relay lmi-info Field Descriptions**

| Field | Description |
|-------|-------------|
| DTE   |             |

| Field | Description                                           |
|-------|-------------------------------------------------------|
| T391  | Local Management Interface polling interval           |
| N391  | Full status polling interval                          |
| N392  | Error threshold value                                 |
| N393  | DTE monitored events count                            |
| DCE   |                                                       |
| T392  | Local Management Interface polling verification timer |
| N392  | Error threshold value                                 |
| N393  | DCE monitored events count                            |



# show frame-relay multilink

To display the multilink Frame-Relay (MFR) information about the given interface along with MFR protocol and internal statistics, use the **show frame-relay multilink interface** command in EXEC mode.

**show frame-relay multilink** [**detail** [**location** *node id*]] **interface** *type interface-path-id* [**detail**| **verbose**]| **location** *node id*| **verbose** [**location** *node id*]]

## Syntax Description

|                                |                                                                                                                                                                                                                                                                             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>detail</b>                  | (Optional) Displays Interface Descriptor Block (IDB) information and Feasible Successor Metrics (FSM) statistics.                                                                                                                                                           |
| <b>location</b> <i>node-id</i> | (Optional) Displays information about all interfaces on the specified node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                 |
| <b>interface</b>               | (Optional) Interface for which you want to display information.                                                                                                                                                                                                             |
| <i>type</i>                    | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                       |
| <i>interface-path-id</i>       | Physical interface or virtual interface.<br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>verbose</b>                 | (Optional) Displays IDB information, FSM statistics and internal statistics.                                                                                                                                                                                                |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                          |
|---------------|---------------------------------------|
| Release 3.6.0 | This command was introduced.          |
| Release 3.7.0 | The <b>verbose</b> keyword was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

**Task ID**

| Task ID | Operations |
|---------|------------|
| fr      | read       |

**Examples**

The following example shows how to display the multilink Frame-Relay information for all interfaces:

```
RP/0/0/CPU0:router# show frame-relay multilink

Bundle interface: Multilink0/3/0/0/1, ifhandle 0x060322c0
  Member Links: 2 active, 0 inactive
  State = Up,   BW Class = A

  Member Links:
    Serial0/3/0/0/1/2:0,   HW state = Up, link state = Up
    Serial0/3/0/0/1/1:0,   HW state = Up, link state = Up

Bundle interface: Multilink0/3/0/0/2, ifhandle 0x06032280
  Member Links: 2 active, 0 inactive
  State = Up,   BW Class = A

  Member Links:
    Serial0/3/0/0/1/4:0,   HW state = Up, link state = Up
    Serial0/3/0/0/1/3:0,   HW state = Up, link state = Up

Member interface: Serial0/3/0/0/1/1:0, ifhandle 0x060323c0
  HW state = Up, link state = Up
  Member of bundle interface Multilink0/3/0/0/1 with ifhandle 0x060322c0

Member interface: Serial0/3/0/0/1/2:0, ifhandle 0x06032380
  HW state = Up, link state = Up
  Member of bundle interface Multilink0/3/0/0/1 with ifhandle 0x060322c0

Member interface: Serial0/3/0/0/1/3:0, ifhandle 0x06032340
  HW state = Up, link state = Up
  Member of bundle interface Multilink0/3/0/0/2 with ifhandle 0x06032280

Member interface: Serial0/3/0/0/1/4:0, ifhandle 0x06032300
  HW state = Up, link state = Up
  Member of bundle interface Multilink0/3/0/0/2 with ifhandle 0x06032280
```

The following example shows how to display detailed multilink Frame-Relay information for all interfaces, including IDB information and FSM statistics:

```
RP/0/0/CPU0:router# show frame-relay multilink detail

Bundle interface: Multilink0/3/0/0/1, ifhandle 0x060322c0
  Member Links: 2 active, 0 inactive
  State = Up,   BW Class = A
    nodeid:      0x838
    group:        1
    my_bid:       Multilink0/3/0/0/1
    peer_bid:     Multilink0/6/0/0/1
    magic:        0x696d8a95
    flags:        0x0
    im_state:     3   [Up]
    fsm_req_state: 3   [Up]
    is_owned_resource: Y
    is_zombie:    N
```

```

active_mbr_count: 2
cfg_bid:
bw_class: 1
bw_class_threshold: 0

===== Member Links =====

Serial0/3/0/0/1/2:0, HW state = Up, link state = Up
my_lid: Serial0/3/0/0/1/2:0
peer_lid: Serial0/6/0/0/1/2:0
flags: 0x0
fsm_state: 3 [Up]
im_state: 3 [Up]
fsm_req_state: 3 [Up]
cause: 0 [None]
retry_count: 0
in_loopback: No
bc_init_rcvd: Yes
bc_owned_res: Yes
cc_owned_res: Yes
is_parent_up: Yes
Last Packet Tx: 00:00:09 ago
Round trip: 00:00.000 (0 secs 999997 nsecs)
Min Round trip: 00:00.000 (0 secs 999997 nsecs)
Max Round trip: 00:00.003 (0 secs 3999988 nsecs)
cfg_lid:
mfr_t_hello: 10
mfr_t_ack: 4
mfr_retry_max: 2
----- Member Link Statistics -----
Add Link Tx: 3 Add Link Rx: 2
Add Link Ack Tx: 2 Add Link Ack Rx: 1
Add Link Rej Tx: 0 Add Link Rej Rx: 0
Remove Link Tx: 0 Remove Link Rx: 0
Remove Link Ack Tx: 0 Remove Link Ack Rx: 0
Hello Tx: 6235 Hello Rx: 6236
Hello Ack Tx: 6236 Hello Ack Rx: 6235
Loopback Detected: 0 Invalid Pkts Rx: 0
Bundle Mismatch: 0 Expired Ack Rx: 0
Hello Timer expiry: 6236 Ack Timer expiry: 1

Serial0/3/0/0/1/1:0, HW state = Up, link state = Up
my_lid: Serial0/3/0/0/1/1:0
peer_lid: Serial0/6/0/0/1/1:0
flags: 0x0
fsm_state: 3 [Up]
im_state: 3 [Up]
fsm_req_state: 3 [Up]
cause: 0 [None]
retry_count: 0
in_loopback: No
bc_init_rcvd: Yes
bc_owned_res: Yes
cc_owned_res: Yes
is_parent_up: Yes
Last Packet Tx: 00:00:01 ago
Round trip: 00:00.000 (0 secs 999997 nsecs)
Min Round trip: 00:00.000 (0 secs 999997 nsecs)
Max Round trip: 00:00.004 (0 secs 4999985 nsecs)
cfg_lid:
mfr_t_hello: 10
mfr_t_ack: 4
mfr_retry_max: 2
----- Member Link Statistics -----
Add Link Tx: 3 Add Link Rx: 2
Add Link Ack Tx: 2 Add Link Ack Rx: 1
Add Link Rej Tx: 0 Add Link Rej Rx: 0
Remove Link Tx: 0 Remove Link Rx: 0
Remove Link Ack Tx: 0 Remove Link Ack Rx: 0
Hello Tx: 6234 Hello Rx: 6237
Hello Ack Tx: 6237 Hello Ack Rx: 6234
Loopback Detected: 0 Invalid Pkts Rx: 0

```

## show frame-relay multilink

```

Bundle Mismatch:          0      Expired Ack Rx:          0
Hello Timer expiry:      6235    Ack Timer expiry:        1

Bundle interface: Multilink0/3/0/0/2, ifhandle 0x06032280
Member Links: 2 active, 0 inactive
State = Up,   BW Class = A
  nodeid:          0x838
  group:           2
  my_bid:          Multilink0/3/0/0/2
  peer_bid:        Multilink0/6/0/0/2
  magic:           0x303c008f
  flags:           0x0
  im_state:        3 [Up]
  fsm_req_state:   3 [Up]
  is_owned_resource: Y
  is_zombie:       N
  active_mbr_count: 2
  cfg_bid:         1
  bw_class:        1
  bw_class_threshold: 0

===== Member Links =====

Serial0/3/0/0/1/4:0,   HW state = Up, link state = Up
  my_lid:           Serial0/3/0/0/1/4:0
  peer_lid:         Serial0/6/0/0/1/4:0
  flags:            0x0
  fsm_state:        3 [Up]
  im_state:         3 [Up]
  fsm_req_state:    3 [Up]
  cause:            0 [None]
  retry_count:      0
  in_loopback:      No
  bc_init_rcvd:     Yes
  bc_owned_res:     Yes
  cc_owned_res:     Yes
  is_parent_up:     Yes
  Last Packet Tx:   00:00:00 ago
  Round trip:       00:00.000 (0 secs 999997 nsecs)
  Min Round trip:   00:00.000 (0 secs 999997 nsecs)
  Max Round trip:   00:00.004 (0 secs 4999985 nsecs)
  cfg_lid:          10
  mfr_t_hello:      4
  mfr_t_ack:        4
  mfr_retry_max:    2
----- Member Link Statistics -----
Add Link Tx:        3      Add Link Rx:          2
Add Link Ack Tx:    2      Add Link Ack Rx:        1
Add Link Rej Tx:    0      Add Link Rej Rx:        0
Remove Link Tx:     0      Remove Link Rx:         0
Remove Link Ack Tx: 0      Remove Link Ack Rx:     0
Hello Tx:           6236    Hello Rx:              6235
Hello Ack Tx:       6235    Hello Ack Rx:          6236
Loopback Detected:  0      Invalid Pkts Rx:        0
Bundle Mismatch:    0      Expired Ack Rx:         0
Hello Timer expiry: 6237    Ack Timer expiry:       1

Serial0/3/0/0/1/3:0,   HW state = Up, link state = Up
  my_lid:           Serial0/3/0/0/1/3:0
  peer_lid:         Serial0/6/0/0/1/3:0
  flags:            0x0
  fsm_state:        3 [Up]
  im_state:         3 [Up]
  fsm_req_state:    3 [Up]
  cause:            0 [None]
  retry_count:      0
  in_loopback:      No
  bc_init_rcvd:     Yes
  bc_owned_res:     Yes
  cc_owned_res:     Yes

```

```

is_parent_up:    Yes
Last Packet Tx:  00:00:01 ago
Round trip:      00:00.000 (0 secs 999997 nsecs)
Min Round trip:  00:00.000 (0 secs 999997 nsecs)
Max Round trip:  00:00.003 (0 secs 3999988 nsecs)
cfg_lid:
mfr_t_hello:     10
mfr_t_ack:        4
mfr_retry_max:    2
----- Member Link Statistics -----
Add Link Tx:      3      Add Link Rx:      2
Add Link Ack Tx:  2      Add Link Ack Rx:    1
Add Link Rej Tx:  0      Add Link Rej Rx:    0
Remove Link Tx:   0      Remove Link Rx:     0
Remove Link Ack Tx: 0      Remove Link Ack Rx: 0
Hello Tx:         6236   Hello Rx:         6237
Hello Ack Tx:     6237   Hello Ack Rx:     6236
Loopback Detected: 0      Invalid Pkts Rx:   0
Bundle Mismatch:  0      Expired Ack Rx:    0
Hello Timer expiry: 6237  Ack Timer expiry:  1

Member interface: Serial0/3/0/0/1/1:0, ifhandle 0x060323c0
HW state = Up, link state = Up
Member of bundle interface Multilink0/3/0/0/1 with ifhandle 0x060322c0
Local bid: Multilink0/3/0/0/1 Peer bid: Multilink0/6/0/0/1
my_lid:          Serial0/3/0/0/1/1:0
peer_lid:        Serial0/6/0/0/1/1:0
flags:           0x0
fsm_state:       3 [Up]
im_state:        3 [Up]
fsm_req_state:   3 [Up]
cause:           0 [None]
retry_count:     0
in_loopback:     No
bc_init_rcvd:    Yes
bc_owned_res:    Yes
cc_owned_res:    Yes
is_parent_up:    Yes
Last Packet Tx:  00:00:00 ago
Round trip:      00:00.000 (0 secs 999997 nsecs)
Min Round trip:  00:00.000 (0 secs 999997 nsecs)
Max Round trip:  00:00.004 (0 secs 4999985 nsecs)
cfg_lid:
mfr_t_hello:     10
mfr_t_ack:        4
mfr_retry_max:    2
----- Member Link Statistics -----
Add Link Tx:      3      Add Link Rx:      2
Add Link Ack Tx:  2      Add Link Ack Rx:    1
Add Link Rej Tx:  0      Add Link Rej Rx:    0
Remove Link Tx:   0      Remove Link Rx:     0
Remove Link Ack Tx: 0      Remove Link Ack Rx: 0
Hello Tx:         6235   Hello Rx:         6237
Hello Ack Tx:     6237   Hello Ack Rx:     6235
Loopback Detected: 0      Invalid Pkts Rx:   0
Bundle Mismatch:  0      Expired Ack Rx:    0
Hello Timer expiry: 6236  Ack Timer expiry:  1

Member interface: Serial0/3/0/0/1/2:0, ifhandle 0x06032380
HW state = Up, link state = Up
Member of bundle interface Multilink0/3/0/0/1 with ifhandle 0x060322c0
Local bid: Multilink0/3/0/0/1 Peer bid: Multilink0/6/0/0/1
my_lid:          Serial0/3/0/0/1/2:0
peer_lid:        Serial0/6/0/0/1/2:0
flags:           0x0
fsm_state:       3 [Up]
im_state:        3 [Up]
fsm_req_state:   3 [Up]
cause:           0 [None]
retry_count:     0
in_loopback:     No
bc_init_rcvd:    Yes
bc_owned_res:    Yes

```

## show frame-relay multilink

```

cc_owned_res:   Yes
is_parent_up:   Yes
Last Packet Tx: 00:00:00 ago
Round trip:     00:00.000 (0 secs 999997 nsecs)
Min Round trip: 00:00.000 (0 secs 999997 nsecs)
Max Round trip: 00:00.003 (0 secs 3999988 nsecs)
cfg_lid:
mfr_t_hello:    10
mfr_t_ack:      4
mfr_retry_max:  2
----- Member Link Statistics -----
Add Link Tx:          3      Add Link Rx:          2
Add Link Ack Tx:      2      Add Link Ack Rx:      1
Add Link Rej Tx:      0      Add Link Rej Rx:      0
Remove Link Tx:       0      Remove Link Rx:       0
Remove Link Ack Tx:   0      Remove Link Ack Rx:   0
Hello Tx:             6236   Hello Rx:             6237
Hello Ack Tx:         6237   Hello Ack Rx:         6236
Loopback Detected:    0      Invalid Pkts Rx:      0
Bundle Mismatch:      0      Expired Ack Rx:       0
Hello Timer expiry:   6237   Ack Timer expiry:     1

Member interface: Serial0/3/0/0/1/3:0, ifhandle 0x06032340
HW state = Up, link state = Up
Member of bundle interface Multilink0/3/0/0/2 with ifhandle 0x06032280
Local bid: Multilink0/3/0/0/2  Peer bid: Multilink0/6/0/0/2
my_lid:           Serial0/3/0/0/1/3:0
peer_lid:         Serial0/6/0/0/1/3:0
flags:            0x0
fsm_state:        3 [Up]
im_state:         3 [Up]
fsm_req_state:    3 [Up]
cause:            0 [None]
retry_count:      0
in_loopback:      No
bc_init_rcvd:     Yes
bc_owned_res:     Yes
cc_owned_res:     Yes
is_parent_up:     Yes
Last Packet Tx:   00:00:02 ago
Round trip:       00:00.000 (0 secs 999997 nsecs)
Min Round trip:   00:00.000 (0 secs 999997 nsecs)
Max Round trip:   00:00.003 (0 secs 3999988 nsecs)
cfg_lid:
mfr_t_hello:     10
mfr_t_ack:       4
mfr_retry_max:   2
----- Member Link Statistics -----
Add Link Tx:          3      Add Link Rx:          2
Add Link Ack Tx:      2      Add Link Ack Rx:      1
Add Link Rej Tx:      0      Add Link Rej Rx:      0
Remove Link Tx:       0      Remove Link Rx:       0
Remove Link Ack Tx:   0      Remove Link Ack Rx:   0
Hello Tx:             6236   Hello Rx:             6237
Hello Ack Tx:         6237   Hello Ack Rx:         6236
Loopback Detected:    0      Invalid Pkts Rx:      0
Bundle Mismatch:      0      Expired Ack Rx:       0
Hello Timer expiry:   6237   Ack Timer expiry:     1

Member interface: Serial0/3/0/0/1/4:0, ifhandle 0x06032300
HW state = Up, link state = Up
Member of bundle interface Multilink0/3/0/0/2 with ifhandle 0x06032280
Local bid: Multilink0/3/0/0/2  Peer bid: Multilink0/6/0/0/2
my_lid:           Serial0/3/0/0/1/4:0
peer_lid:         Serial0/6/0/0/1/4:0
flags:            0x0
fsm_state:        3 [Up]
im_state:         3 [Up]
fsm_req_state:    3 [Up]
cause:            0 [None]
retry_count:      0
in_loopback:      No
bc_init_rcvd:     Yes

```

```

bc_owned_res:    Yes
cc_owned_res:    Yes
is_parent_up:    Yes
Last Packet Tx:  00:00:01 ago
Round trip:      00:00.000 (0 secs 999997 nsecs)
Min Round trip:  00:00.000 (0 secs 999997 nsecs)
Max Round trip:  00:00.004 (0 secs 4999985 nsecs)
cfg_lid:
mfr_t_hello:     10
mfr_t_ack:        4
mfr_retry_max:   2
----- Member Link Statistics -----
Add Link Tx:      3      Add Link Rx:      2
Add Link Ack Tx:  2      Add Link Ack Rx:    1
Add Link Rej Tx:  0      Add Link Rej Rx:    0
Remove Link Tx:   0      Remove Link Rx:     0
Remove Link Ack Tx: 0      Remove Link Ack Rx: 0
Hello Tx:         6236   Hello Rx:         6235
Hello Ack Tx:     6235   Hello Ack Rx:     6236
Loopback Detected: 0      Invalid Pkts Rx:   0
Bundle Mismatch:  0      Expired Ack Rx:    0
Hello Timer expiry: 6237   Ack Timer expiry:  1

```

The following example shows how to display the multilink Frame-Relay information for the interface at location 0/3/0/0/1:

```
RP/0/0/CPU0:router# show frame-relay multilink interface multilink 0/3/0/0/1
```

```

Bundle interface: Multilink0/3/0/0/1, ifhandle 0x060322c0
  Member Links: 2 active, 0 inactive
  State = Up,   BW Class = A

  Member Links:
    Serial0/3/0/0/1/2:0,   HW state = Up, link state = Up
    Serial0/3/0/0/1/1:0,   HW state = Up, link state = Up

```

## Related Commands

| Command                                                                 | Description                                                                         |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <a href="#">interface multilink</a> , <a href="#">on page 640</a>       | Configures a multilink interface and enters multilink interface configuration mode. |
| <a href="#">frame-relay multilink bid</a> , <a href="#">on page 495</a> | Creates a name for a Frame Relay multilink bundle interface.                        |

# show frame-relay pvc

To display statistics about Frame Relay permanent virtual circuits (PVCs), use the **show frame-relay pvc** command in EXEC mode.

**show frame-relay pvc** [**interface** *type interface-path-id*] **location** *node-id*] [*dlci-number*]

## Syntax Description

|                                |                                                                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>interface</b>               | (Optional) Interface for which information is to be displayed. Use the <i>type</i> and <i>interface-path-id</i> arguments to specify the interface.                                                                                                                                        |
| <i>type</i>                    | (Optional) Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i>       | (Optional) Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>location</b> <i>node-id</i> | (Optional) Displays information about all interfaces on the specified node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                                |
| <i>dlci-number</i>             | (Optional) DLCI number used to identify the PVC. The range is from 16 to 1007.                                                                                                                                                                                                             |

## Command Default

Information for all Frame Relay interfaces and PVCs is displayed.

## Command Modes

EXEC (#)

## Command History

| Release       | Modification                                                           |
|---------------|------------------------------------------------------------------------|
| Release 3.4.0 | This command was introduced.                                           |
| Release 4.0.0 | The Fragmentation Statistics section of output and counters was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **show frame-relay pvc** command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.



This command is used to check the status of PVCs on interfaces.

## Task ID

| Task ID | Operations |
|---------|------------|
| fr      | read       |

## Examples

The following example shows the output from the **show frame-relay pvc** command:

```
RP/0/0/CPU0:router# show frame-relay pvc
```

PVC Statistics for interface POS0/3/2/0 (Frame Relay DCE)

|          | Active | Inactive | Deleted | Static |
|----------|--------|----------|---------|--------|
| Local    | 4      | 0        | 0       | 0      |
| Switched | 0      | 0        | 0       | 0      |
| Dynamic  | 0      | 0        | 0       | 0      |

```
DLCI = 612, DLCI USAGE = LOCAL, ENCAP = CISCO, INHERIT = TRUE, PVC STATUS = ACT
VE, INTERFACE = POS0/3/2/0.1
input pkts 0          output pkts 0          in bytes 0
out bytes 0          dropped pkts 0      in FECN packets 0
in BECN pkts 0      out FECN pkts 0      out BECN pkts 0
in DE pkts 0        out DE pkts 0
out bcast pkts 0    out bcast bytes 0
pvc create time 00:00:00    last time pvc status changed 00:00:00
```

```
DLCI = 613, DLCI USAGE = LOCAL, ENCAP = CISCO, INHERIT = TRUE, PVC STATUS = ACT
VE, INTERFACE = POS0/3/2/0.2
input pkts 0          output pkts 0          in bytes 0
out bytes 0          dropped pkts 0      in FECN packets 0
in BECN pkts 0      out FECN pkts 0      out BECN pkts 0
in DE pkts 0        out DE pkts 0
out bcast pkts 0    out bcast bytes 0
pvc create time 00:00:00    last time pvc status changed 00:00:00
```

```
DLCI = 614, DLCI USAGE = LOCAL, ENCAP = CISCO, INHERIT = TRUE, PVC STATUS = ACT
VE, INTERFACE = POS0/3/2/0.3
input pkts 0          output pkts 0          in bytes 0
out bytes 0          dropped pkts 0      in FECN packets 0
in BECN pkts 0      out FECN pkts 0      out BECN pkts 0
in DE pkts 0        out DE pkts 0
out bcast pkts 0    out bcast bytes 0
pvc create time 00:00:00    last time pvc status changed 00:00:00
```

```
DLCI = 615, DLCI USAGE = LOCAL, ENCAP = CISCO, INHERIT = TRUE, PVC STATUS = ACT
VE, INTERFACE = POS0/3/2/0.4
input pkts 0          output pkts 0          in bytes 0
out bytes 0          dropped pkts 0      in FECN packets 0
in BECN pkts 0      out FECN pkts 0      out BECN pkts 0
in DE pkts 0        out DE pkts 0
out bcast pkts 0    out bcast bytes 0
pvc create time 00:00:00    last time pvc status changed 00:00:00
```

The following example shows the output for a specific frame-relay PVC:

```
RP/0/0/CPU0:router# show frame-relay pvc 613
```

```
DLCI = 613, DLCI USAGE = LOCAL, ENCAP = CISCO, INHERIT = TRUE, PVC STATUS = ACTI
VE, INTERFACE = POS0/3/2/0.2
input pkts 0          output pkts 0          in bytes 0
out bytes 0          dropped pkts 0      in FECN packets 0
in BECN pkts 0      out FECN pkts 0      out BECN pkts 0
in DE pkts 0        out DE pkts 0
```

```

out bcast pkts 0      out bcast bytes 0
pvc create time 00:00:00      last time pvc status changed 00:00:00

```

The following example shows the output for a specific frame-relay PVC with fragment counters enabled:

```

RP/0/0/CPU0:router# show frame-relay pvc interface serial 0/3/2/0/1/1:0 16

Tue Jul 28 11:03:11.646 UTC

DLCI = 16, DLCI USAGE = LOCAL, ENCAP = CISCO, INHERIT = TRUE, PVC STATUS = ACTIVE, INTERFACE
= Serial0/3/2/0/1/1:0.1 (Frame Relay DTE)
  input pkts 100      output pkts 100      in bytes 80400
  out bytes 80800      dropped pkts 0      in FECN packets 0
  in BECN pkts 0      out FECN pkts 0      out BECN pkts 0
  in DE pkts 0      out DE pkts 0
  out bcast pkts 0      out bcast bytes 0
  pvc create time Tue Jul 28 11:01:25 2009
  last time pvc status changed Tue Jul 28 11:02:14 2009

Fragmentation Statistics

fragment type end-to-end      fragment size 256
Input Fragmented packets 400      Input Fragmented bytes 0
Output Fragmented packets 400      Output Fragmented bytes 0
Input Unfragmented packets 0      Input Unfragmented bytes 0
Output Unfragmented packets 0      Output Unfragmented bytes 0
Input Reassembled packets 100      Input Reassembled bytes 0
Fragment Counters Enabled

```

**Table 33: show frame-relay pvc Field Descriptions**

| Field       | Description                                                                                                                             |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| DLCI        | One of the DLCI numbers for the PVC.                                                                                                    |
| DLCI USAGE  | Lists SWITCHED when the router or access server is used as a switch, or LOCAL when the router or access server is used as a DTE device. |
| ENCAP       | Type of encapsulation.                                                                                                                  |
| INHERIT     | Encapsulation type for the PVC is inherited from the main interface.                                                                    |
| PVC STATUS  | Status of the PVC: ACTIVE, INACTIVE, or DELETED.                                                                                        |
| INTERFACE   | Specific subinterface associated with this DLCI.                                                                                        |
| input pkts  | Number of packets received on this PVC.                                                                                                 |
| output pkts | Number of packets sent on this PVC.                                                                                                     |
| in bytes    | Number of bytes received on this PVC.                                                                                                   |
| out bytes   | Number of bytes sent on this PVC.                                                                                                       |

| Field                        | Description                                                                                                                                                                                         |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dropped pkts                 | Number of incoming and outgoing packets dropped by the router at the Frame Relay level.                                                                                                             |
| in FECN pkts                 | Number of packets received with the FECN bit set.                                                                                                                                                   |
| in BECN pkts                 | Number of packets received with the BECN bit set.                                                                                                                                                   |
| out FECN pkts                | Number of packets sent with the FECN bit set.                                                                                                                                                       |
| out BECN pkts                | Number of packets sent with the BECN bit set.                                                                                                                                                       |
| in DE pkts                   | Number of DE packets received.                                                                                                                                                                      |
| out DE pkts                  | Number of DE packets sent.                                                                                                                                                                          |
| out beast pkts               | Number of output broadcast packets.                                                                                                                                                                 |
| out beast bytes              | Number of output broadcast bytes.                                                                                                                                                                   |
| pvc create time              | Time at which the PVC was created.                                                                                                                                                                  |
| last time pvc status changed | Time at which the PVC changed status.                                                                                                                                                               |
| shaping drops                | Number of packets dropped by the traffic-shaping process.                                                                                                                                           |
| Fragment Counters            | Displays whether fragment counters are enabled or disabled on the PVC. Fragment counters are disabled by default. Use the <b>fragment-counter</b> command to enable collection of these statistics. |

# show frame-relay vcm-info interface

To display Virtual Circuit (VC) manager information for a given interface, use the **show frame-relay vcm-info interface** command in EXEC mode.

**show frame-relay vcm-info interface** *type interface-path-id* [**vc** *dlci*]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>              | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>vc</b>                | (Optional) Specifies a VC on the interface.                                                                                                                                                                                                                                     |
| <i>dlci</i>              | (Optional) Data-link Connection Identifier number. Range is from 0 to 1023.                                                                                                                                                                                                     |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---------|------------|
| fr      | read       |

## Examples

The following example shows how to display Virtual Circuit (VC) manager information for the multilink interface 0/1/0/0:

```
RP/0/0/CPU0:router# show frame-relay vcm-info interface multilink 0/3/0/0/1

VCM IDB:Multilink0_3_0_0_1
=====
IDB type:                      IFT_MAIN
<main specific>
  i/f term type:                L3
  i/f handle:                   0x06186240
  BW:                           0x000000c00
  OIR insert:                   F
VC chkpt oid:                   0x00000000
proto info:                     500323c8 [ptr]
proto fn table:                 500323d4 [ptr]
i/f type:                       0x00000037 [IFT_MULTILINK]
i/f state:                      0x00000003 [up]
i/f basecaps num:               0x0000004c [fr]
i/f basecaps state:             0x00000003 [up]
VCM states:                     5002c708 [ptr]
in db:                          T
chkpt:                          F
datapath info                   0 [0 bytes]
partner info                    50016d98 [16 bytes]
  encaps type:                  IETF
  intf type:                    DTE
non chkptd info                 0 [0 bytes]
```

## Related Commands

| Command                                                 | Description                                                                         |
|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| <a href="#">interface multilink</a> , on page 640       | Configures a multilink interface and enters multilink interface configuration mode. |
| <a href="#">frame-relay multilink bid</a> , on page 495 | Creates a name for a Frame Relay multilink bundle interface.                        |

# show interfaces (frame relay)

To display statistics about Frame Relay interfaces, use the **show interfaces** command in EXEC mode.

**show interfaces** [**summary**] [*type interface-path-id*] [**brief**] **description** | **detail** | **accounting** [**rates**]]] [**location** *node-id*]

## Syntax Description

|                                |                                                                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>summary</b>                 | (Optional) Displays a summary of interface information by interface type.                                                                                                                                                                                                                  |
| <i>type</i>                    | (Optional) Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i>       | (Optional) Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>brief</b>                   | (Optional) Displays brief information about each interface (one line per interface).                                                                                                                                                                                                       |
| <b>description</b>             | (Optional) Displays an interface description.                                                                                                                                                                                                                                              |
| <b>detail</b>                  | (Optional) Displays detailed information about each interface. This is the default.                                                                                                                                                                                                        |
| <b>accounting</b>              | (Optional) Displays the number of packets of each protocol type that have been sent through the interface.                                                                                                                                                                                 |
| <b>rates</b>                   | (Optional) Displays interface accounting rates.                                                                                                                                                                                                                                            |
| <b>location</b> <i>node-id</i> | (Optional) Displays information about all interfaces on the specified node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                                |

## Command Default

No default behavior or values

## Command Modes

EXEC (#)

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **show interfaces** (Frame Relay) command is available on Packet-over-SONET/SDH (POS), serial, and multilink interfaces.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

**Examples**

The following example shows the output from the **show interfaces** command when the interface is configured with Frame Relay encapsulation:

```
RP/0/0/CPU0:router# show interfaces pos 0/1/0/0

POS0/1/0/0 is up, line protocol is up
  Hardware is Packet over SONET/SDH
  Internet address is Unknown
  MTU 4474 bytes, BW 622080 Kbit
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation FRAME-RELAY, crc 32, controller loopback not set,
  LMI enq sent 0, LMI stat recvd 0, LMI upd recvd 0
  LMI enq recvd 9463, LMI stat sent 9463, LMI upd sent 0, DCE LMI up
  LMI DLCI 0 LMI type is ANSI Annex D frame relay DCE
  Last clearing of "show interface" counters never
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    20934 packets input, 1508069 bytes, 1151 total input drops
      0 drops for unrecognized upper-level protocol
    Received 0 broadcast packets, 0 multicast packets
      0 runts, 0 giants, 0 throttles, 0 parity
    1151 input errors, 1058 CRC, 0 frame, 0 overrun, 93 ignored, 0 abort
    19590 packets output, 990924 bytes, 0 total output drops
    Output 0 broadcast packets, 0 multicast packets
    0 output errors, 0 underruns, 0 applique, 0 resets
    0 output buffer failures, 0 output buffers swapped out
```

**Table 34: show interfaces Field Descriptions**

| Field           | Description                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------------------|
| Interface name  | Displays the name of the current interface. In the example, the interface name is POS0/1/0/0.           |
| Interface state | Displays the state of the interface. In the example, the interface is in the administratively up state. |

| Field                                | Description                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Line protocol state                  | <p>Displays the state of the Layer 2 line protocol. This field may be different from the interface state if, for example, a keepalive failure has brought down the Layer 2.</p> <p><b>Note</b> The line protocol state is not the same as the protocol state displayed in the <b>show ip interfaces</b> command, because it is the state of Layer 2 (media) rather than Layer 3 (IP protocol).</p> |
| Hardware                             | Displays the current hardware type.                                                                                                                                                                                                                                                                                                                                                                |
| Internet address is <i>n.n.n.n/n</i> | <p>Displays the Layer 2 address (MAC address for Ethernet interfaces).</p> <p><b>Note</b> Enter the <b>mac-address</b> command to configure the hardware address.</p>                                                                                                                                                                                                                              |
| MTU                                  | <p>Displays the maximum transmission unit (MTU) for the interface. The MTU is the maximum packet size that can be transmitted over the interface.</p> <p><b>Note</b> The MTU field indicates the interface MTU. Enter the <b>mtu</b> command to configure a lower MTU value at the layer 3 level.</p>                                                                                              |
| BW                                   | Displays the bandwidth of the interface in kbps.                                                                                                                                                                                                                                                                                                                                                   |
| reliability                          | <p>Displays the proportion of packets that are not dropped and do not have errors.</p> <p><b>Note</b> The reliability is shown as a fraction of 255.</p>                                                                                                                                                                                                                                           |
| txload                               | <p>Indicates the traffic flowing out of the interface as a proportion of the bandwidth.</p> <p><b>Note</b> The txload is shown as a fraction of 255.</p>                                                                                                                                                                                                                                           |
| rxload                               | <p>Indicates the traffic flowing into the interface as a proportion of the bandwidth.</p> <p><b>Note</b> The rxload is shown as a fraction of 255.</p>                                                                                                                                                                                                                                             |
| Encapsulation                        | Layer 2 encapsulation installed on the interface.                                                                                                                                                                                                                                                                                                                                                  |
| CRC                                  | <p>Indicates the length of the cyclic redundancy check (CRC), in bytes.</p> <p><b>Note</b> Enter the <b>pos crc</b> command to configure the CRC.</p>                                                                                                                                                                                                                                              |



| Field                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| controller loopback                     | Indicates that the hardware was configured as controller loopback.                                                                                                                                                                                                                                                                                                                                                                                                                |
| LMI enq sent                            | Number of LMI enquiry messages sent.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| LMI stat recvd                          | Number of LMI status messages received.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| LMI upd recvd                           | Number of LMI updated messages received.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| LMI enq recvd                           | Number of LMI enquiry messages received.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| LMI stat sent                           | Number of LMI status messages sent.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| LMI upd sent                            | Number of LMI updated messages sent.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| DCE LMI                                 | Displays the state of the DCE LMI.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| LMI DLCI                                | Displays the LMI DLCI identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| LMI type                                | Displays the LMI type.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Last clearing                           | Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing for example, load and reliability) are not cleared when the counters are cleared.                                                                                                                                                                                    |
| 5 minute input rate5 minute output rate | <p>Average number of bits and packets transmitted per second in the last 5 minutes.</p> <p>The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average is within two percent of the instantaneous rate of a uniform stream of traffic over that period.</p> |
| packets input                           | Total number of error-free packets received by the system.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| bytes                                   | Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.                                                                                                                                                                                                                                                                                                                                                                    |
| Received...broadcasts                   | Total number of broadcast or multicast packets received by the interface                                                                                                                                                                                                                                                                                                                                                                                                          |

| Field               | Description                                                                                                                                                                                                                                                                                        |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| runts               | Number of packets that are discarded because they are smaller than the minimum packet size of the medium.                                                                                                                                                                                          |
| giants              | Number of packets that are discarded because they exceed the maximum packet size of the medium                                                                                                                                                                                                     |
| input errors        | Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum might not balance with the other counts.                                                                                      |
| CRC                 | Cyclic redundancy checksum generated by the originating station or far-end device does not match the checksum calculated from the data received. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link.                                        |
| frame               | Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.                                                                                                                 |
| overrun             | Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.                                                                                                                      |
| ignored             | Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. Broadcast storms and bursts of noise can cause the ignored count to be increased.                                                                                                  |
| abort               | Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.                                                                                                                                            |
| carrier transitions | Number of times the carrier detect signal of a serial interface has changed state. For example, if data carrier detect (DCD) goes down and comes up, the carrier transition counter will increment two times. Indicates modem or line problems if the carrier detect line is changing state often. |

## snmp-server traps frame-relay pvc

To enable Simple Network Management Protocol (SNMP) trap notifications for a Frame Relay permanent virtual circuit (PVC), use the **snmp-server traps frame-relay pvc** command in global configuration mode. To disable SNMP notifications for a FR PVC, use the **no** form of this command.

**snmp-server traps frame-relay pvc** [*interval seconds*]

**no snmp-server traps frame-relay pvc** [*interval seconds*]

| Syntax Description | <b>interval</b> <i>seconds</i> | (Optional) Minimum period between successive traps. The range is from 1 to 3600. |
|--------------------|--------------------------------|----------------------------------------------------------------------------------|
|--------------------|--------------------------------|----------------------------------------------------------------------------------|

| Command Default | <i>seconds</i> : 30 |
|-----------------|---------------------|
|-----------------|---------------------|

| Command Modes | Global configuration |
|---------------|----------------------|
|---------------|----------------------|

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.4.0 | This command was introduced. |

| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Use the **snmp-server traps frame-relay pvc** command to enable trap requests for a Frame Relay PVC. This command is used with the **snmp-server host** command. Use the **snmp-server host** command to specify which host or hosts receive SNMP notifications.

See *Implementing SNMP on Cisco IOS XR Software* in *Cisco IOS XR System Management Configuration Guide for the Cisco XR 12000 Series Router* for detailed information about SNMP configuration tasks and commands.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | snmp    | read, write |
|         | fr      | read, write |

## Examples

The following example shows how to configure the router to send SNMP trap notifications for a Frame Relay PVC:

```
RP/0/0/CPU0:router(config)# snmp-server host 12.26.25.61 traps public udp-port 5000
RP/0/0/CPU0:router(config)# snmp-server community public RW
RP/0/0/CPU0:router(config)# snmp-server traps frame-relay pvc interval 50
```

## Related Commands

| Command                      | Description                                                          |
|------------------------------|----------------------------------------------------------------------|
| <b>snmp-server community</b> | Configures the community access string to permit access to the SNMP. |
| <b>snmp-server host</b>      | Specifies the recipient of an SNMP notification operation.           |



# Global Interface Commands on the Cisco IOS XR Software

---

This module describes the global command line interface (CLI) commands for configuring interfaces on the Cisco XR 12000 Series Router.

- [bandwidth \(global\), page 532](#)
- [clear interface, page 534](#)
- [controller SYSCLOCK, page 536](#)
- [dampening, page 538](#)
- [interface \(global\), page 540](#)
- [mtu, page 542](#)
- [show im dampening, page 545](#)
- [show interfaces, page 549](#)
- [shutdown \(global\), page 560](#)

# bandwidth (global)

To configure the bandwidth of an interface, use the **bandwidth** command in interface configuration mode.

**bandwidth** *rate*

## Syntax Description

|             |                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------|
| <i>rate</i> | Amount of bandwidth to be allocated on the interface, in Kilobits per second (kbps). Range is from 0 through 4294967295. |
|-------------|--------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default bandwidth depends on the interface type.

## Command Modes

Interface configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

To obtain the default bandwidth for a specific interface, use the **show interfaces** command after you first bring up the interface. The default interface bandwidth is displayed in the **show interfaces** command output.

## Task ID

| Task ID        | Operations  |
|----------------|-------------|
| interface      | execute     |
| basic-services | read, write |

## Examples

The following example shows how to configure the bandwidth on a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router# interface GigabitEthernet 0/4/1/0
```

```
RP/0/0/CPU0:router# bandwidth 4000000
```

**Related Commands**

| Command                                         | Description                                                              |
|-------------------------------------------------|--------------------------------------------------------------------------|
| <a href="#">interface (global), on page 540</a> | Configures an interface or creates or configures a virtual interface.    |
| <a href="#">shutdown (global), on page 560</a>  | Disables an interface (forces an interface to be administratively down). |

# clear interface

To clear interface statistics or packet counters, use the **clear interface** command in EXEC mode.

**clear interface** *type interface-path-id*

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>              | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.



**Task ID**

| Task ID        | Operations  |
|----------------|-------------|
| interface      | execute     |
| basic-services | read, write |

**Examples**

The following example shows how to use the **clear interface** command to clear the loopback interface 2:

```
RP/0/0/CPU0:router# clear interface loopback 2
```

**Related Commands**

| Command                                         | Description                                                              |
|-------------------------------------------------|--------------------------------------------------------------------------|
| <a href="#">interface (global), on page 540</a> | Configures an interface or creates or configures a virtual interface.    |
| <a href="#">shutdown (global), on page 560</a>  | Disables an interface (forces an interface to be administratively down). |

# controller SYSCLOCK

To configure a system clock (telecom-bus clock) controller, use the **controller sysclock** command in global configuration mode. This command does not have a no form.

**controller sysclock** *location*

## Syntax Description

*location* Fully qualified location in the notation is *rack/slot/module*. A slash is required between values as part of the notation.

- *rack*: Chassis number of the rack.
- *slot*: Physical slot number of the modular services card or line card.
- *module*: Module number. A physical layer interface module (PLIM) is always 0. Shared port adapters (SPAs) are referenced by their subslot number.

For more information about the syntax for the router, use the question mark (?) online help function.

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.7.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

## Examples

The following example shows how to configure a system clock (telecom-bus clock) controller:

```
RP/0/0/CPU0:Router(config)# controller sysclock 0/0/1
```

```
RP/0/0/CPU0:Router(config)#
```

**Related Commands**

| Command                                            | Description                                                                                      |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">controller t3</a> , on page 926        | Configures a T3 controller and enters T3 configuration mode.                                     |
| <a href="#">clock source (T3/E3)</a> , on page 918 | Sets clocking for individual T3 or E3 links.                                                     |
| <a href="#">show controllers t3</a> , on page 991  | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# dampening

To limit propagation of transient or frequently changing interface states on Interface Manager (IM) clients, turn on event dampening by using the **dampening** command in interface configuration mode. To turn dampening off, use the **no** form of this command.

**dampening** [*half-life* [*reuse suppress max-suppress-time*]]

**no dampening** [*half-life* [*reuse suppress max-suppress-time*]]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                                                           |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>half-life</i>         | (Optional) Time (in minutes) after which a penalty is decreased. Once the interface has been assigned a penalty, the penalty is decreased by half after the half-life period. The process of reducing the penalty happens every 5 seconds. The range of the half-life period is 1 to 45 minutes. The default is 1 minute. |
| <i>reuse</i>             | (Optional) Penalty value below which a stable interface is unsuppressed. Range is from 1 through 20000. Default value is 750.                                                                                                                                                                                             |
| <i>suppress</i>          | (Optional) Limit at which an interface is suppressed when its penalty exceeds that limit. Range is from 1 through 20000, and must be greater than the reuse threshold. The default value is 2000.                                                                                                                         |
| <i>max-suppress-time</i> | (Optional) Maximum time (in minutes) that an interface can be suppressed. This value effectively acts as a ceiling that the penalty value cannot exceed. Default value is four times the half-life period.                                                                                                                |

## Command Default

Dampening is turned off by default. When you use the **dampening** command, the following default values are enabled for any optional parameters that you do not enter:

- *half-life*: 1 minute
- *reuse*: 750
- *suppress*: 2000
- *max-suppress-time*: Four times the half-life

## Command Modes

Interface configuration

## Command History

| Release     | Modification                |
|-------------|-----------------------------|
| Release 3.2 | This command was introduced |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Event dampening suppresses a constantly unstable interface until it remains stable for a period of time. Enabling dampening on an interface that already has dampening configured has the effect of resetting the penalty associated with that interface to zero. The reuse threshold must always be less than the suppress threshold.

Consider the following guidelines when configuring event dampening:

- Configuring dampening on both a subinterface and its parent is usually unnecessary because their states are almost always the same and dampening would be triggered at the same time on each interface.
- If all subinterfaces require dampening, then apply dampening to the main interface only. Applying configuration to large numbers of subinterfaces requires an abundance of memory and increases the time required to process the configuration during boot and failover.
- When dampening is enabled, an interface has a penalty value associated with it. The value starts at 0 and is increased by 1000 whenever the underlying state of the interface changes from up to down.
- The penalty value decreases exponentially while the interface state is stable. If the penalty value exceeds a configured suppress threshold, then the state of the interface is suppressed and IM will not notify upper layers of further state transitions. The suppressed state remains until the penalty value decreases past a configured reuse threshold.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

### Examples

The following example shows how to enable dampening with default values on an interface:

```
RP/0/0/CPU0:router(config)# interface POS 0/4/0/0
RP/0/0/CPU0:router(config-if)# dampening
```

### Related Commands

| Command                                                         | Description                                                                  |
|-----------------------------------------------------------------|------------------------------------------------------------------------------|
| <a href="#">show im dampening</a> , <a href="#">on page 545</a> | Displays the state of all interfaces on which dampening has been configured. |

# interface (global)

To configure an interface or to create or configure a virtual interface, use the **interface** command in global configuration mode. To delete the interface configuration, use the **no** form of this command.

**interface** *type interface-path-id*

**no interface** *type interface-path-id*

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>              | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

## Command Default

No interfaces are configured

## Command Modes

Global configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

The **interface** command enters interface configuration mode to allow you to configure interfaces. If a virtual interface is configured, then the interface is created if it did not already exist.

The **no** form of this command applies only to virtual interfaces or to subinterfaces (that is, interfaces that have been created in global configuration mode).

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

**Examples**

In the following example, the **interface** command is given for the POS card in location 0/2/0/1, and interface configuration mode is entered for that interface:

```
RP/0/0/CPU0:router(config)# interface POS 0/2/0/1
```

**Related Commands**

| Command                                         | Description                                                              |
|-------------------------------------------------|--------------------------------------------------------------------------|
| <a href="#">clear interface</a> , on page 534   | Clears interface statistics or packet counters.                          |
| <a href="#">shutdown (global)</a> , on page 560 | Disables an interface (forces an interface to be administratively down). |

# mtu

To adjust the maximum transmission unit (MTU) value for packets on the interface, use the **mtu** command in interface configuration mode. To return the interface to the default MTU for the interface type, use the **no** form of this command.

**mtu** *bytes*

**no mtu**

## Syntax Description

|              |                                                                             |
|--------------|-----------------------------------------------------------------------------|
| <i>bytes</i> | Maximum number of bytes in a Layer 2 frame. Range is from 64 through 65535. |
|--------------|-----------------------------------------------------------------------------|

## Command Default

The default MTU for each interface is as follows:

- Ethernet—1514 bytes
- POS—4474 bytes
- Tunnel—1500 bytes
- Loopback—1514 bytes
- ATM—4470 bytes

## Command Modes

Interface configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **mtu** command to set a specific MTU value for an interface, or use the **no mtu** command to return the interface to the default MTU value for that interface type. The MTU value can be increased or decreased using the **mtu** command, subject to minimum and maximum MTU limits for the interface type.

If the MTU value is not configured, then each interface will have a default MTU value that is specific to the interface type. The default MTU value is generally the largest Layer 2 frame size possible for the interface type.

The default/configured MTU value on an atm interface includes the L2 header.



The MTU size consists of L2 header that includes either SNAP(8bytes)/MUX(0)/NLPID(2) header or the AAL5 SDU. The AAL5 SDU includes the L3 datagram and the optional Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) header.

The Ethernet interface is the Layer 3 datagram plus 14 bytes. For ATM main interface, the MTU is L3 datagram + 0 bytes.

For ATM L3 sub interface, mtu is as follows:

- SNAP - L3 datagram + 8 bytes
- NLPID - L3 datagram + 2 bytes
- MUX - L3datagram + 0 bytes
- When no pvc is configured under sub interface - L3datagram + 0 bytes

**Note**

All serial links in a Multilink Point-to-Point Protocol (MLPPP) bundle or a Multilink Frame Relay (MFR) bundle inherit the default MTU value from the multilink bundle. If a serial interface has a nondefault MTU value, the Cisco IOS XR software blocks that serial interface from being added to an MLPPP or MFR bundle. Therefore, you must not configure the MTU value on a serial interface until you have added that serial interface to an MLPPP or MFR bundle.

You can use the **show interfaces** command to determine if the MTU value has been changed. The **show interfaces** command output displays the MTU size for each interface in the MTU (byte) field.

**Note**

You can use the **show interfaces** command to determine if the MTU value has been changed. The **show interfaces** command output displays the MTU size for each interface in the MTU (byte) field. Note that the MTU size that is displayed includes the Layer 2 header bytes used for each encapsulation type.

**Note**

Changing the MTU on an interface triggers a change on the protocols and capsulations configured on that interface, although some protocol-specific configurations can override the interface MTU. For example, specifically changing the interface MTU configuration does not affect the IP MTU configuration, but may affect the resulting MTU on that node.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

**Examples**

In the following example, the MTU value for all interfaces is verified. The MTU value is shown in the next-to-last column:

```
RP/0/0/CPU0:router# show interfaces all brief
```

|              |               |                |               |               |              |
|--------------|---------------|----------------|---------------|---------------|--------------|
| Intf<br>Name | Intf<br>State | LineP<br>State | Encap<br>Type | MTU<br>(byte) | BW<br>(Kbps) |
|--------------|---------------|----------------|---------------|---------------|--------------|

```

-----
          Nu0                up          up          Null 1500   Unknown
        PO6/0/0/0            up          up          HDLC 4474   2488320
        PO6/0/0/1            up          up          HDLC 4474   2488320
        PO6/0/0/2  admin-down admin-down  HDLC 4474   2488320
        PO6/0/0/3  admin-down admin-down  HDLC 4474   2488320
        Mg0/RP0/CPU0/0      up          up          ARPA 1514   100000

```

```

RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 6/0/0/0
RP/0/0/CPU0:router(config-if)# mtu 1000

```

After the **mtu** command is used to decrease the MTU Layer 2 frame size for the POS interface on 6/0/0/0 to 1000 bytes, the **show interfaces all brief** command is used again to verify that the MTU Layer 2 frame size has been changed:

```
RP/0/0/CPU0:router# show interfaces all brief
```

```

          Intf      Intf      LineP      Encap  MTU      BW
          Name      State      State      Type  (byte)  (Kbps)
-----
          Nu0                up          up          Null 1500   Unknown
        PO6/0/0/0            up          up          HDLC 1000   2488320
        PO6/0/0/1            up          up          HDLC 4474   2488320
        PO6/0/0/2  admin-down admin-down  HDLC 4474   2488320
        PO6/0/0/3  admin-down admin-down  HDLC 4474   2488320
        Mg0/RP0/CPU0/0      up          up          ARPA 1514   100000

```

## Related Commands

| Command                                                         | Description                                                              |
|-----------------------------------------------------------------|--------------------------------------------------------------------------|
| <a href="#">shutdown (global)</a> , <a href="#">on page 560</a> | Disables an interface (forces an interface to be administratively down). |

# show im dampening

To display the state of all interfaces on which dampening has been configured, use the **show im dampening** command in EXEC mode.

**show im dampening** [*interface type*] *ifhandle handle*

## Syntax Description

|                        |                                                                                                             |
|------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>interface type</b>  | (Optional) Interface type. For more information, use the question mark (?) online help function.            |
| <b>ifhandle handle</b> | (Optional) Identifies the caps node whose Interface Manager (IM) dampening information you want to display. |

## Command Default

If you do not specify an interface, then the system displays brief details about all dampened interfaces.

## Command Modes

EXEC

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you do not specify an interface, then the system displays brief details about all dampened interfaces.

The physical hardware (layer 1) is not the only part of an interface that can change state. L2 keepalive failure event is one of the many instances that can have a similar impact on routing protocols despite the underlying interface state staying UP. To take account of such events, when dampening is configured on an interface, it is applied independently to every layer. They all use the same parameters as the interface but they have their own penalty value which is incremented when that layer changes state.

Capsulations that may be dampened in this way include these:

- L2 basecaps, such as HDLC and PPP, which may flap if keepalives are not received due to events such as intermittent packet loss.
- L3 capsulations (for example ipv4, ipv6). These may be brought down if another link has a conflicting IP address configured.
- Other locations where negotiation takes place with a peer router, as in the case of PPP control protocols such as IPCP. If the negotiation fails, then the caps is brought down.

## Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

## Examples

The following example shows the output from the **show im dampening** command issued with default values:

```
RP/0/0/CPU0:router(config)# interface POS 0/4/0/3
RP/0/0/CPU0:router(config-if)# no shutdown
RP/0/0/CPU0:router(config-if)# dampening
RP/0/0/CPU0:router# show im dampening
```

| Interface  | Proto | Caps  | Penalty Suppressed |
|------------|-------|-------|--------------------|
| -----      | ----- | ----- | -----              |
| POS0/4/0/3 | 0     | 0     | 0 NO               |

```
RP/0/0/CPU0:router# show im dampening interface POS 0/4/0/3
```

```
POS0/4/0/3 (0x05000d00)
Dampening enabled: penalty 0, not suppressed
underlying state: Up
half_life: 1 reuse: 750
suppress: 3000 max-suppress-time: 4
```

```
RP/0/0/CPU0:router# show interfaces POS 0/4/0/3
```

```
POS0/4/0/3 is up, line protocol is down
Dampening enabled: penalty 0, not suppressed
half_life: 1 reuse: 750
suppress: 3000 max-suppress-time: 4
Hardware is Packet-over-SONET
Description: ensoft-gsr5 POS 4\2
Internet address is Unknown
MTU 4474 bytes, BW 155520 Kbit
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation HDLC, crc 16, controller loopback not set, keepalive set (10 sec)
Last clearing of "show interface" counters never
30 second input rate 0 bits/sec, 0 packets/sec
30 second output rate 0 bits/sec, 0 packets/sec
0 packets input, 0 bytes, 0 total input drops
0 drops for unrecognized upper-level protocol
Received 0 broadcast packets, 0 multicast packets
0 runts, 0 giants, 0 throttles, 0 parity
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
48 packets output, 1504 bytes, 0 total output drops
Output 0 broadcast packets, 0 multicast packets
0 output errors, 0 underruns, 0 applique, 0 resets
0 output buffer failures, 0 output buffers swapped out
```

The following sample output shows a POS interface with PPP basecaps and IPCP. The subsequent output for **show im dampening interface <ifname>** contains a table of any encapsulations which have their own penalty as shown below:

```
RP/0/0/CPU0:router# show im dampening
```

| Interface              | Protocol | Capsulation | Pen   | Sup |
|------------------------|----------|-------------|-------|-----|
| -----                  | -----    | -----       | ----- | --- |
| GigabitEthernet0/0/0/0 |          |             | 629   | NO  |
| GigabitEthernet0/0/0/1 |          |             | 2389  | YES |
| POS0/2/0/0             |          |             | 0     | NO  |

```

POS0/2/0/0          <base>          ppp          0 NO
POS0/2/0/0          ipv4            ipcp          0 NO

```

RP/0/0/CPU0:router# **show im dampening interface TenGigaE 0/1/0/0**

```

TenGigE 0/1/0/0 (0x01180020)
Dampening enabled: Penalty 1625, SUPPRESSED (42 secs remaining)
  Underlying state: Down
    half-life: 1      reuse:          1000
    suppress: 1500    max-suppress-time: 4

```

| Protocol | Capsulation | Pen  | Suppression       | U-L State |
|----------|-------------|------|-------------------|-----------|
| ipv6     | ipv6        | 1625 | YES 42s remaining | Down      |



#### Note

When dampening is configured on an interface it is also applied independently to all capsulations on that interface. For example, the ppp or hdlc basecaps state can flap even while the interface stays up and if keepalives fail. The **show im dampening interface** command contains one line for each such capsulation as well as the interface itself as shown for the POS interface in the previous example.

**Table 35: show im dampening Field Descriptions**

| Field             | Description                                                                                                                                                                                                                          |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dampening         | Indicates the dampening state and penalty value: not suppressed, suppressed.                                                                                                                                                         |
| underlying state  | Underlying state of the interface: up, down, administratively down (if an interface has been configured to be “shutdown”).                                                                                                           |
| half_life         | This is the time (in minutes) at which the penalty on the interface would be half that of the original penalty (of 1000) when the interface transitions from UP to DOWN. It ranges from 1 to 45 minutes and the default is 1 minute. |
| reuse             | Penalty value below which a stable interface is unsuppressed. It ranges from 1 to 20000 and the default value is 750.                                                                                                                |
| suppress          | Limit at which an unstable interface is suppressed when the penalty value exceeds the suppress value. It ranges from 1 to 20000 and the default value is 2000.                                                                       |
| max-suppress-time | Maximum time (in minutes) that an interface can be suppressed. The default is 4 minutes.                                                                                                                                             |

**Related Commands**

| Command                                         | Description                                                              |
|-------------------------------------------------|--------------------------------------------------------------------------|
| <a href="#">dampening</a> , on page 538         | Turns on event dampening.                                                |
| <a href="#">shutdown (global)</a> , on page 560 | Disables an interface (forces an interface to be administratively down). |

# show interfaces

To display statistics for all interfaces configured on the router or for a specific node, use the **show interfaces** command in EXEC mode.

**show interfaces** [*type interface-path-id*] **all** | **local** | **location node-id**] [**accounting** | **brief** | **detail** | **summary**]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>              | (Optional) Specifies the type of interface for which you want to display statistics. For more information, use the question mark (?) online help function.                                                                                                                      |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | (Optional) Displays interface information for all interfaces. This is the default.                                                                                                                                                                                              |
| <b>local</b>             | (Optional) Displays interface information for all interfaces in the local card.                                                                                                                                                                                                 |
| <b>location node-id</b>  | (Optional) Displays information about all interfaces on the specified node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                     |
| <b>accounting</b>        | (Optional) Displays the number of packets of each protocol type that have been sent through the interface.                                                                                                                                                                      |
| <b>brief</b>             | (Optional) Displays brief information about each interface (one line per interface).                                                                                                                                                                                            |
| <b>detail</b>            | (Optional) Displays detailed information about each interface. This is the default.                                                                                                                                                                                             |
| <b>summary</b>           | (Optional) Displays a summary of interface information by interface type.                                                                                                                                                                                                       |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                                                                                                                                            |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Release 3.2   | This command was introduced.                                                                                                                            |
| Release 3.8.4 | The err-disable interface state was added as a possible interface state output value for bundle member links that have been administratively shut down. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

The **show interfaces** command displays statistics for the network interfaces. The resulting display shows the interface processors in slot order.

For example, if you type the **show interfaces** command without an interface type, you receive information for all the interfaces installed in the networking device. Only by specifying the interface *type*, *slot*, and *port* arguments can you display information for a particular interface.

If you enter a **show interfaces** command for an interface type that has been removed from the networking device, an error message is displayed: “Interface not found.”

The output displayed depends on the network for which an interface has been configured.

Beginning in Cisco IOS XR Release 3.8.4, when you shut down a bundle interface, the member links are put into err-disable link interface status and admin-down line protocol state.

**Note**

The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average is within 2 percent of the instantaneous rate of a uniform stream of traffic over that period.

**Task ID**

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

**Examples**

The following example shows the output from the **show interfaces** command. The output displayed depends on the type and number of interface cards in the networking device.

```
RP/0/0/CPU0:router# show interfaces tenGigE 0/0/0/1
```

```
TenGigE0/0/0/1 is administratively down, line protocol is administratively down
```



```

Hardware is TenGigE, address is 0800.4539.d909 (bia 0800.4539.d909)
Description: user defined string
Internet address is Unknown
MTU 1514 bytes, BW 10000000 Kbit
    reliability 255/255, txload 0/255, rxload 0/255
Encapsulation ARPA,
Full-duplex, 10000Mb/s, LR
output flow control is off, input flow control is off
loopback not set
ARP type ARPA, ARP timeout 01:00:00
Last clearing of "show interface" counters never
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 total input drops
    0 drops for unrecognized upper-level protocol
    Received 0 broadcast packets, 0 multicast packets
        0 runts, 0 giants, 0 throttles, 0 parity
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 total output drops
    Output 0 broadcast packets, 0 multicast packets
    0 output errors, 0 underruns, 0 applique, 0 resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions

```

In the following sample output, instance 1 is specified on a Packet-over-SONET/SDH (POS) card:

RP/0/0/CPU0:router# **show interfaces POS 0/1/0/1**

```

POS0/1/0/1 is administratively down, line protocol is administratively down
Hardware is Packet over SONET
Internet address is n.n.n.n/n
MTU 4474 bytes, BW 9953280 Kbit
    reliability 255/255, txload 0/255, rxload 0/255
Encapsulation HDLC, crc 32, controller loopback not set, keepalive not set
Last clearing of "show interface" counters never
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 total input drops
    0 drops for unrecognized upper-level protocol
    Received 0 broadcast packets, 0 multicast packets
        0 runts, 0 giants, 0 throttles, 0 parity
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 total output drops
    Output 0 broadcast packets, 0 multicast packets
    0 output errors, 0 underruns, 0 applique, 0 resets
    0 output buffer failures, 0 output buffers swapped out

```

The following example shows sample output for ATM subinterface 0/4/2/0/1.1:

RP/0/0/CPU0:router# **show interfaces ATM0/4/2/0/1.1**

```

ATM0/4/2/0/1.1 is up, line protocol is up
Interface state transitions: 1
Hardware is ATM network sub-interface(s)
Description: Connected to PE22_C12406 ATM 0/4/0/0/1.1
Internet address is 10.212.4.2I/24
MTU 4486 bytes, BW 1544 Kbit
    reliability Unknown, txload Unknown, rxload Unknown
Encapsulation AAL5/SNAP, controller loopback not set,
Last clearing of "show interface" counters Unknown
Datarate information unavailable.
Interface counters unavailable.

```

**Note**

The **show interfaces atm interface-path-id** command does not display data rates and counters for an ATM subinterface. Alternatively, you can use the **show interfaces atm interface-path-id accounting** command to view packet and character counters for each protocol, and the **show atm pvc vpi/vci** command to view cell, packet, and byte counters.

The following example shows bundle member links whose link interface status is “err-disable” and line protocol state is “admin-down” after the bundle interface has been administratively shut down using the **shutdown** command:

```
RP/0/0/CPU0:router# show interfaces brief
```

```
Thu May 6 06:30:55.797 DST
```

| Intf<br>Name    | Intf<br>State | LineP<br>State | Encap<br>Type | MTU<br>(byte) | BW<br>(Kbps) |
|-----------------|---------------|----------------|---------------|---------------|--------------|
| BE16            | admin-down    | admin-down     | ARPA          | 9216          | 1000000      |
| BE16.160        | up            | up             | 802.1Q VLAN   | 9220          | 1000000      |
| BE16.161        | up            | up             | 802.1Q VLAN   | 9220          | 1000000      |
| BE16.162        | up            | up             | 802.1Q VLAN   | 9220          | 1000000      |
| BE16.163        | up            | up             | 802.1Q VLAN   | 9220          | 1000000      |
| Lo0             | up            | up             | Loopback      | 1500          | Unknown      |
| Nu0             | up            | up             | Null          | 1500          | Unknown      |
| tt44190         | up            | up             | TUNNEL        | 1500          | Unknown      |
| tt44192         | up            | up             | TUNNEL        | 1500          | Unknown      |
| tt44194         | up            | up             | TUNNEL        | 1500          | Unknown      |
| tt44196         | up            | up             | TUNNEL        | 1500          | Unknown      |
| Mg0/0/CPU0/0    | up            | up             | ARPA          | 1514          | 100000       |
| Mg0/0/CPU0/1    | admin-down    | admin-down     | ARPA          | 1514          | 10000        |
| Gi0/1/0/0       | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/1       | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/2       | up            | up             | ARPA          | 9014          | 1000000      |
| Gi0/1/0/3       | up            | up             | ARPA          | 9014          | 1000000      |
| Gi0/1/0/3.160   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/3.161   | up            | up             | 802.1Q VLAN   | 9018          | 1000000      |
| Gi0/1/0/3.185   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/3.189   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/3.215   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/4       | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/5       | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/6       | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/7       | up            | up             | ARPA          | 9014          | 1000000      |
| Gi0/1/0/7.185   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/7.187   | up            | up             | 802.1Q VLAN   | 9014          | 1000000      |
| Gi0/1/0/7.189   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/7.210   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/7.211   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/7.215   | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/8       | up            | up             | ARPA          | 9014          | 1000000      |
| Gi0/1/0/9       | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/10      | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/11      | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/12      | up            | up             | ARPA          | 9216          | 1000000      |
| Gi0/1/0/13      | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/14      | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/15      | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |
| Gi0/1/0/16      | up            | up             | ARPA          | 9216          | 1000000      |
| Gi0/1/0/17      | up            | up             | ARPA          | 1514          | 1000000      |
| Gi0/1/0/18      | up            | up             | ARPA          | 9216          | 1000000      |
| Gi0/1/0/19      | up            | up             | ARPA          | 9014          | 1000000      |
| Gi0/1/0/19.2127 | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/19.2130 | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/20      | up            | up             | ARPA          | 9014          | 1000000      |
| Gi0/1/0/20.2125 | up            | up             | 802.1Q VLAN   | 9022          | 1000000      |
| Gi0/1/0/21      | admin-down    | admin-down     | ARPA          | 1514          | 1000000      |

```

Gi0/1/0/22 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/23 up up ARPA 9216 1000000
Gi0/1/0/24 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/25 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/26 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/27 up up ARPA 1514 1000000
Gi0/1/0/28 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/29 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/30 up up ARPA 9014 1000000
Gi0/1/0/30.215 up up 802.1Q VLAN 9018 1000000
Gi0/1/0/31 up up ARPA 9014 1000000
Gi0/1/0/32 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/33 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/34 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/35 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/36 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/37 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/38 admin-down admin-down ARPA 1514 1000000
Gi0/1/0/39 admin-down admin-down ARPA 1514 1000000
Te0/4/0/0 err-disable admin-down ARPA 1514 10000000
Te0/4/0/1 err-disable admin-down ARPA 1514 10000000
Te0/4/0/2 err-disable admin-down ARPA 1514 10000000
Te0/4/0/3 err-disable admin-down ARPA 1514 10000000
Te0/4/0/4 err-disable admin-down ARPA 1514 10000000
Te0/4/0/5 err-disable admin-down ARPA 1514 10000000
Te0/4/0/6 err-disable admin-down ARPA 1514 10000000
Te0/4/0/7 err-disable admin-down ARPA 1514 10000000
Te0/6/0/0 admin-down admin-down ARPA 1514 10000000
Te0/6/0/1 admin-down admin-down ARPA 1514 10000000
Te0/6/0/2 admin-down admin-down ARPA 1514 10000000
Te0/6/0/3 admin-down admin-down ARPA 1514 10000000

```

**Table 36: show interfaces Field Descriptions**

| Field                       | Description                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface name              | Displays the name of the current interface. For example, POS0/1/0/1.                                                                                                                                                                                                                                                                                                                               |
| Interface state             | Displays the state of the interface. For example, the interface is in the administratively up state.                                                                                                                                                                                                                                                                                               |
| Interface state transitions | Displays the number of times since the last reload that the interface transitioned from the administratively up state to the administrative down state and from the administratively down state to the administratively up state.                                                                                                                                                                  |
| line protocol state         | <p>Displays the state of the Layer 2 line protocol. This field may be different from the interface state if, for example, a keepalive failure has brought down the Layer 2.</p> <p><b>Note</b> The line protocol state is not the same as the protocol state displayed in the <b>show ip interfaces</b> command, because it is the state of Layer 2 (media) rather than Layer 3 (IP protocol).</p> |
| Hardware                    | Displays the current hardware type.                                                                                                                                                                                                                                                                                                                                                                |

| Field                                | Description                                                                                                                                                                                                                                                                                    |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internet address is <i>n.n.n.n/n</i> | Displays the Layer 2 address (MAC address for Ethernet interfaces).<br><br><b>Note</b> Enter the <b>mac-address</b> command to configure the hardware address.                                                                                                                                 |
| bia                                  | Displays the burned-in address (BIA) for the interface. The BIA is the default L2 (MAC) address for the interface.<br><br><b>Note</b> The BIA is not configurable.                                                                                                                             |
| description                          | Displays the user-defined string that is associated with the interface.<br><br><b>Note</b> Enter the <b>description</b> command to configure the description associated with the interface.                                                                                                    |
| Internet Address                     | Displays the Layer 3 (IP) address for the interface.<br><br><b>Note</b> Enter the <b>ipv4 address</b> command to configure the internet address for the interface.                                                                                                                             |
| MTU                                  | Displays the maximum transmission unit (MTU) for the interface. The MTU is the maximum packet size that can be transmitted over the interface.<br><br><b>Note</b> The MTU field indicates the interface MTU. Enter the <b>mtu</b> command to configure a lower MTU value at the Layer 3 level. |
| BW                                   | Displays the bandwidth of the interface in kbps.                                                                                                                                                                                                                                               |
| reliability                          | Displays the proportion of packets that are not dropped and do not have errors.<br><br><b>Note</b> The reliability is shown as a fraction of 255.                                                                                                                                              |
| txload                               | Indicates the traffic flowing out of the interface as a proportion of the bandwidth.<br><br><b>Note</b> The txload is shown as a fraction of 255.                                                                                                                                              |
| rxload                               | Indicates the traffic flowing into the interface as a proportion of the bandwidth.<br><br><b>Note</b> The rxload is shown as a fraction of 255.                                                                                                                                                |
| Encapsulation                        | Layer 2 encapsulation installed on the interface.                                                                                                                                                                                                                                              |

| Field                           | Description                                                                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CRC                             | <p>Indicates the length of the cyclic redundancy check (CRC), in bytes.</p> <p><b>Note</b> The CRC is not present for all interface types.</p> <p><b>Note</b> Enter the <b>pos crc</b> command to configure the CRC.</p>                                                         |
| loopback or controller loopback | <p>Indicates whether the hardware has been configured to be looped back.</p> <p><b>Note</b> Enter the <b>loopback</b> command to configure the loopback or controller loopback.</p>                                                                                              |
| keepalive                       | <p>Displays the configured keepalive value, in seconds.</p> <p><b>Note</b> Enter the <b>keepalive</b> command to configure the value of the keepalive field.</p> <p><b>Note</b> The <i>keepalive</i> field may not be present if it is not applicable to the interface type.</p> |
| Duplexity                       | <p>Displays the duplexity of the link.</p> <p><b>Note</b> This field is present only for shared media.</p> <p><b>Note</b> For some interface types, you can configure the duplexity by entering the <b>full-duplex</b> and <b>half-duplex</b> commands.</p>                      |
| Speed                           | Speed and bandwidth of the link in Mbps. This field is present only when other parts of the media info line are also displayed (see duplexity and media type).                                                                                                                   |
| Media Type                      | Media type of the interface.                                                                                                                                                                                                                                                     |
| output flow control             | Whether output flow control is enabled on the interface.                                                                                                                                                                                                                         |
| input flow control              | See output flow control.                                                                                                                                                                                                                                                         |
| ARP type                        | Address Resolution Protocol (ARP) type used on the interface. This value is not displayed on interface types that do not use ARP.                                                                                                                                                |
| ARP timeout                     | ARP timeout in <i>hours:mins:secs</i> . This value is configurable using the <b>arp timeout</b> command.                                                                                                                                                                         |
| Last clearing of counters       | Time since the following counters were last cleared using the <b>clear counters</b> exec command in <i>hours:mins:secs</i> .                                                                                                                                                     |

| Field                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 minute input rate  | <p>Average number of bits and packets received per second in the last 5 minutes. If the interface is not in promiscuous mode, it senses network traffic that it sends and receives (rather than all network traffic).</p> <p><b>Note</b> The 5-minute period referenced in the command output is a load interval that is configurable under the interface. The default value is 5 minutes.</p> <p><b>Note</b> The 5-minute input should be used only as an approximation of traffic per second during a given 5-minute period. This rate is exponentially weighted average with a time constant of 5 minutes. A period of four time constants must pass before the average is within two percent of the instantaneous rate of a uniform stream of traffic over that period.</p>     |
| 5 minute output rate | <p>Average number of bits and packets transmitted per second in the last 5 minutes. If the interface is not in promiscuous mode, it senses network traffic that it sends and receives (rather than all network traffic).</p> <p><b>Note</b> The 5-minute period referenced in the command output is a load interval that is configurable under the interface. The default value is 5 minutes.</p> <p><b>Note</b> The 5-minute output should be used only as an approximation of traffic per second during a given 5-minute period. This rate is exponentially weighted average with a time constant of 5 minutes. A period of four time constants must pass before the average is within two percent of the instantaneous rate of a uniform stream of traffic over that period.</p> |
| packets input        | Number of packets received on the interface that were successfully delivered to higher layers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| bytes input          | Total number of bytes successfully received on the interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| total input drops    | Total number of packets that were dropped after they were received. This includes packets that were dropped due to configured quality of service (QoS) or access control list (ACL) policies. QoS drops include policer drops, WRED drops, and tail drops. This does not include drops due to unknown Layer 3 protocol.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Field                                       | Description                                                                                                                                                                                                                                             |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| drops for unrecognized upper-level protocol | Total number of packets that could not be delivered because the necessary protocol was not configured on the interface.                                                                                                                                 |
| Received broadcast packets                  | Total number of Layer 2 broadcast packets received on the interface. This is a subset of the total input packet count.                                                                                                                                  |
| Received multicast packets                  | Total number of Layer 2 multicast packets received on the interface. This is a subset of the total input packet count.                                                                                                                                  |
| runts                                       | Number of received packets that were too small to be handled. This is a subset of the input errors count.                                                                                                                                               |
| giants                                      | Number of received packets that were too large to be handled. This is a subset of the input errors count.                                                                                                                                               |
| throttles                                   | Number of packets dropped due to throttling (because the input queue was full).                                                                                                                                                                         |
| parity                                      | Number of packets dropped because the parity check failed.                                                                                                                                                                                              |
| input errors                                | Total number of received packets that contain errors and hence cannot be delivered. Compare this to total input drops, which counts packets that were not delivered despite containing no errors.                                                       |
| CRC                                         | Number of packets that failed the CRC check.                                                                                                                                                                                                            |
| frame                                       | Number of packets with bad framing bytes.                                                                                                                                                                                                               |
| overrun                                     | Number of overrun errors experienced by the interface. Overruns represent the number of times that the receiver hardware is unable to send received data to a hardware buffer because the input rate exceeds the receiver's ability to handle the data. |
| ignored                                     | Total number of ignored packet errors. Ignored packets are those that are discarded because the interface hardware does not have enough internal buffers. Broadcast storms and bursts of noise can result in an increased number of ignored packets.    |
| abort                                       | Total number of abort errors on the interface.                                                                                                                                                                                                          |
| packets output                              | Number of packets received on the interface that were successfully delivered to higher layers.                                                                                                                                                          |

| Field                      | Description                                                                                                                                                                                                                                     |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| bytes output               | Total number of bytes successfully received on the interface.                                                                                                                                                                                   |
| total output drops         | Number of packets that were dropped before being transmitted. This includes packets that were dropped due to configured quality of service (QoS), (policer drops, WRED drops, and tail drops).                                                  |
| Received broadcast packets | Number of Layer 2 broadcast packets transmitted on the interface. This is a subset of the total input packet count.                                                                                                                             |
| Received multicast packets | Total number of Layer 2 multicast packets transmitted on the interface. This is a subset of the total input packet count.                                                                                                                       |
| output errors              | Number of times that the receiver hardware was unable to handle received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.                                                                   |
| underruns                  | Number of underrun errors experienced by the interface. Underruns represent the number of times that the hardware is unable to transmit data to a hardware buffer because the output rate exceeds the transmitter's ability to handle the data. |
| applique                   | Number of applique errors.                                                                                                                                                                                                                      |
| resets                     | Number of times that the hardware has been reset. The triggers and effects of this event are hardware-specific.                                                                                                                                 |
| output buffer failures     | Number of times that a packet was not output from the output hold queue because of a shortage of MEMD shared memory.                                                                                                                            |
| output buffers swapped out | Number of packets stored in main memory when the output queue is full; swapping buffers to main memory prevents packets from being dropped when output is congested. The number is high when traffic is bursty.                                 |
| carrier transitions        | Number of times the carrier detect (CD) signal of a serial interface has changed state.                                                                                                                                                         |



**Related Commands**

| Command                          | Description                                                                                                                        |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>show controller interface</b> | Displays information that is specific to the interface hardware statistics for all interfaces configured on the networking device. |

# shutdown (global)

To disable an interface (to force an interface to be administratively down), use the **shutdown** command in interface configuration mode. To enable an interface that has been shut down, use the **no** form of this command.

**shutdown**

**no shutdown**

## Syntax Description

This command has no keywords or arguments.

## Command Default

The interface is enabled by default and is disabled only when shutdown is configured.



### Note

When you add an interface to the system, or when all the configuration for an interface is lost or deleted, the interface is put in the shutdown state by the system adding the interface.

## Command Modes

Interface configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **shutdown** command to move the state of an interface to administratively down, which stops traffic flowing through the interface. This state does not stop other action from happening on the interface such as changes in configuration, protocols, encapsulations, and so forth.

The **shutdown** command also marks the interface as unavailable. To check whether the state of an interface is down, use the **show interfaces** command in EXEC mode, which displays the current state of the interface. An interface that has been shut down is shown as administratively down in the display from the **show interfaces** command.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

### Examples

In the following example, POS interface 0/4/0/2 is turned off:

```
RP/0/0/CPU0:router(config)# interface POS 0/4/0/2  
RP/0/0/CPU0:router(config-if)# shutdown
```

### Related Commands

| Command                                      | Description                                                                            |
|----------------------------------------------|----------------------------------------------------------------------------------------|
| <a href="#">show interfaces, on page 549</a> | Displays statistics for all interfaces configured on the router or on a specific node. |
| <b>show ip interface</b>                     | Displays IPv4 interface status and configuration.                                      |

 shutdown (global)



## Link Bundling Commands on the Cisco IOS XR Software

---

This module provides command line interface (CLI) commands for configuring Link Bundle interfaces on the Cisco XR 12000 Series Router.

- [bundle-hash, page 564](#)
- [bundle id, page 569](#)
- [bundle maximum-active links, page 571](#)
- [bundle minimum-active bandwidth, page 575](#)
- [bundle minimum-active links, page 576](#)
- [bundle port-priority, page 578](#)
- [clear lacp counters, page 580](#)
- [interface \(bundle\), page 582](#)
- [lacp packet-capture, page 584](#)
- [lacp period short, page 587](#)
- [lacp system priority, page 590](#)
- [show bundle, page 592](#)
- [show bundle brief, page 604](#)
- [show bundle replication bundle-ether, page 607](#)
- [show lacp bundle, page 608](#)
- [show lacp counters, page 611](#)
- [show lacp io, page 613](#)
- [show lacp packet-capture, page 616](#)
- [show lacp port, page 619](#)
- [show lacp system-id, page 622](#)

# bundle-hash

To display the source and destination IP addresses for the member links, distributed by the load balancing feature, in a multilink interface bundle, use the **bundle-hash** command in EXEC mode.

**bundle-hash** {**Bundle-Ether** *bundle-id*| **Bundle-POS** *bundle-id*| **members** {**GigabitEthernet**| **POS**} *interface-path-id*}

## Syntax Description

|                                      |                                                                                                                                                                                                                                                                                 |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bundle-Ether</b> <i>bundle-id</i> | Specifies an Ethernet bundle for which you want to calculate load balancing. Range is 1- 65535.                                                                                                                                                                                 |
| <b>Bundle-POS</b> <i>bundle-id</i>   | Specifies a POS bundle for which you want to calculate load balancing. Range is 1- 65535.                                                                                                                                                                                       |
| <b>members</b>                       | Identifies specific bundle member links for which you want to calculate load balancing.                                                                                                                                                                                         |
| <b>GigabitEthernet</b>               | Specifies the Gigabit Ethernet interface for which you want to calculate load balancing.                                                                                                                                                                                        |
| <b>POS</b>                           | Specifies the POS interface for which you want to calculate load balancing.                                                                                                                                                                                                     |
| <i>interface-path-id</i>             | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Bundle interface traffic is distributed over the various member links of a bundle according to a hash function. The **bundle-hash** command allows you to determine which bundle member link will carry a particular flow of traffic.

You can use the **bundle-hash** command to get the following information:

- Which members are used for a specified source/destination address pair,
- such as 10.10.10.1 20.20.20.1
- The destination IP address for a specified source IP address on a specified member.
- The load balancing distribution—how many times the members of a bundle are used for a specified range of IP addresses.

**Note**

The **bundle-hash** command does not display all possible IP addresses in an entire series. It stops displaying addresses after all the addresses for all the members of the bundle have been displayed once.

The **bundle-hash** command invokes a utility that initially prompts you to select some options. Based on the options you select, the utility prompts you more options to select. The initial options to select are as follows:

- L3/3-tuple
- Single pair or Range
- IPv4 or IPv6

The **bundle-hash** command utility prompts you for these options as follows:

- Specify load-balance configuration (L3/3-tuple) (L3,L4):
- Single SA/DA pair (IPv4,IPv6) or range (IPv4 only): S/R [S]:
- Enter bundle type IP V4 (1) or IP V6 (2):
- Enter source IP V4 address:
- Enter destination IP V4 address:
- Compute destination address set for all members? [y/n]:
- Enter subnet prefix for destination address set:
- Enter bundle IP V4 address [10.10.10.10]:

You may also be prompted to make further option choices depending on your selections.

You can use the **show bundle** command to get IP address information.

[Table 37: bundle-hash Command Options, on page 565](#) provides a general summary of the options and the information you need to provide for each selected option. The actual information that you need to provide depends on the selections you make and may vary from the information provided in [Table 37: bundle-hash Command Options, on page 565](#).

**Table 37: bundle-hash Command Options**

| Option      | Information You Need to Provide                                                                                                                                                                                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| L3/3-tuple  | L3 information: <ul style="list-style-type: none"> <li>• Source IP address</li> <li>• Destination IP address</li> <li>• Destination subnet prefix</li> <li>• Bundle IP address</li> </ul>                                                                                                                                |
| Single pair | Information for a single source port and destination port. The utility uses this information to calculate the hash and display the bundle load-balance distribution among the user-provided physical/bundle links.<br><br>The default is single mode.<br><br>While in single mode, you may receive the following prompt: |
| Range       | Information for sets of source and destination addresses to generate a packet flow for each set. The utility uses this information to calculate the hash for the generated packet flows and display the user-provided egress member links/bundle interfaces and the number of packet flows on each link.                 |
| IPv4        | IPv4 addresses                                                                                                                                                                                                                                                                                                           |

Compute destination address set for all members [y|n]:

If you enter y(es), several sample IPv4 addresses in the destination subnet are generated, and the link is calculated for each sample address. During this calculation, the destination network address is derived from the destination IPv4 address and the subnet prefix.

**Task ID**

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

**Examples**

The following example shows the **members** keyword prompts and options:

```
RP/0/0/CPU0:router# bundle-hash members pos 0/2/0/1
Thu Aug 20 20:19:21.241 DST
Single SA/DA pair or range: S/R [S]: s
Enter source IP V4 address: 10.10.10.10
```



```

Enter source IP V4 address: 10.10.10.10
Enter destination IP V4 address: 20.20.20.20
Compute destination address set for all members? [y/n]: y
Enter subnet prefix for destination address set: 8
Enter bundle IP V4 address [10.10.10.10]: 10.10.10.11

Link hashed [hash:0] to is POS0/2/0/1 member id 0 ifh 0x3000f00

Destination address set for subnet 20.0.0.0:
  20.0.0.1 [hash:4] hashes to link POS0/2/0/1

Another? [y]:

```

The following example shows how to calculate load balancing across the members of a link bundle (bundle-ether 2) using a single source and destination:

```

RP/0/0/CPU0:router# bundle-hash bundle-ether 2
Single SA/DA pair or range: S/R [S]: s
Enter source IP V4 address: 10.23.23.23
Enter destination IP V4 address: 10.12.12.12
Compute destination address set for all members? [y/n]: y
Enter subnet prefix for destination address set: 24
Enter bundle IP V4 address [10.23.23.23]: 10.1.1.2

Link hashed [hash:0] to is GigabitEthernet0/2/1/1 member id 0 ifh 0x3000b00

Destination address set for subnet 10.12.12.0:
  10.12.12.2 [hash:6] hashes to link GigabitEthernet0/2/1/1
  10.12.12.1 [hash:5] hashes to link GigabitEthernet0/2/1/0

```

The following example shows how to calculate load balancing across the members of a link bundle (bundle-ether 2) using a range of source and destinations:

```

RP/0/0/CPU0:router# bundle-hash bundle-ether 2

Single SA/DA pair or range: S/R [S]: r
Enter first source IP address: 10.1.1.1
Enter subnet prefix for source address set: 24
Enter number of source addresses (1-65536): 100
Enter source address modifier (1-167114) [1]: 1
Enter destination IP address: 10.4.4.4
Enter subnet prefix for destination address set: 24
Enter number of destination addresses (1-655): 10
Enter destination address modifier (1-1651404) [1]: 1
.
Total number of hits 1000
Member GigabitEthernet0/2/1/1 has 500 hits
Member GigabitEthernet0/2/1/0 has 500 hits

```

The following example shows how to calculate load balancing across specified members of a link bundle (bundle-ether 2) using a single source and destination:

```

RP/0/0/CPU0:router# bundle-hash members gigabitEthernet 0/2/1/1 gigabitEthernet 0/2/1/0
Single SA/DA pair or range: S/R [S]: s
Enter source IP V4 address: 10.1.1.1
Enter destination IP V4 address: 10.2.1.1
Compute destination address set for all members? [y/n]: y
Enter subnet prefix for destination address set: 16
Enter bundle IP V4 address [10.1.1.1]: 10.1.1.2

Link hashed [hash:6] to is GigabitEthernet0/2/1/1 member id 0 ifh 0x3000b00

Destination address set for subnet 10.2.1.0:
  10.2.1.1 [hash:6] hashes to link GigabitEthernet0/2/1/1
  10.2.1.2 [hash:5] hashes to link GigabitEthernet0/2/1/0

```

**Related Commands**

| Command                                  | Description                                    |
|------------------------------------------|------------------------------------------------|
| <a href="#">show bundle, on page 592</a> | Displays information about configured bundles. |

# bundle id

To add a port to an aggregated interface (or bundle), enter the **bundle id** command in interface configuration mode.

**bundle id** *bundle-id* [**mode** {**active**|**on**|**passive**}]

**no bundle id** *bundle-id*

## Syntax Description

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>bundle-id</i> | Number of the bundle (from 1 to 65535) on which you want to add a port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>mode</b>      | (Optional) Specifies the mode of operation, as follows: <ul style="list-style-type: none"><li>• <b>active</b>—Use the <b>mode active</b> keywords to run Link Aggregation Control Protocol (LACP) in active mode over the port. When you specify <b>active</b>, the port joins the bundle and is activated if LACP determines that it is compatible.</li><li>• <b>on</b>—Use the <b>mode on</b> keywords to configure an Etherchannel link over the port (no LACP running over the port).</li><li>• <b>passive</b>—Use the <b>mode passive</b> keywords to run LACP in passive mode over the port. When you specify <b>passive</b>, LACP packets are sent only if the other end of the link is using active LACP. The link joins the bundle and is activated if LACP packets are exchanged and the port is compatible.</li></ul> |

## Command Default

The default setting is **mode on**.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you enter the **bundle id** command and specify a port that is already bound to a bundle, the port unbinds from the original bundle and becomes attached to the new bundle. If the bundle numbers are the same, then the port does not unbind, but the mode changes to mode you specified with the **bundle id** command.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| bundle  | read, write |

**Examples**

The following example shows how to add a port onto a bundle:

```
RP/0/0/CPU0:router(config)# interface GigabitEthernet 0/1/5/0
RP/0/0/CPU0:router(config-if)# bundle id 1
```

The following example shows how to add an active LACP port onto an aggregated interface (or bundle):

```
RP/0/0/CPU0:router(config)# interface GigabitEthernet 0/6/5/7
RP/0/0/CPU0:router(config-if)# bundle id 5 mode active
```

**Related Commands**

| Command                                       | Description                                                                             |
|-----------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">show bundle, on page 592</a>      | Displays information about configured bundles.                                          |
| <a href="#">show interfaces, on page 549</a>  | Displays statistics for all interfaces configured on the router or for a specific node. |
| <a href="#">show lacp bundle, on page 608</a> | Displays detailed information about LACP ports and their peers.                         |
| <a href="#">show lacp port, on page 619</a>   |                                                                                         |

# bundle maximum-active links

To designate one active link and one link in standby mode that can take over immediately for a bundle if the active link fails, use the **bundle maximum-active links** command in interface configuration mode. To return to the default maximum active links value, use the **no** form of this command.

**bundle maximum-active links** *links* [**hot-standby**]

**no bundle maximum-active links** *links*

## Syntax Description

|                    |                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>links</i>       | Number of active links you want to bring up in the specified bundle, up to the maximum supported on the platform.                                                                                                                                                                                                                                     |
| <b>hot-standby</b> | (Optional) Determines how a switchover between active and standby links is implemented. This option is available only on links with LACP enabled. By default, a switchover is implemented per an IEEE standard approach. If you optionally specify the <b>hot-standby</b> keyword, a switchover is implemented per a faster proprietary optimization. |

## Command Default

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release       | Modification                              |
|---------------|-------------------------------------------|
| Release 3.6.0 | This command was introduced.              |
| Release 3.8.0 | The <b>hot-standby</b> keyword was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

1:1 link protection is not supported.

By default, multiple links can actively carry traffic for a bundle. However, if one of the links fails, there is no dedicated standby link to take its place. The **bundle maximum-active links** command enables you to implement the optional 1:1 link protection, which means for the specified bundle, you designate one active link and one or more standby links that can take over immediately if the active link fails.

By setting the **bundle maximum-active links** command to 1, the highest-priority link within the bundle becomes active (distributing state) and the remaining links are in standby mode. If a standby link meets one of the following criteria, it is in the collecting state:

- Running Link Aggregation Control Protocol (LACP), and the **hot-standby** option is implemented.
- Not running LACP.

If a standby link does not meet either of these criteria, it is in the waiting state.

The second highest-priority link within the bundle becomes the standby link that takes over immediately if the active link fails. The priority is based on the value from the **bundle port-priority** command, where a lower value is a higher priority. Therefore, you must configure the highest priority (lowest value) for the link that you want to be active and the second-highest priority for the link that you want to act as a backup to the active link.

**Note**

We recommend designating only one backup link to the active link. Although you can designate an additional backup link, maintaining two backup links consumes more bandwidth and offsets any benefits that may be gained.

**Note**

If a link is not running LACP, the configuration of the **bundle maximum-active links** and **bundle port-priority** commands or equivalent commands must be the same on both ends of the link. If a link is running LACP, the configuration of the **bundle maximum-active links** command only must be the same on both ends of the link.

The **hot-standby** option of using an IEEE standard-based switchover (the default) or a faster proprietary optimized switchover is available only for active and standby links running LACP. For links not running LACP, the proprietary optimized switchover option is used.

When using one of the **hot-standby** options on a Cisco IOS XR device, the peer device must have a standby link configured and be one of the following:

- Another Cisco IOS XR device using the same option.
- Another device using an IEEE standard-based switchover. (Cisco does not recommend using this option because unexpected behavior, such as the peer sending traffic on the standby link, can occur.)

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| bundle  | read, write |

**Examples**

In the following example, the user implements 1:1 link protection for Ethernet bundle 5 and specifies that the proprietary optimization is used for the LACP-enabled active and standby links:

```
RP/0/0/CPU0:router(config)# interface bundle-ether 5
RP/0/0/CPU0:router(config-if)# bundle maximum-active links 1 hot-standby
```

The following example shows how to display information about Ethernet bundle 5:

```
RP/0/0/CPU0:router# show bundle bundle-ether 5
```

State: 0 - Port is Detached. 1 - Port is Waiting.  
 2 - Port is Attached. 3 - Port is Collecting.  
 4 - Port is Distributing.

Bundle-Ether 5

| B/W (Kbps)                | MAC address | Minimum active Links | B/W (Kbps) | Maximum active Links |
|---------------------------|-------------|----------------------|------------|----------------------|
| 10000000001d.e5eb.2898111 |             |                      |            |                      |

  

| Port      | State | Port ID        | B/W (Kbps) | MAC address    |
|-----------|-------|----------------|------------|----------------|
| Te0/1/0/1 | 4     | 0x8000, 0x0001 | 10000000   | 0000.abab.0001 |
| Te0/1/0/0 | 3     | 0x8000, 0x0002 | 10000000   | 0000.abab.0000 |

In the **show bundle bundle-ether 5** command output, the state of the active link is 4, which indicates that the port is distributing. The state of the standby link is 3, which indicates that the port is collecting.

In the following example, the user implements 1:1 link protection for Ethernet bundle 5 and does not specify the **hot-standby** keyword, because the user wants to use the default IEEE standard-based switchover on the LACP-enabled active and standby links:

```
RP/0/0/CPU0:router(config)# interface bundle-ether 5
RP/0/0/CPU0:router(config-if)# bundle maximum-active links 1
```

The following example shows how to display information about Ethernet bundle 5:

```
RP/0/0/CPU0:router# show bundle bundle-ether 5
```

State: 0 - Port is Detached. 1 - Port is Waiting.  
 2 - Port is Attached. 3 - Port is Collecting.  
 4 - Port is Distributing.

Bundle-Ether 5

| B/W (Kbps)                | MAC address | Minimum active Links | B/W (Kbps) | Maximum active Links |
|---------------------------|-------------|----------------------|------------|----------------------|
| 10000000001d.e5eb.2898111 |             |                      |            |                      |

  

| Port      | State | Port ID         | B/W (Kbps) | MAC address    |
|-----------|-------|-----------------|------------|----------------|
| Te0/1/0/1 | 4     | 0x8000, 0x0001  | 10000000   | 0000.abab.0001 |
| Te0/1/0/0 | 1     | 10x8000, 0x0002 | 10000000   | 0000.abab.0000 |

In the **show bundle bundle-ether 5** command output, the state of the active link is 4, which indicates that the port is distributing. The state of the standby link is 1, which indicates that the port is waiting.

In the following example, the user implements 1:1 link protection for Ethernet bundle 5 and does not specify the **hot-standby** keyword, because the LACP-disabled link automatically uses the proprietary optimized switchover:

```
RP/0/0/CPU0:router(config)# interface bundle-ether 5
RP/0/0/CPU0:router(config-if)# bundle maximum-active links 1
```

The following example shows how to display information about Ethernet bundle 5:

```
RP/0/0/CPU0:router# show bundle bundle-ether 5
```

State: 0 - Port is Detached. 1 - Port is Waiting.  
 2 - Port is Attached. 3 - Port is Collecting.  
 4 - Port is Distributing.

**bundle maximum-active links**

```

Bundle-Ether 5
  B/W (Kbps)   MAC address   Minimum active   Maximum active
  -----
10000000001d.e5eb.2898111
  Port         State   Port ID         B/W (Kbps)   MAC address
  -----
Te0/1/0/1     4       0x8000, 0x0001  10000000    0000.abab.0001
Te0/1/0/0     3       0x8000, 0x0002  10000000    0000.abab.0000

```

In the **show bundle bundle-ether 5** command output, the state of the active link is 4, which indicates that the port is distributing. The state of the standby link is 3, which indicates that the port is collecting.

**Related Commands**

| Command                                                  | Description                                                             |
|----------------------------------------------------------|-------------------------------------------------------------------------|
| <a href="#">bundle minimum-active links, on page 576</a> | Sets the number of active links required to bring up a specific bundle. |
| <a href="#">show bundle, on page 592</a>                 | Displays information about configured bundles.                          |
| <a href="#">show lacp bundle, on page 608</a>            | Displays detailed information about LACP ports and their peers.         |



# bundle minimum-active bandwidth

To set the minimum amount of bandwidth required before a user can bring up a specific bundle, use the **bundle minimum-active bandwidth** command in interface configuration mode.

**bundle minimum-active bandwidth** *kbps*

|                           |             |                                                                                                                                                          |
|---------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>kbps</i> | Minimum bandwidth required before you can bring up a bundle. Range is from 1 through a number that varies depending on the platform and the bundle type. |
|---------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

|                        |                 |
|------------------------|-----------------|
| <b>Command Default</b> | <i>kbps</i> : 1 |
|------------------------|-----------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| <b>Command History</b> | Release       | Modification                 |
|------------------------|---------------|------------------------------|
|                        | Release 3.6.0 | This command was introduced. |

|                         |                                                                                                                                                                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Task ID</b> | Task ID | Operations  |
|----------------|---------|-------------|
|                | bundle  | read, write |

|                 |                                                                                                                                                                                                                                                |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example shows how to set the minimum amount of bandwidth required before a user can bring up a specific bundle. In this example, the user sets the minimum amount of bandwidth required to bring up Ethernet bundle 1 to 620000: |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

```
RP/0/0/CPU0:router(config)# interface Bundle-Ether 1
RP/0/0/CPU0:router(config-if)# bundle minimum-active bandwidth 620000
```

| <b>Related Commands</b> | Command                                                   | Description                                    |
|-------------------------|-----------------------------------------------------------|------------------------------------------------|
|                         | <a href="#">show bundle</a> , <a href="#">on page 592</a> | Displays information about configured bundles. |

# bundle minimum-active links

To set the number of active links required to bring up a specific bundle, use the **bundle minimum-active links** command in interface configuration mode.

**bundle minimum-active links** *links*

## Syntax Description

|              |                                                                                                   |
|--------------|---------------------------------------------------------------------------------------------------|
| <i>links</i> | Minimum number of active links allowed in the specified bundle.<br>The range is from 1 through 8. |
|--------------|---------------------------------------------------------------------------------------------------|

## Command Default

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| bundle  | read, write |

## Examples

The following example shows how to set the number of active links required to bring up a specific bundle. In this example, the user configures Ethernet bundle 5 so that two links must be active before the bundle can be brought up:

```
RP/0/0/CPU0:router(config)# interface Bundle-Ether 5
RP/0/0/CPU0:router(config-if)# bundle minimum-active links 2
```

## Related Commands

| Command                                                   | Description |
|-----------------------------------------------------------|-------------|
| <a href="#">bundle maximum-active links</a> , on page 571 |             |

| Command                                  | Description                                    |
|------------------------------------------|------------------------------------------------|
| <a href="#">show bundle, on page 592</a> | Displays information about configured bundles. |

# bundle port-priority

To configure a port priority for a bundle member link, enter the **bundle port-priority** command in interface configuration mode. To return to the default priority value, use the **no** form of this command.

**bundle port-priority** *priority*

**no bundle port-priority** *priority*

## Syntax Description

|                 |                                                                                                                                                          |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>priority</i> | Priority for this port, where a lower value equals a higher priority. Replace the <i>priority</i> argument with a number. Range is from 1 through 65535. |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

*priority*: 32768

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **bundle port-priority** command enables you to determine whether or not similar ports, for example, Gigabit Ethernet ports with Link Aggregation Control Protocol (LACP) enabled or with LACP disabled, are aggregated based on the priority of the port.

In cases where LACP is enabled on aggregated ports, the port priority forms part of the port ID, which is transmitted within a packet when a device exchanges packets with its peer. The peers use the port ID within the packets to determine whether a given port should carry traffic for the bundle.

In cases where LACP is disabled, the port priority is used locally, and a device does not communicate its priority to a peer. Therefore, the peers should have the same priority configured to avoid a mismatch in which links are used for carrying traffic. For example, you could set up the port priorities so that a device would use links 1, 3, and 4 for carrying traffic, and its peer would use links 1, 2, and 3, where links use the same numbering sequence at both ends.



### Note

A lower value is a higher priority for the port.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| bundle  | read, write |

**Examples**

The following example shows how to configure the priority of a port:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/1
RP/0/0/CPU0:router(config-if)# bundle port-priority 1
```

**Related Commands**

| Command                                          | Description                                                     |
|--------------------------------------------------|-----------------------------------------------------------------|
| <a href="#">bundle id, on page 569</a>           | Adds a port to an aggregated interface or bundle.               |
| <a href="#">show lacp bundle, on page 608</a>    | Displays detailed information about LACP ports and their peers. |
| <a href="#">show lacp port, on page 619</a>      |                                                                 |
| <a href="#">show lacp system-id, on page 622</a> | Displays the local system ID used by the LACP.                  |

## clear lacp counters

To clear Link Aggregation Control Protocol (LACP) counters for all members of all bundles, all members of a specific bundle, or for a specific port, enter the **clear lacp counters** command in EXEC mode.

**clear lacp counters** [**bundle** {**Bundle-Ether** *bundle-id*| **Bundle-POS** *bundle-id*}| **port** {**GigabitEthernet** *interface-path-id*| **TenGigE** *interface-path-id*| **POS** *interface-path-id*}]

### Syntax Description

|                                    |                                                                                                                                                                                                                                                                                 |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>bundle</b>                      | (Optional) Clears LACP counters for all members of a bundle.                                                                                                                                                                                                                    |
| <b>Bundle-Ether</b> <i>node-id</i> | (Optional) Ethernet bundle. Use the <i>node-id</i> argument to specify the node ID number of the LACP counters you want to clear. Range is 1 through 65535.                                                                                                                     |
| <b>Bundle-POS</b> <i>bundle-id</i> | (Optional) POS bundle. Use the <i>bundle-id</i> argument to specify the bundle ID number of the LACP counters you want to clear. Range is from 1 through 65535.                                                                                                                 |
| <b>port</b>                        | (Optional) Clears all LACP counters on the specified bundle or interface.                                                                                                                                                                                                       |
| <b>GigabitEthernet</b>             | (Optional) Gigabit Ethernet interface. Use the <i>interface-path-id</i> argument to specify the Gigabit Ethernet interface whose LACP counters you want to clear.                                                                                                               |
| <b>TenGigE</b>                     | (Optional) Ten Gigabit Ethernet interface. Use the <i>interface-path-id</i> argument to specify the Ten Gigabit Ethernet interface whose LACP counters you want to clear.                                                                                                       |
| <b>POS</b>                         | (Optional) Packet-over-SONET/SDH (POS) interface. Use the <i>interface-path-id</i> argument to specify the POS interface whose LACP counters you want to clear.                                                                                                                 |
| <i>interface-path-id</i>           | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

### Command Default

No default behavior or values

### Command Modes

EXEC

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

### Task ID

| Task ID        | Operations  |
|----------------|-------------|
| bundle         | execute     |
| basic-services | read, write |

### Examples

The following example shows how to clear LACP counters:

```
RP/0/0/CPU0:router# clear lacp counters
```

### Related Commands

| Command                                         | Description               |
|-------------------------------------------------|---------------------------|
| <a href="#">show lacp counters, on page 611</a> | Displays LACP statistics. |

# interface (bundle)

To create a new bundle and enter interface configuration mode for that bundle, use the **interface (bundle)** command in global configuration mode. To delete a bundle, use the **no** form of this command.

**interface** {**Bundle-Ether** | **Bundle-POS**} *bundle-id*

**no interface** {**Bundle-Ether** | **Bundle-POS**} *bundle-id*

## Syntax Description

|                     |                                                             |
|---------------------|-------------------------------------------------------------|
| <b>Bundle-Ether</b> | Specifies or creates an Ethernet bundle interface.          |
| <b>Bundle-POS</b>   | Specifies or creates a POS bundle interface.                |
| <i>bundle-id</i>    | Number from 1 to 65535 that identifies a particular bundle. |

## Command Default

No bundle interface is configured.

## Command Modes

Global configuration (config)

## Command History

| Release       | Modification                             |
|---------------|------------------------------------------|
| Release 3.6.0 | This command was introduced.             |
| Release 3.9.0 | The <b>Bundle-POS</b> keyword was added. |

## Usage Guidelines

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operation   |
|---------|-------------|
| bundle  | read, write |

## Examples

The following example shows how to create an Ethernet bundle and enter interface configuration mode:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface Bundle-Ether 3
RP/0/0/CPU0:router(config-if)#
```



The following example shows how to create a new POS bundle and enter interface configuration mode:

```
RP/0/0/CPU0:router(config)# interface Bundle-POS 10  
RP/0/0/CPU0:router(config-if)#
```

#### Related Commands

| Command                                                   | Description                                    |
|-----------------------------------------------------------|------------------------------------------------|
| <a href="#">show bundle</a> , <a href="#">on page 592</a> | Displays information about configured bundles. |

# lACP packet-capture

To capture LACP packets so that their information can be displayed by the **show lACP packet-capture** command, use the **lACP packet-capture** command in EXEC mode.

```
{lACP packet-capture gigabitethernet interface-path-id | pos interface-path-id | tengige interface-path-id
number-of-packets}
```

To stop capturing LACP packets or to clear captured LACP packets, use the **lACP packet-capture** command in EXEC mode.

```
{lACP packet-capture [bundle-ether bundle-id] [bundle-pos bundle-id] [gigabitethernet interface-path-id]
[pos interface-path-id] [tengige interface-path-id] clear | stop}
```

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>bundle-ether</b>      | Ethernet bundle interface specified by <i>bundle-id</i> .                                                                                                                                                                                                                       |
| <b>bundle-pos</b>        | Packet-over-SONET (POS) bundle interface specified by <i>bundle-id</i> .                                                                                                                                                                                                        |
| <b>GigabitEthernet</b>   | Gigabit Ethernet interface specified by <i>interface-path-id</i> .                                                                                                                                                                                                              |
| <b>POS</b>               | Packet-over-SONET (POS) interface specified by <i>interface-path-id</i> .                                                                                                                                                                                                       |
| <b>TenGigE</b>           | Ten Gigabit Ethernet interface specified by <i>interface-path-id</i> .                                                                                                                                                                                                          |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <i>bundle-id</i>         | Number specifying the bundle interface. The range is 1 to 65535.                                                                                                                                                                                                                |
| <i>number-of-packets</i> | Number of packets to capture.                                                                                                                                                                                                                                                   |
| <b>clear</b>             | Clears all currently captured packets.                                                                                                                                                                                                                                          |
| <b>stop</b>              | Stops capturing packets.                                                                                                                                                                                                                                                        |

## Command Default

The default (no parameters) executes globally for all interfaces on the line card.

## Command Modes

EXEC

**Command History**

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **lACP packet-capture** command captures transmitted and received LACP packets on a single bundle member interface. The contents of these packets can then be displayed by the **show lACP packet-capture** command. If the **lACP packet-capture** command is not issued, the **show lACP packet-capture** command does not display any information.

The **lACP packet-capture** command continues capturing LACP packets until the **stop** keyword is issued for that port or that bundle. Captured packets are stored and continue to be displayed until the **clear** keyword is issued for that port or that bundle.

LACP packets can only be captured for one port on a line card at a time. Starting a packet capture on a port implicitly stops and clears all packet-captures on all other ports on that line card.

To **stop** capturing LACP packets before the specified number of packets have been captured, issue the **stop** keyword.

If **stop** is specified for a single interface, packet capturing is stopped only on that interface.

If **stop** is specified for a bundle interface, packet capturing is stopped on all members of that bundle.

If **stop** is specified globally (the default - no parameters), packet capturing is stopped on all bundle interfaces on the router.

To **clear** all captured LACP packets that are stored for an interface, issue the **clear** keyword.

If **clear** is specified for a single interface, packets are cleared only on that interface.

If **clear** is specified for a bundle interface, packets are cleared on all members of that bundle.

If **clear** is specified globally (the default - no parameters), packets are cleared on all bundle interfaces on the router.

**Task ID**

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

**Examples**

The following example shows how to capture LACP packets on a POS interface:

```
RP/0/0/CPU0:router# lACP packet-capture pos 0/1/0/0 100
```

The following example shows how to stop capturing LACP packets on a POS interface:

```
RP/0/0/CPU0:router# lACP packet-capture pos 0/1/0/0 stop
```

The following example shows how to clear all captured LACP packets on a POS interface:

```
RP/0/0/CPU0:router# lacp packet-capture pos 0/1/0/0 clear
```

The following example shows how to capture LACP packets on a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# lacp packet-capture gigabitethernet 0/2/0/0 100
```

The following example shows how to stop capturing LACP packets on a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# lacp packet-capture gigabitethernet 0/2/0/0 stop
```

## Related Commands

| Command                                               | Description                                                                                                          |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <a href="#">show lacp io, on page 613</a>             | Displays the LACP transmission information that used by the transmitting device for sending packets on an interface. |
| <a href="#">show lacp packet-capture, on page 616</a> | Displays the contents of LACP packets that are sent and received on an interface.                                    |
| <a href="#">lacp period short, on page 587</a>        | Enables a short period time interval for the transmission and reception of LACP packets.                             |

# lacp period short

To enable a short period time interval for the transmission and reception of Link Aggregation Control Protocol (LACP) packets, use the **lacp period short** command in interface configuration mode. To return to the default short period, use the **no** form of this command.

**lacp period short** [*receive interval*] [*transmit interval*]

**no lacp period short** [*receive interval*] [*transmit interval*]

## Syntax Description

|                          |                                                                                                                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>receive interval</b>  | Time interval (in milliseconds) for receiving LACP packets when LACP short period is enabled. The range is 100 to 1000 and must be multiples of 100, such as 100, 200, 300, and so on.    |
| <b>transmit interval</b> | Time interval (in milliseconds) for transmitting LACP packets when LACP short period is enabled. The range is 100 to 1000 and must be multiples of 100, such as 100, 200, 300, and so on. |

## Command Default

The default is 1000.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                                                |
|---------------|-------------------------------------------------------------|
| Release 3.6.0 | This command was introduced.                                |
| Release 3.9.0 | The keywords <b>transmit</b> and <b>receive</b> were added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

Only the default short period (1 second) is supported.

When you configure a custom LACP short period *transmit* interval at one end of a link, you must configure the same time period for the *receive* interval at the other end of the link.

**Note**

You must always configure the *transmit* interval at both ends of the connection before you configure the *receive* interval at either end of the connection. Failure to configure the *transmit* interval at both ends first results in route flapping (a route going up and down continuously). When you remove a custom LACP short period, you must do it in reverse order. You must remove the *receive* intervals first and then the *transmit* intervals.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| bundle  | read, write |

**Examples**

The following example shows how to enable a default Link Aggregation Control Protocol (LACP) short period on a Gigabit Ethernet interface:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# lacp period short
RP/0/0/CPU0:router(config-if)# commit
```

The following example shows how to configure custom Link Aggregation Control Protocol (LACP) short period transmit and receive intervals at both ends of a connection:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# lacp period short
RP/0/0/CPU0:router(config-if)# commit
```

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# lacp period short
RP/0/0/CPU0:router(config-if)# commit
```

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# lacp period short transmit 500
RP/0/0/CPU0:router(config-if)# commit
```

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# lacp period short transmit 500
RP/0/0/CPU0:router(config-if)# commit
```

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# lacp period short receive 500
RP/0/0/CPU0:router(config-if)# commit
```

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/0/CPU0:router(config-if)# lacp period short receive 500
RP/0/0/CPU0:router(config-if)# commit
```

**Related Commands**

| Command                                               | Description                                                                                                          |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <a href="#">show lacp io, on page 613</a>             | Displays the LACP transmission information that used by the transmitting device for sending packets on an interface. |
| <a href="#">show lacp packet-capture, on page 616</a> | Displays the contents of LACP packets that are sent and received on an interface.                                    |
| <a href="#">lacp packet-capture, on page 584</a>      | Captures LACP packets so that their information can be displayed.                                                    |

# lacp system priority

To configure the priority for the current system, enter the **lacp system priority** command in global configuration mode. To return to the default LACP system priority value, use the **no** form of this command.

**no lacp system priority** *priority*

## Syntax Description

*s*      Priority for this system. Replace *priority* with a number. Range is from 1 through 65535. A lower value is higher priority.

## Command Default

*priority*: 32768

## Command Modes

Global configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The system priority value forms part of the LACP system ID, which is transmitted within each LACP packet. The system ID, port ID and key combine to uniquely define a port within a LACP system.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| bundle  | read, write |

## Examples

The following example shows how to configure an LACP priority of 100 on a router:

```
RP/0/0/CPU0:router(config)# lacp system priority 100
```

## Related Commands

| Command                                                           | Description                                    |
|-------------------------------------------------------------------|------------------------------------------------|
| <a href="#">show lacp system-id</a> , <a href="#">on page 622</a> | Displays the local system ID used by the LACP. |



| Command                                       | Description                                                     |
|-----------------------------------------------|-----------------------------------------------------------------|
| <a href="#">show lacp bundle, on page 608</a> | Displays detailed information about LACP ports and their peers. |
| <a href="#">show lacp port, on page 619</a>   |                                                                 |

# show bundle

To display information about all bundles or a specific bundle of a particular type, use the **show bundle** command in EXEC configuration mode.

**show bundle** [{**Bundle-Ether** | **Bundle-POS** } *bundle-id*]

## Syntax Description

|                     |                                                             |
|---------------------|-------------------------------------------------------------|
| <b>Bundle-Ether</b> | Displays information for the specified Ethernet bundle.     |
| <b>Bundle-POS</b>   | Displays information for the specified POS bundle.          |
| <i>bundle-id</i>    | Number from 1 to 65535 that identifies a particular bundle. |

## Command Default

Information is displayed for all configured bundles.

## Command Modes

EXEC (#)

## Command History

| Release       | Modification                                                                                                                        |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Release 3.6.0 | This command was introduced.                                                                                                        |
| Release 3.8.0 | The <b>reasons</b> keyword was removed.                                                                                             |
| Release 4.0.0 | The output for this command was replaced with a new format.                                                                         |
| Release 4.1.0 | The following output fields were added: <ul style="list-style-type: none"><li>• Load-balancing</li><li>• Cisco extensions</li></ul> |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

To see information for all bundles configured on the router, use the **show bundle** form of the command.

To see information for a specific bundle, use the **show bundle Bundle-Ether***bundle-id* **show bundle Bundle-POS***bundle-id* form of the command with the number of the configured bundle.

**Task ID**

| Task ID | Operation |
|---------|-----------|
| bundle  | read      |

**Examples**

The following example shows output for all bundle interfaces that are configured on the router:

```
RP/0/0/CPU0:router# show bundle
Sun Mar  6 12:16:25.601 PST
```

```
Bundle-Ether10
```

```
Status: Up
Local links <active/standby/configured>: 1 / 1 / 2
Local bandwidth <effective/available>: 1000000 (1000000) kbps
MAC address (source): f866.f213.25a8 (Gi0/1/0/16)
Minimum active links / bandwidth: 1 / 1 kbps
Maximum active links: 1
Wait while timer: 2000 ms
Load balancing: Default
LACP: Operational
Flap suppression timer: Off
Cisco extensions: Disabled
mLACP: Not configured
IPv4 BFD: Not operational
State: Off
Fast detect: Enabled
Start timer: Off
Neighbor-unconfigured timer: Off
Preferred min interval: 150 ms
Preferred multiple: 3
Destination address: Not Configured
```

| Port                                                      | Device | State   | Port ID        | B/W, kbps |
|-----------------------------------------------------------|--------|---------|----------------|-----------|
| Gi0/1/0/9                                                 | Local  | Active  | 0x0001, 0x0001 | 1000000   |
| Link is Active                                            |        |         |                |           |
| Gi0/1/0/10                                                | Local  | Standby | 0x0002, 0x0002 | 1000000   |
| Link is Standby due to maximum-active links configuration |        |         |                |           |

**Table 38: show bundle Field Descriptions**

| Field                     | Description                                                                                                                              |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Bundle- <i>typenumber</i> | Full name of the bundle interface, where <i>type</i> is Ether (Ethernet) or POS, followed by the configured <i>number</i> of the bundle. |

| Field                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status:                                  | <p>State of the bundle on the local device, with one of the following possible values:</p> <ul style="list-style-type: none"> <li>• Admin down—The bundle has been configured to be shut down.</li> <li>• Bundle shut—The bundle is holding all links in Standby state and will not support any traffic.</li> <li>• Down—The bundle is operationally down. It has no Active members on the local device.</li> <li>•</li> <li>•</li> <li>• Nak—The local and peer devices cannot resolve a configuration error.</li> <li>• Partner down—The partner system indicates that the bundle is unable to forward traffic at its end.</li> <li>• PE isolated—The bundle is isolated from the core.</li> <li>• Up—The bundle has Active members on this device.</li> </ul> |
| Local links <active/standby/configured>: | <p>The number of links on the device (from 0 to the maximum number of supported links for the bundle) in the format <math>x / y / z</math>, with the following values:</p> <ul style="list-style-type: none"> <li>• <math>x</math>—Number of links in Active state on the bundle.</li> <li>• <math>y</math>—Number of links in Standby state on the bundle.</li> <li>• <math>z</math>—Total number of links configured on the bundle.</li> </ul>                                                                                                                                                                                                                                                                                                                 |
| Local bandwidth <effective/available>:   | <p>Bandwidth characteristics on the bundle in kilobits per second (kbps) in the format <math>x / y</math>, with the following values:</p> <ul style="list-style-type: none"> <li>• <math>x</math>—Current bandwidth of the bundle (this effective bandwidth might be limited by configuration).</li> <li>• <math>y</math>—Available bandwidth of the bundle that is the sum of the bandwidths of all of the locally active links.</li> </ul>                                                                                                                                                                                                                                                                                                                     |

| Field                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC address (source):             | <p>Layer 2 MAC address on the bundle interface in the format<br/>xxxx.xxxx.xxxx. The (<i>source</i>) of the address is shown in parentheses with the following possible values:</p> <ul style="list-style-type: none"> <li>• Interface name—The MAC address is from the displayed member interface type and path.</li> <li>• Configured—The MAC address is explicitly configured.</li> <li>• Chassis pool—The MAC address is from the available pool of addresses for the chassis.</li> <li>• [unknown MAC source 0]—No MAC address could be assigned to the bundle. (You might see this display if you have not completed your bundle configuration.)</li> </ul> |
| Minimum active links / bandwidth: | <p>Displays the following information in the format <i>x / y</i> kbps, with the following values:</p> <ul style="list-style-type: none"> <li>• <i>x</i>—Minimum number of active links (from 1 to the maximum number of links supported on the bundle) that are required for the bundle to be operative.</li> <li>• <i>y</i>—Minimum total bandwidth on active links (in kbps) that is required for the bundle to be operative.</li> <li>• (partner)—Shows that the peer system's value is in use.</li> </ul>                                                                                                                                                     |
| Maximum active links:             | Maximum number of links (from 1 to the maximum supported on a bundle) that can be active on the bundle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Wait-while timer:                 | Amount of time (in milliseconds) that the system allows for the Link Aggregation Control Protocol (LACP) to negotiate on a “working” link, before moving a “protect” or backup link to Standby state.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Load balancing:                   | The default load balancing method for the system is used on the bundle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Field                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LACP:                   | <p>Displays whether or not Link Aggregation Control Protocol (LACP) is active on the bundle, with the following possible values:</p> <ul style="list-style-type: none"> <li>• Operational—All required configuration has been committed and LACP is in use on active members.</li> <li>• Not operational—LACP is not working because some mandatory configuration is missing on the bundle or on the active members of the bundle.</li> <li>• Not configured—None of the mandatory configuration for LACP has been committed on the bundle, and the LACP sub-fields are not displayed.</li> </ul> |
| Flap suppression timer: | <p>Displays the status of the flap suppression timer, with the following possible values:</p> <ul style="list-style-type: none"> <li>• Off—The flap suppression timer is not configured using the <b>lacp switchover suppress-flaps</b> command.</li> <li>• x ms—Amount of time allowed (in milliseconds) for standby links to activate after a working link fails, before putting the link in Down state.</li> </ul>                                                                                                                                                                             |
| Cisco extensions:       | <p>Displays whether or not the Cisco-specific TLVs for LACP are enabled. The possible values are Enabled or Disabled.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| mLACP:                  | <p>mLACP is not supported on the platform.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Field        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IPv4 BFD:    | <p>Displays whether or not IPv4-based bidirectional forwarding (BFD) is operating on the bundle interface, with the following possible values:</p> <ul style="list-style-type: none"> <li>• Operational—All required configuration has been committed for IPv4 BFD, and it is in use on the bundle.</li> <li>• Not operational—IPv4 BFD is not working because some mandatory configuration is missing on the bundle or on the active members of the bundle.</li> <li>• Not configured—None of the mandatory configuration for IPv4 BFD has been committed on the bundle, and the BFD sub-fields are not displayed.</li> </ul> |
| State:       | <p>When BFD is enabled, displays the state of BFD sessions on the bundle from the sessions running on bundle members that is communicated to interested protocols, with the following possible values:</p> <ul style="list-style-type: none"> <li>• Down—The configured minimim threshold for active links or bandwidth for BFD bundle members is not available so BFD sessions are down.</li> <li>• Off—BFD is not configured on bundle members.</li> <li>• Up—BFD sessions on bundle members are up because the minimum threshold for the number of active links or bandwidth is met.</li> </ul>                             |
| Fast detect: | <p>Displays whether or not BFD fast detection is configured on the bundle, with the following possible values:</p> <ul style="list-style-type: none"> <li>• Enabled—The <b>bfd fast-detect</b> command is configured on the bundle.</li> <li>• Disabled—The <b>bfd fast-detect</b> command is not configured on the bundle.</li> </ul>                                                                                                                                                                                                                                                                                         |

| Field                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Start timer:                 | <p>Displays status of the BFD start timer that is configured using the <b>bfd address-family ipv4 timers start</b> command, with the following possible values:</p> <ul style="list-style-type: none"> <li>• <i>x s</i>—Number of seconds (from 60 to 3600) after startup of a BFD member link session to wait for the expected notification from the BFD peer to be received, so that the session can be declared up. If the SCN is not received after that period of time, the BFD session is declared down.</li> <li>• Off—The start timer is not configured, and a BFD session is only declared Down upon notification from the BFD server.</li> </ul>                                                                              |
| Neighbor-unconfigured timer: | <p>Displays status of the BFD start timer that is configured using the <b>bfd address-family ipv4 timers nbr-unconfig</b> command, with the following possible values:</p> <ul style="list-style-type: none"> <li>• <i>x s</i>—Number of seconds (from 60 to 3600) to wait after receipt of notification that the BFD configuration has been removed by a BFD neighbor, so that any configuration inconsistency between the BFD peers can be fixed. If the BFD configuration issue is not resolved before the specified timer is reached, the BFD session is declared down.</li> <li>• Off—The neighbor-unconfigured timer is not configured, and a BFD session is only declared Down upon notification from the BFD server.</li> </ul> |
| Preferred min interval:      | Number of milliseconds (in the format <i>x ms</i> ) as the minimum control packet interval for BFD sessions. The range is 15 to 30000.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Preferred multiple:          | Value of the multiplier (from 2 to 50) that is used for echo failure detection, which specifies the maximum number of echo packets that can be missed before a BFD session is declared Down.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Destination address:         | Destination IP address for BFD sessions on bundle member links that is configured using the <b>bfd address-family ipv4 destination</b> command. “Not configured” is displayed when no destination IP address is configured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |



| Field        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port         | Name of the local interface port that is configured to be a bundle member. The possible values are the shortened interface name or a text string.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Device       | Label Distribution Protocol (LDP) address of the device where the interface port is located, with the following possible values: <ul style="list-style-type: none"> <li>• <i>address</i>—IP address of the device.</li> <li>• Local—Interface port is on the local device.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| State        | Status of the port, with one of the following possible values: <ul style="list-style-type: none"> <li>• Active—Link can send and receive traffic.</li> <li>• BFD Running—Link is inactive because BFD is down or has not been fully negotiated.</li> <li>• Configured—Link is not operational or remains down due to a configuration mismatch. The link is not available for switchover from failure of an active link.</li> <li>• Hot Standby—Link is ready to take over if an active link fails and can immediately transition to Active state without further exchange of LACP protocol data units (PDUs).</li> <li>• Negotiating—Link is in the process of LACP negotiation and is being held in a lower LACP state by the peer (for example, because the link is Standby on the peer.)</li> <li>• Standby—Link is not sending or receiving traffic, but is available for switchover from failure of an active link.</li> </ul> |
| Port ID      | ID of the interface port in the format <i>x/y</i> , with the following values: <ul style="list-style-type: none"> <li>• <i>x</i>—Port priority as a 2-byte hexadecimal value.</li> <li>• <i>y</i>—Link ID as a 2-byte hexadecimal value.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| B/W, kbps    | Bandwidth of the interface port in kilobits per second.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| State reason | Text string that is displayed beneath the bundle member listing explaining why a link has not reached Active state.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 39: State Reasons**

| Reason                                                               | Description                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BFD session is unconfigured on the remote end                        | The link is in BFD Running state because LACP is negotiated but the BFD session from the remote device has been unconfigured.                                                                                                                                  |
| BFD state of this link is Down                                       | The link is in BFD Running state because LACP is negotiated but the BFD session between the local system and the remote device is Down.                                                                                                                        |
| Bundle has been shut down                                            | The link is in Configured state because the bundle it is configured as a member of is administratively down.                                                                                                                                                   |
| Bundle interface is not present in configuration                     | The link is in Configured state because the bundle it is configured as a member of has not itself been configured.                                                                                                                                             |
| Bundle is in the process of being created                            | The link is in Configured state because the bundle it is configured as a member of is still being created.                                                                                                                                                     |
| Bundle is in the process of being deleted                            | The link is in Configured state because the bundle it is configured as a member of is being deleted.                                                                                                                                                           |
| Bundle is in the process of being replicated to this location        | The link is in Configured state because the bundle it is configured as a member of is still being replicated to the linecard where the link is located.                                                                                                        |
| Forced switchover to the mLACP peer                                  | The link is in Configured state because it has been brought down as part of a forced switchover to the mLACP peer PoA. This happens only when brute force switchovers are configured.                                                                          |
| ICCP group is isolated from the core network                         | The link is in Configured state because there is no connectivity through the network core for the ICCP group that the link and its bundle are part of. Therefore, the link has been brought down to prevent any traffic being sent by the LACP partner device. |
| Incompatible with other links in the bundle (bandwidth out of range) | The link is in Configured state because its bandwidth is incompatible with other links configured to be in the same bundle. The bandwidth may be too high or too low.                                                                                          |
| LACP shutdown is configured for the bundle                           | The link is in Standby state because the bundle is configured with LACP shutdown.                                                                                                                                                                              |

| Reason                                                             | Description                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Incompatible with other links in the bundle (LACP vs non-LACP)     | The link is in Configured state because its use of LACP is incompatible with other links configured in the same bundle. Some links might be running LACP while others are not.                                                                                                           |
| Link is Attached and has not gone Collecting (reason unknown)      | The link is in Negotiating state because the mLACP peer PoA has not indicated that the link has gone Collecting in the Mux machine. This could be because of an issue between the mLACP peer and its LACP partner or because this state has not been communicated to the local system.   |
| Link is Collecting and has not gone Distributing (reason unknown)  | The link is in Negotiating state because the mLACP peer PoA has not indicated that the link has gone Distributing in the Mux machine. This could be because of an issue between the mLACP peer and its LACP partner or because this state has not been communicated to the local system. |
| Link is being removed from the bundle                              | The link is being removed from the bundle and remains in Configured state while this happens.                                                                                                                                                                                            |
| Link is Defaulted; LACPDUs are not being received from the partner | The link is in Configured state because no LACPDUs are being received from the LACP partner device. Either the partner is not transmitting or the packets are getting lost.                                                                                                              |
| Link is down                                                       | The link is in Configured state because it is operationally or administratively down.                                                                                                                                                                                                    |
| Link is Expired; LACPDUs are not being received from the partner   | The link is in Negotiating state because no LACPDUs have been received from the LACP Partner device in the Current-While period and the link is now marked as Expired in the Receive machine.                                                                                            |
| Link is in the process of being created                            | The link is in Configured state because the member configuration is still being processed.                                                                                                                                                                                               |
| Link is marked as Standby by mLACP peer                            | The link is in Standby state because this has been indicated by the mLACP peer PoA.                                                                                                                                                                                                      |
| Link is Not Aggregatable (reason unknown)                          | The link is in Configured state because it is marked as an Individual link by the mLACP peer PoA.                                                                                                                                                                                        |
| Link is not operational as a result of mLACP negotiations          | mLACP negotiations with the peer have led to this link being kept in Configured state. This is likely to indicate a misconfiguration between the two peer devices.                                                                                                                       |

| Reason                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Link is Standby; bundle has more links than are supported           | The link is in Standby state because the number of links in Selected state has already reached the hard platform limit on the number of active links.                                                                                                                                                                                                                                          |
| Link is Standby due to maximum-active links configuration           | The link is in Standby state because the number of links in Selected state has already reached the configured maximum active links threshold.                                                                                                                                                                                                                                                  |
| Link is waiting for BFD session to start                            | The link is in BFD Running state because LACP is negotiated but the BFD session has not started from the remote device.                                                                                                                                                                                                                                                                        |
| Loopback: Actor and Partner have the same System ID and Key         | The link is in Configured state because a loopback condition has been detected on the link—two links configured to be members of the bundle are actually connected to each other.                                                                                                                                                                                                              |
| Not enough links available to meet minimum-active threshold         | The link is in Standby state because there are not enough selectable links (i.e. links which meet the criteria to be marked Selected within the bundle) to meet the minimum active links/bandwidth threshold.                                                                                                                                                                                  |
| Partner has marked the link as Not Aggregatable                     | The link is in Configured state because it is marked as an Individual link by the LACP partner device.                                                                                                                                                                                                                                                                                         |
| Partner has not advertised that it is Collecting                    | The link is in Negotiating state because the LACP partner device has not advertised that the link is in Collecting state in its LACPDUs.                                                                                                                                                                                                                                                       |
| Partner has not echoed the correct parameters for this link         | The link is in Negotiating state because the LACP partner device has not correctly echoed the local system's port information in the LACPDUs it is sending.                                                                                                                                                                                                                                    |
| Partner is not Synchronized (Waiting, not Selected, or out-of-date) | The link is in Negotiating state because the mLACP peer PoA has not indicated that its LACP partner device is Synchronized. This could be because the devices are genuinely not Synchronized or because this state has not been communicated to the local system.                                                                                                                              |
| Partner is not Synchronized (Waiting, Standby, or LAG ID mismatch)  | The link is in Negotiating state because the LACP partner device has not indicated that it is Synchronized in the LACPDUs it is sending. On the partner device the link could still be waiting for the Wait-While timer to expire, it could be held in Standby state, or there could be a misconfiguration leading to a LAG ID mismatch between links configured to be within the same bundle. |

| Reason                                                        | Description                                                                                                                                                                                                                        |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Partner System ID/Key do not match that of the Selected links | The link is in Configured state because the System ID or Operational Key specified by the LACP partner device does not match that seen on other Selected links within the same bundle. This probably indicates a misconfiguration. |
| Wait-while timer is running                                   | The link is in Configured state because the Wait-While timer is still running and the new state has not yet been determined.                                                                                                       |

**Related Commands**

| Command                                          | Description                                                                                |
|--------------------------------------------------|--------------------------------------------------------------------------------------------|
| <a href="#">interface (bundle)</a> , on page 582 | Specifies or creates a new bundle and enters interface configuration mode for that bundle. |

# show bundle brief

To display summary information about all configured bundles, use the **show bundle brief** command in EXEC configuration mode.

## show bundle brief

### Syntax Description

This command has no keywords or arguments.

### Command Default

Information for all configured bundles is displayed.

### Command Modes

EXEC (#)

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 4.0.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID | Operation |
|---------|-----------|
| bundle  | read      |

### Examples

The following examples shows the status of two bundles, BE16 and BE100, that are configured on the router. Both are Ethernet bundles and only bundle 16 is Up:

```
RP/0/0/CPU0:router# show bundle brief
Thu Mar 3 14:40:35.167 PST
```

| Name  | IG | State  | LACP | BFD | Links<br>act/stby/cfgd | Local b/w,<br>kbps |
|-------|----|--------|------|-----|------------------------|--------------------|
| BE16  |    | - Up   | On   | Off | 1 / 1 / 2              | 1000000            |
| BE100 |    | - Down | Off  | Off | 0 / 0 / 0              | 0                  |

[Table 40: show bundle brief Field Descriptions, on page 605](#) describes the fields shown in the display.

**Table 40: show bundle brief Field Descriptions**

| Field | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name  | <p>Abbreviated name of the bundle interface, with the following possible formats:</p> <ul style="list-style-type: none"> <li>• BEx—Ethernet bundle with ID number <i>x</i>.</li> <li>• BPy—POS bundle with ID number <i>y</i>.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| IG    | Interchassis group ID (if configured) of which the bundle is a member.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| State | <p>State of the bundle on the local device, with the following possible values:</p> <ul style="list-style-type: none"> <li>• Admin down—The bundle has been configured to be shut down.</li> <li>• Bundle shut—The bundle is holding all links in Standby state and will not support any traffic.</li> <li>• Down—The bundle is operationally down. It has no Active members on the local device.</li> <li>•</li> <li>•</li> <li>• Nak—The local and peer devices cannot resolve a configuration error.</li> <li>• Partner down—The partner system indicates that the bundle is unable to forward traffic at its end.</li> <li>• PE isolated—The bundle is isolated from the core.</li> <li>• Up—The bundle has Active members on this device.</li> </ul> |
| LACP  | <p>Status of the Link Aggregation Control Protocol (LACP) on the bundle, with the following possible values:</p> <ul style="list-style-type: none"> <li>• On—LACP is in use on the bundle.</li> <li>• Off—LACP is not active.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Field               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BFD                 | <p>When BFD is enabled, displays the state of BFD sessions on the bundle from the sessions running on bundle members that is communicated to interested protocols, with the following possible values:</p> <ul style="list-style-type: none"> <li>• Down—The configured minimum threshold for active links or bandwidth for BFD bundle members is not available so BFD sessions are down.</li> <li>• Off—BFD is not configured on bundle members.</li> <li>• Up—BFD sessions on bundle members are up because the minimum threshold for the number of active links or bandwidth is met.</li> </ul>                                      |
| Links act/stby/cfgd | <p>Number of links on the bundle with a particular status in the format <i>x/y/z</i>, with the following values:</p> <ul style="list-style-type: none"> <li>• <i>x</i>—Number of links in Active state on the bundle for the local device (from 1 to the maximum number of links supported on the bundle).</li> <li>• <i>y</i>—Number of links in Standby state on the bundle for the local device (from 1 to the maximum number of links supported on the bundle).</li> <li>• <i>z</i>—Total number of links configured on the bundle for the local device (from 1 to the maximum number of links supported on the bundle).</li> </ul> |
| Local b/w, kbps     | Current bandwidth of the bundle on the local device (this effective bandwidth might be limited by configuration).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

**Related Commands**

| Command                                                   | Description                                    |
|-----------------------------------------------------------|------------------------------------------------|
| <a href="#">show bundle</a> , <a href="#">on page 592</a> | Displays information about configured bundles. |



# show bundle replication bundle-ether

To display the replication status of a link bundle interface, use the **show bundle replication bundle-ether** command in EXEC mode.

**show bundle replication bundle-ether** *bundle\_id* [**all**] [**in-progress**] [**pending**]

## Syntax Description

|                    |                                                |
|--------------------|------------------------------------------------|
| <b>all</b>         | Shows replication status for all nodes.        |
| <b>in-progress</b> | Shows only nodes with replication in progress. |
| <b>pending</b>     | Shows only nodes pending replication.          |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

## Examples

The following example shows how to

```
RP/0/0/CPU0:router# show bundle replication bundle-ether 1 all
```

# show lacp bundle

To display detailed information about Link Aggregation Control Protocol (LACP) ports and their peers, enter the **show lacp bundle** command in EXEC mode.

**show lacp bundle** {**Bundle-Ether**| **bundle-POS**} *bundle-id*

## Syntax Description

|                                      |                                                                                                                         |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Bundle-Ether</b> <i>bundle-id</i> | (Optional) Specifies the number of the Ethernet bundle whose information you want to display. Range is 1 through 65535. |
| <b>Bundle-POS</b> <i>bundle-id</i>   | (Optional) Specifies the number of the POS bundle whose information you want to display. Range is 1 through 65535.      |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

## Examples

The following example shows how to display LACP information for a specific Ethernet Bundle:

```
RP/0/0/CPU0:router# show lacp bundle Bundle-Ether 1
```

```
Flags: A - Device is in Active mode. P - Device is in Passive mode.
       S - Device sends PDUs at slow rate. F - Device sends PDUs at fast rate.
       D - Port is using default values for partner information
       E - Information about partner has expired
State: 0 - Port is Not Aggregatable. 1 - Port is Out Of Sync with peer.
       2 - Port is In Sync with peer. 3 - Port is Collecting.
       4 - Port is Collecting and Distributing.
```

```

Bundle-Ether1
  B/W (Kbps)   MAC address   Minimum active   Maximum active
  -----
                0      0800.453a.651d      1      620000      32

  Port         State  Flags  Port ID      Key      System-ID
  -----
  Gi0/0/2/0    1      ASDE   0x8000, 0x0001  0x0001   0x8000, 08-00-45-3a-65-01
  PEER         0      PSD    0xffff, 0x0000  0x0000   0xffff, 00-00-00-00-00-00

```

**Table 41: show lacp bundle Field Descriptions**

| Field   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flags   | Describes the possible flags that may apply to a device or port, under the “Flags” field.                                                                                                                                                                                                                                                                                                                                                                              |
| State   | Describes the possible flags that may apply the port state, under the “State” field.                                                                                                                                                                                                                                                                                                                                                                                   |
| Port    | Port identifier, in the <i>rack/slot/module/port</i> notation.                                                                                                                                                                                                                                                                                                                                                                                                         |
| State   | Provides information about the state of the specified port. Possible flags are: <ul style="list-style-type: none"> <li>• 0—Port is not aggregatable.</li> <li>• 1—Port is out of sync with peer.</li> <li>• 2—Port is in sync with peer.</li> <li>• 3—Port is collecting.</li> <li>• 4—Port is collecting and distributing.</li> </ul>                                                                                                                                 |
| Flags   | Provides information about the state of the specified device or port. Possible flags are: <ul style="list-style-type: none"> <li>• A—Device is in Active mode.</li> <li>• P—Device is in Passive mode.</li> <li>• S—Device requests peer to send PDUs at a slow rate.</li> <li>• F—Device requests peer to send PDUs at a fast rate.</li> <li>• D—Port is using default values for partner information.</li> <li>• E—Information about partner has expired.</li> </ul> |
| Port ID | Port identifier, expressed in the format <i>Nxnnnn</i> . <i>N</i> is the port priority, and <i>nnnn</i> is the port number assigned by the sending router.                                                                                                                                                                                                                                                                                                             |

| Field     | Description                                                                                                                                                                                                                                                                                                                                       |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Key       | Two-byte number associated with the specified link and aggregator. Each port is assigned an operational key. The ability of one port to aggregate with another is summarized by this key. Ports which have the same key select the same bundled interface. The system ID, port ID and key combine to uniquely define a port within a LACP system. |
| System-ID | System identifier. The system ID is a LACP property of the system which is transmitted within each LACP packet together with the details of the link.                                                                                                                                                                                             |

**Related Commands**

| Command                                   | Description                                       |
|-------------------------------------------|---------------------------------------------------|
| <a href="#">bundle id</a> , on page 569   | Adds a port to an aggregated interface or bundle. |
| <a href="#">show bundle</a> , on page 592 | Displays information about configured bundles.    |

# show lacp counters

To display Link Aggregation Control Protocol (LACP) statistics, enter the **show lacp counters** command in EXEC mode.

**show lacp counters** {**Bundle-Ether**| **bundle-POS**} *bundle-id*

## Syntax Description

|                                      |                                                                                                                                                     |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bundle-Ether</b> <i>bundle-id</i> | Specifies the Ethernet bundle whose counters you want to display. Replace <i>bundle-id</i> with a bundle identifier. Range is from 1 through 65535. |
| <b>Bundle-POS</b> <i>bundle-id</i>   | Specifies the POS bundle whose counters you want to display. Replace <i>bundle-id</i> with a bundle identifier. Range is from 1 through 65535.      |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

## Examples

The following example shows how to display LACP counters on an Ethernet bundle:

```
RP/0/0/CPU0:router# show lacp counters bundle-ether 1
```

```
Bundle-Ether1
```

| Port      | LACPDUs |          | Marker   |            | Last Cleared |
|-----------|---------|----------|----------|------------|--------------|
|           | Sent    | Received | Received | Resp. Sent |              |
| Gi0/0/2/0 | 12      | 0        | 0        | 0          | never        |
| Port      | Excess  |          | Excess   |            | Pkt Errors   |
| -----     | -----   |          | -----    |            | -----        |

Gi0/0/2/0

0

0

0

**Table 42: show lacp counters Field Descriptions**

| Field  | Description                                                                                                                                                                                                                                                                                                                                                                                     |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LACPDU | <p>Provides the following statistics for Link Aggregation Control Protocol data units (LACPDU):</p> <ul style="list-style-type: none"> <li>• Port</li> <li>• Sent</li> <li>• Received</li> <li>• Last Cleared</li> <li>• Excess</li> <li>• Pkt Errors</li> </ul>                                                                                                                                |
| Marker | <p>Provides the following statistics for marker packets:</p> <ul style="list-style-type: none"> <li>• Received</li> <li>• Resp. Sent</li> <li>• Last Cleared</li> <li>• Excess</li> <li>• Pkt Errors</li> </ul> <p><b>Note</b> The Marker Protocol is used by IEEE 802.3ad bundles to ensure that data no longer is transmitted on a link when a flow is redistributed away from that link.</p> |

**Related Commands**

| Command                                           | Description                                                                                                    |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <a href="#">clear lacp counters</a> , on page 580 | Clears LACP counters for all members of all bundles, all members of a specific bundle, or for a specific port. |

# show lacp io

To display the Link Aggregation Control Protocol (LACP) transmission information that used by the transmitting device for sending packets on an interface, use the **show lacp io** command in EXEC mode.

**show lacp io** {**Bundle-Ether**|**bundle-POS**} *bundle-id* {**GigabitEthernet**|**POS**|**TenGigE**} *interface-path-id*

## Syntax Description

|                                      |                                                                                                                                                                                                                                                                                 |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bundle-Ether</b> <i>bundle-id</i> | (Optional) Displays information for the Ethernet bundle interface with the specified <i>bundle-id</i> . The range is 1 through 65535.                                                                                                                                           |
| <b>Bundle-POS</b> <i>bundle-id</i>   | (Optional) Displays information for the POS bundle interface with the specified <i>bundle-id</i> . The range is 1 through 65535.                                                                                                                                                |
| <b>GigabitEthernet</b>               | (Optional) Displays information for the Gigabit Ethernet interface with the specified <i>interface-path-id</i> .                                                                                                                                                                |
| <b>TenGigE</b>                       | (Optional) Displays information for the Ten Gigabit Ethernet interface with the specified <i>interface-path-id</i> .                                                                                                                                                            |
| <b>POS</b>                           | (Optional) Displays information for the POS interface with the specified <i>interface-path-id</i> .                                                                                                                                                                             |
| <i>interface-path-id</i>             | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

## Command Default

The default takes no parameters and displays information for all actively transmitting interfaces.

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command displays information only for interfaces that are actively transmitting packets.

**Task ID**

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

**Examples**

The following example shows how to display Link Aggregation Control Protocol (LACP) information for the Ethernet bundle interface with bundle ID 28.

```
RP/0/0/CPU0:router# show lacp io bundle-ether 28
```

```
Thu Jun 18 16:28:54.068 PST
```

```
Bundle-Ether28
```

```
Interface GigabitEthernet0/1/5/6
=====
Interface handle:      0x01180100
Interface media type:  Ethernet
Fast periodic interval: 1000ms
Source MAC address:    0015.63c0.b3b8
Actor system:          0x8000, 00-15-63-c0-b0-04
Actor key:              0x001c
Actor port:             0x8000, 0x0001
Actor state:            Act (T/o) Agg Sync Coll Dist (Def) (Exp)
Partner system:         0x8000, 00-15-63-58-b9-04
Partner key:            0x001c
Partner port:           0x0001, 0x0003
Partner state:          Act (T/o) Agg Sync Coll Dist (Def) (Exp)

Interface GigabitEthernet0/1/5/7
=====
Interface handle:      0x01180120
Interface media type:  Ethernet
Fast periodic interval: 1000ms
Source MAC address:    0015.63c0.b3b9
Actor system:          0x8000, 00-15-63-c0-b0-04
Actor key:              0x001c
Actor port:             0x8000, 0x0002
Actor state:            Act (T/o) Agg Sync (Coll) (Dist) (Def) (Exp)
Partner system:         0x8000, 00-15-63-58-b9-04
Partner key:            0x001c
Partner port:           0x0002, 0x0004
Partner state:          Act (T/o) Agg (Sync) (Coll) (Dist) (Def) (Exp)
```

The following example shows how to display Link Aggregation Control Protocol (LACP) information for all actively transmitting interfaces:

```
RP/0/0/CPU0:router# show lacp io
```

```
Thu Jun 18 16:33:57.330 PST
```

```
Bundle-Ether28
```

```
Interface GigabitEthernet0/1/5/6
=====
Interface handle:      0x01180100
Interface media type:  Ethernet
Fast periodic interval: 1000ms
Source MAC address:    0015.63c0.b3b8
Actor system:          0x8000, 00-15-63-c0-b0-04
Actor key:              0x001c
Actor port:             0x8000, 0x0001
Actor state:            Act (T/o) Agg Sync Coll Dist (Def) (Exp)
```



```

Partner system: 0x8000, 00-15-63-58-b9-04
Partner key:    0x001c
Partner port:   0x0001, 0x0003
Partner state:  Act (T/o) Agg Sync Coll Dist (Def) (Exp)

Interface GigabitEthernet0/1/5/7
=====
Interface handle:      0x01180120
Interface media type:  Ethernet
Fast periodic interval: 1000ms
Source MAC address:   0015.63c0.b3b9
Actor system:         0x8000, 00-15-63-c0-b0-04
Actor key:            0x001c
Actor port:          0x8000, 0x0002
Actor state:         Act (T/o) Agg Sync (Coll) (Dist) (Def) (Exp)
Partner system:      0x8000, 00-15-63-58-b9-04
Partner key:         0x001c
Partner port:        0x0002, 0x0004
Partner state:       Act (T/o) Agg (Sync) (Coll) (Dist) (Def) (Exp)

Bundle-POS24

Interface POS0/1/4/0
=====
Interface handle:      0x011804c0
Interface media type:  POS
Fast periodic interval: 1000ms
Actor system:         0x8000, 00-15-63-c0-b0-04
Actor key:            0x0018
Actor port:          0x8000, 0x0003
Actor state:         Act (T/o) Agg Sync Coll Dist (Def) (Exp)
Partner system:      0x8000, 00-15-63-58-b9-04
Partner key:         0x0018
Partner port:        0x8000, 0x0001
Partner state:       Act (T/o) Agg Sync Coll Dist (Def) (Exp)

Interface POS0/1/4/1
=====
Interface handle:      0x011804e0
Interface media type:  POS
Fast periodic interval: 1000ms
Actor system:         0x8000, 00-15-63-c0-b0-04
Actor key:            0x0018
Actor port:          0x8000, 0x0004
Actor state:         Act (T/o) Agg Sync Coll Dist (Def) (Exp)
Partner system:      0x8000, 00-15-63-58-b9-04
Partner key:         0x0018
Partner port:        0x8000, 0x0002
Partner state:       Act (T/o) Agg Sync Coll Dist (Def) (Exp)

```

**Related Commands**

| Command                                               | Description                                                                              |
|-------------------------------------------------------|------------------------------------------------------------------------------------------|
| <a href="#">show lacp packet-capture, on page 616</a> | Displays the contents of LACP packets that are sent and received on an interface.        |
| <a href="#">lacp period short, on page 587</a>        | Enables a short period time interval for the transmission and reception of LACP packets. |
| <a href="#">lacp packet-capture, on page 584</a>      | Captures LACP packets so that their information can be displayed.                        |

# show lacp packet-capture

To display the contents of Link Aggregation Control Protocol (LACP) packets that are sent and received on an interface, use the **show lacp packet-capture** command in EXEC mode.

**show lacp packet-capture** [**decoded**] [**in**|**out**] {**GigabitEthernet**|**POS**|**TenGigE**} *interface-path-id*

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>decoded</b>           | (Optional) Displays packet information in decoded form for the specified interface.                                                                                                                                                                                             |
| <b>in</b>                | (Optional) Displays packet information for ingress packets only.                                                                                                                                                                                                                |
| <b>out</b>               | (Optional) Displays packet information for egress packets only.                                                                                                                                                                                                                 |
| <b>GigabitEthernet</b>   | Displays packet information for the Gigabit Ethernet interface specified by <i>interface-path-id</i> .                                                                                                                                                                          |
| <b>POS</b>               | Displays packet information for the POS interface specified by <i>interface-path-id</i> .                                                                                                                                                                                       |
| <b>TenGigE</b>           | Displays packet information for the Ten Gigabit Ethernet interface specified by <i>interface-path-id</i> .                                                                                                                                                                      |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

## Command Default

The default displays both in and out information.

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

**Note**

The **lacp packet-capture** command captures transmit and receive packets on a single interface. The contents of these packets can then be displayed by the **show lacp packet-capture** command. If the **lacp packet-capture** command is not issued, the **show lacp packet-capture** command does not display any information.

**Task ID**

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

**Examples**

The following example shows how to display the contents of an LACP packet, in hexadecimal, for a Gigabit Ethernet interface:

**Note**

In the following example, after you issue the **lacp packet-capture** command, you must wait for a reasonable amount of time for the system to capture packets that are sent and received on the interface before you issue the **show lacp packet-capture** command. Otherwise, there is no information to display.

```
RP/0/0/CPU0:router# lacp packet-capture gigabitethernet 0/1/0/0 100
RP/0/0/CPU0:router# show lacp packet-capture gigabitethernet 0/1/0/0

Wed Apr 29 16:27:40.996 GMT
OUT Apr 29 17:05:50.123
=====
01 01 01 14 80 00 02 a7 4c 81 95 04 00 01 80 00 00 01 45 00
00 00 02 14 ff ff 00 00 00 00 00 00 00 00 00 ff ff 00 00 40 00
00 00 03 10 ff ff 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00

OUT Apr 29 17:35:50.124
=====
...
```

The following example shows how to display the LACP parameters, decoded from individual packets, transmitted and received on a Gigabit Ethernet interface:

**Note**

In the following example, after you issue the **lacp packet-capture** command, you must wait for a reasonable amount of time for the system to capture packets that are sent and received on the interface before you issue the **show lacp packet-capture** command. Otherwise, there is no information to display.

```
RP/0/0/CPU0:router# lacp packet-capture gigabitethernet 0/1/0/0 100
RP/0/0/CPU0:router# show lacp packet-capture decoded gigabitethernet 0/1/0/0

Wed Apr 29 16:27:54.748 GMT
OUT Apr 29 17:06:03.008
=====
Subtype: 0x01 - LACP      Version: 1
```

**show lacp packet-capture**

```

TLV: 0x01 - Actor Information      Length: 20
System: Priority: 32768, ID: 02-a7-4c-81-95-04
Key: 0x0001, Port priority: 32768, Port ID: 1
State: Act (T/o) Agg (Sync) (Coll) (Dist) Def (Exp)

TLV: 0x02 - Partner Information    Length: 20
System: Priority: 65535, ID: 00-00-00-00-00-00
Key: 0x0000, Port priority: 65535, Port ID: 0
State: (Act) (T/o) (Agg) (Sync) (Coll) (Dist) Def (Exp)

TLV: 0x03 - Collector Information  Length: 16
Max delay: 65535

TLV: 0x00 - Terminator             Length: 0

```

**Related Commands**

| Command                                          | Description                                                                                                          |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <a href="#">show lacp io, on page 613</a>        | Displays the LACP transmission information that used by the transmitting device for sending packets on an interface. |
| <a href="#">lacp period short, on page 587</a>   | Enables a short period time interval for the transmission and reception of LACP packets.                             |
| <a href="#">lacp packet-capture, on page 584</a> | Captures LACP packets so that their information can be displayed.                                                    |

# show lacp port

To display detailed information about Link Aggregation Control Protocol (LACP) ports, enter the **show lacp port** command in EXEC mode.

**show lacp port** [[GigabitEthernet| POS| TenGigE] *interface\_instance*]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>GigabitEthernet</b>   | (Optional) Gigabit Ethernet interface. Use the <i>interface-path-id</i> argument to specify the Gigabit Ethernet interface whose LACP counters you want to display.                                                                                                             |
| <b>TenGigE</b>           | (Optional) Ten Gigabit Ethernet interface. Use the <i>interface-path-id</i> argument to specify the Ten Gigabit Ethernet interface whose LACP counters you want to display.                                                                                                     |
| <b>POS</b>               | (Optional) Packet-over-SONET/SDH (POS) interface. Use the <i>interface-path-id</i> argument to specify the POS interface whose LACP counters you want to display.                                                                                                               |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

## Command Default

No default behavior or values.

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, if specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:

- *rack*: Chassis number of the rack.
- *slot*: Physical slot number of the line card.
- *module*: Module number. A physical layer interface module (PLIM) is always 0.

- *port*: Physical port number of the interface.

**Task ID**

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

**Examples**

The following example shows how to display LACP port information for all link bundles on a router:

```
RP/0/0/CPU0:router# show lacp port
```

```
Flags: A - Device is in Active mode. P - Device is in Passive mode.
       S - Device sends PDUs at slow rate. F - Device sends PDUs at fast rate.
       D - Port is using default values for partner information
       E - Information about partner has expired
State: 0 - Port is Not Aggregatable. 1 - Port is Out Of Sync with peer.
       2 - Port is In Sync with peer. 3 - Port is Collecting.
       4 - Port is Collecting and Distributing.
```

```
Bundle-Ether1
```

| B/W (Kbps) | MAC address    | Minimum active<br>Links | B/W (Kbps) | Maximum active<br>Links |
|------------|----------------|-------------------------|------------|-------------------------|
| 0          | 0800.453a.651d | 1                       | 620000     | 32                      |

  

| Port      | State | Flags | Port ID        | Key    | System-ID                 |
|-----------|-------|-------|----------------|--------|---------------------------|
| Gi0/0/2/0 | 1     | ASDE  | 0x8000, 0x0001 | 0x0001 | 0x8000, 08-00-45-3a-65-01 |
| PEER      | 0     | PSD   | 0xffff, 0x0000 | 0x0000 | 0xffff, 00-00-00-00-00-00 |

**Table 43: show lacp port Field Descriptions**

| Field | Description                                                                                                                                                                                                                                                                                                                                      |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port  | Identifies the LACP port whose information is displayed. The port number is expressed in the <i>rack/slot/module/port</i> notation.                                                                                                                                                                                                              |
| State | Provides information about the state of the specified device or port. Possible flags are: <ul style="list-style-type: none"> <li>• 0—Port is not aggregatable.</li> <li>• 1—Port is out of sync with peer.</li> <li>• 2—Port is in sync with peer.</li> <li>• 3—Port is collecting.</li> <li>• 4—Port is collecting and distributing.</li> </ul> |

| Field     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flags     | <p>Provides information about the state of the specified port. Possible flags are:</p> <ul style="list-style-type: none"> <li>• A—Device is in Active mode.</li> <li>• P—Device is in Passive mode.</li> <li>• S—Device requests peer to send PDUs at a slow rate.</li> <li>• F—Device requests peer to send PDUs at a fast rate.</li> <li>• D—Port is using default values for partner information.</li> <li>• E—Information about partner has expired.</li> </ul> |
| Port ID   | Port identifier, expressed in the following format: <i>Nxnnnn</i> . <i>N</i> is the port priority, and <i>nnnn</i> is the port number assigned by the sending router.                                                                                                                                                                                                                                                                                               |
| Key       | Two-byte number associated with the specified link and aggregator. Each port is assigned an operational key. The ability of one port to aggregate with another is summarized by this key. Ports which have the same key select the same bundled interface. The system ID, port ID and key combine to uniquely define a port within a LACP system.                                                                                                                   |
| System-ID | System identifier. The System ID is an LACP property of the system which is transmitted within each LACP packet together with the details of the link.                                                                                                                                                                                                                                                                                                              |

**Related Commands**

| Command                                   | Description                                       |
|-------------------------------------------|---------------------------------------------------|
| <a href="#">bundle id</a> , on page 569   | Adds a port to an aggregated interface or bundle. |
| <a href="#">show bundle</a> , on page 592 | Displays information about configured bundles.    |

# show lacp system-id

To display the local system ID used by the Link Aggregation Control Protocol (LACP), enter the **show lacp system-id** command in EXEC mode.

**show lacp system-id**

**Syntax Description** This command has no keywords or arguments.

**Command Default** No default behavior or values

**Command Modes** EXEC

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



**Note** The System ID and details about the specific link are transmitted within each LACP packet.

| Task ID | Operations |
|---------|------------|
| bundle  | read       |

**Examples** The following example shows how to display the system ID used by the LACP:

```
RP/0/0/CPU0:router# show lacp system-id
```

```
Priority  MAC Address
-----  -
0x8000   08-00-45-3a-65-01
```



**Table 44: show lacp system-id Field Descriptions**

| Field       | Description                                                 |
|-------------|-------------------------------------------------------------|
| Priority    | Priority for this system. A lower value is higher priority. |
| MAC Address | MAC address associated with the LACP system ID.             |

**Related Commands**

| Command                                                   | Description                                       |
|-----------------------------------------------------------|---------------------------------------------------|
| <a href="#">bundle id</a> , <a href="#">on page 569</a>   | Adds a port to an aggregated interface or bundle. |
| <a href="#">show bundle</a> , <a href="#">on page 592</a> | Displays information about configured bundles.    |

 `show lacp system-id`



# Management Ethernet Interface Commands on the Cisco IOS XR Software

---

This module provides command line interface (CLI) commands for configuring Management Ethernet interfaces on the Cisco XR 12000 Series Router.

- [duplex \(Management Ethernet\), page 626](#)
- [interface MgmtEth, page 628](#)
- [mac-address \(Management Ethernet\), page 630](#)
- [speed \(Management Ethernet\), page 632](#)

## duplex (Management Ethernet)

To configure duplex mode operation on a Management Ethernet interface, use the **duplex** command in interface configuration mode. To return the interface to autonegotiated duplex mode, use the **no** form of the **duplex** command.

**duplex** {full| half}

**no duplex**

### Syntax Description

|             |                                                                              |
|-------------|------------------------------------------------------------------------------|
| <b>full</b> | Configures the Management Ethernet interface to operate in full duplex mode. |
| <b>half</b> | Configures the Management Ethernet interface to operate in half duplex mode. |

### Command Default

Autonegotiates duplex operation

### Command Modes

Interface configuration

### Command History

| Release     | Modification                      |
|-------------|-----------------------------------|
| Release 3.2 | This command was first supported. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

### Examples

The following example shows how to configure the Management Ethernet interface to operate in full duplex mode:

```
RP/0/0/CPU0:router(config)# interface MgmtEth 0/0/CPU0/0
RP/0/0/CPU0:router(config-if)# duplex full
```

The following example shows how to configure the Management Ethernet interface to operate in half duplex mode:

```
RP/0/0/CPU0:router(config)# interface MgmtEth 0/0/CPU0/0
RP/0/0/CPU0:router(config-if)# duplex half
```

The following example shows how to return a Management Ethernet interface to autonegotiated duplex mode:

```
RP/0/0/CPU0:router(config)# interface MgmtEth 0/0/CPU0/0
RP/0/0/CPU0:router(config-if)# no duplex
```

#### Related Commands

| Command                                         | Description                                                                |
|-------------------------------------------------|----------------------------------------------------------------------------|
| <a href="#">interface MgmtEth</a> , on page 628 | Enters interface configuration mode for the Management Ethernet interface. |

# interface MgmtEth

To enter interface configuration mode for the Management Ethernet interface, use the **interface MgmtEth** command in global configuration mode. To delete a Management Ethernet interface configuration, use the **no** form of this command.

**interface MgmtEth** *interface-path-id*

**no interface MgmtEth** *interface-path-id*

## Syntax Description

|                          |                                                                                                            |
|--------------------------|------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.                                                                   |
| <b>Note</b>              | Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router. |
|                          | For more information about the syntax for the router, use the question mark (?) online help function.      |

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release     | Modification                      |
|-------------|-----------------------------------|
| Release 3.2 | This command was first supported. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

## Examples

The following example shows how to enter interface configuration mode for a Management Ethernet interface:

```
RP/0/0/CPU0:router(config)# interface MgmtEth 0/0/CPU0/0
RP/0/0/CPU0:router(config-if)#
```

**Related Commands**

| Command                                                        | Description                                                          |
|----------------------------------------------------------------|----------------------------------------------------------------------|
| <a href="#">duplex (Management Ethernet), on page 626</a>      | Configures duplex mode operation on a Management Ethernet interface. |
| <a href="#">mac-address (Management Ethernet), on page 630</a> | Sets the MAC layer address of a Management Ethernet interface.       |
| <a href="#">speed (Management Ethernet), on page 632</a>       | Configures the speed for a Management Ethernet interface.            |

## mac-address (Management Ethernet)

To set the MAC layer address of a Management Ethernet interface, use the **mac-address** command in interface configuration mode. To return the interface to its default MAC address, use the **no** form of the **mac-address** command.

**mac-address** *value1.value2.value3*

**no mac-address**

### Syntax Description

|               |                                                                            |
|---------------|----------------------------------------------------------------------------|
| <i>value1</i> | High 2 bytes of the MAC address in hexadecimal. Range is from 0 to ffff.   |
| <i>value2</i> | Middle 2 bytes of the MAC address in hexadecimal. Range is from 0 to ffff. |
| <i>value3</i> | Low 2 bytes of the MAC address in hexadecimal. Range is from 0 to ffff.    |

### Command Default

The default MAC address is read from the hardware burned-in address (BIA).

### Command Modes

Interface configuration

### Command History

| Release     | Modification                      |
|-------------|-----------------------------------|
| Release 3.2 | This command was first supported. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The MAC address must be in the form of three 4-digit values (12 digits in dotted decimal notation).

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

### Examples

The following example shows how to set the MAC address of the Management Ethernet interface located at 0/ RP0/CPU0/0:

```
RP/0/0/CPU0:router(config)# interface MgmtEth 0/0/CPU0/0
RP/0/0/CPU0:router(config-if)# mac-address 0001.2468.ABCD
```



**Related Commands**

| Command                                        | Description                                                                |
|------------------------------------------------|----------------------------------------------------------------------------|
| <a href="#">interface MgmtEth, on page 628</a> | Enters interface configuration mode for the Management Ethernet interface. |

## speed (Management Ethernet)

To configure the speed for a Management Ethernet interface, enter the **speed** command in interface configuration mode. To return the system to autonegotiate speed, use the **no** form of the **speed** command.

**speed** {10| 100| 1000}

**no speed**

### Syntax Description

|             |                                                             |
|-------------|-------------------------------------------------------------|
| <b>10</b>   | Configures the interface to transmit at 10 Mbps.            |
| <b>100</b>  | Configures the interface to transmit at 100 Mbps.           |
| <b>1000</b> | Configures the interface to transmit at 1000 Mbps (1 Gbps). |

### Command Default

Interface speed is autonegotiated.

### Command Modes

Interface configuration

### Command History

| Release     | Modification                      |
|-------------|-----------------------------------|
| Release 3.2 | This command was first supported. |

### Usage Guidelines

#### Note

Keep in mind that both ends of a link must have the same interface speed. A manually configured interface speed overrides any autonegotiated speed, which can prevent a link from coming up if the configured interface speed at one end of a link is different from the interface speed on the other end.

[Table 45: Relationship Between duplex and speed Commands, on page 632](#) describes the performance of the system for different combinations of the duplex and speed modes. The specified **duplex** command configured with the specified **speed** command produces the resulting system action.

**Table 45: Relationship Between duplex and speed Commands**

| duplex Command | speed Command | Resulting System Action                     |
|----------------|---------------|---------------------------------------------|
| no duplex      | no speed      | Autonegotiates both speed and duplex modes. |
| no duplex      | speed 1000    | Forces 1000 Mbps (1 Gbps) and full duplex.  |

| duplex Command | speed Command | Resulting System Action                                           |
|----------------|---------------|-------------------------------------------------------------------|
| no duplex      | speed 100     | Autonegotiates for duplex mode and forces 100 Mbps.               |
| no duplex      | speed 10      | Autonegotiates for duplex mode and forces 10 Mbps.                |
| duplex full    | no speed      | Forces full duplex and autonegotiates for speed.                  |
| duplex full    | speed 1000    | Forces 1000 Mbps (1 Gbps) and full duplex.                        |
| duplex full    | speed 100     | Forces 100 Mbps and full duplex.                                  |
| duplex full    | speed 10      | Forces 10 Mbps and full duplex.                                   |
| duplex half    | no speed      | Forces half duplex and autonegotiates for speed (10 or 100 Mbps.) |
| duplex half    | speed 100     | Forces 100 Mbps and half duplex.                                  |
| duplex half    | speed 10      | Forces 10 Mbps and half duplex.                                   |

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

**Examples**

The following example shows how to configure the Management Ethernet interface to transmit at one gigabit:

```
RP/0/0/CPU0:router(config)# interface MgmtEth 0/0/CPU0/0
RP/0/0/CPU0:router(config-if)# speed 1000
```

**Related Commands**

| Command                                        | Description                                                                |
|------------------------------------------------|----------------------------------------------------------------------------|
| <a href="#">interface MgmtEth, on page 628</a> | Enters interface configuration mode for the Management Ethernet interface. |





# Multilink Commands on the Cisco IOS XR Software

---

This module provides command line interface (CLI) commands for configuring multilink interfaces on the Cisco XR 12000 Series Router.

- [bundle, page 636](#)
- [controller MgmtMultilink, page 638](#)
- [interface multilink, page 640](#)
- [multilink, page 642](#)
- [multilink fragment-size, page 644](#)
- [multilink group, page 646](#)
- [multilink interleave, page 648](#)
- [ppp multilink minimum-active links, page 650](#)
- [show controllers mgmtmultilink, page 652](#)
- [show interfaces multilink, page 655](#)

# bundle

To create a multilink interface bundle, use the **bundle** command in the interface configuration mode. To remove a multilink interface bundle, use the **no** form of this command.

**bundle** *bundleID*

## Syntax Description

|                 |                                                                            |
|-----------------|----------------------------------------------------------------------------|
| <i>bundleID</i> | ID number of the multilink interface bundle. Range is from 1 through 1023. |
|-----------------|----------------------------------------------------------------------------|

## Command Default

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.1 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **bundle** command is used in mgmtmultilink controller mode to dynamically create a multilink interface. This command is similar to the **channel-group** command on the T1 controller, which dynamically creates a serial interface.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to create a multilink interface with a bundle ID of 1:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# controller mgmtmultilink 0/1/0/0
RP/0/0/CPU0:router(config-mgmtmultilink)# bundle 1
RP/0/0/CPU0:router(config-mgmtmultilink)# commit
```

**Related Commands**

| Command                                                          | Description                                                                                                          |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <a href="#">multilink</a> , on page 642                          | Enters the config-if-multilink submode.                                                                              |
| <a href="#">multilink fragment-size</a> , on page 644            |                                                                                                                      |
| <a href="#">multilink group</a> , on page 646                    | Attaches a serial interface to a multilink interface bundle.                                                         |
| <a href="#">ppp multilink minimum-active links</a> , on page 650 | Sets the minimum number of active links required before the multilink interface line can be brought to the up state. |

# controller MgmtMultilink

To configure a controller for a generic multilink bundle and enter MgmtMultilink configuration mode, use the **controller MgmtMultilink** command in global configuration mode. To return to the default state, use the **no** form of this command.

```
controller MgmtMultilink interface-path-id
no controller MgmtMultilink interface-path-id
```

|                    |                                                                                                                                                                                                                                 |                    |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Syntax Description | <i>interface-path-id</i>                                                                                                                                                                                                        | Virtual interface. |
|                    | <b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |                    |

|                 |                               |
|-----------------|-------------------------------|
| Command Default | No default behavior or values |
|-----------------|-------------------------------|

|               |                      |
|---------------|----------------------|
| Command Modes | Global configuration |
|---------------|----------------------|

|                 |                |                              |
|-----------------|----------------|------------------------------|
| Command History | <b>Release</b> | <b>Modification</b>          |
|                 | Release 3.6.0  | This command was introduced. |

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.<br><br>For the <i>interface-path-id</i> argument, use the following guidelines:                                                                                                                                                                                                                                                                                                                                                                                    |
|                  | <ul style="list-style-type: none"> <li>If specifying a physical interface, the naming notation is <i>rack/slot/module/instance</i>. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:                             <ul style="list-style-type: none"> <li><i>rack</i>: Chassis number of the rack.</li> <li><i>slot</i>: Physical slot number of the line card.</li> <li><i>module</i>: Module number.</li> <li><i>instance</i>: Number of the controller instance. The instance is always 0.</li> </ul> </li> <li>If specifying a virtual interface, the number range varies, depending on interface type.</li> </ul> |



**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

**Examples**

The following example shows how to enter the MgmtMultilink configuration mode :

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# controller MgmtMultilink 0/1/0/0
RP/0/0/CPU0:router(config-mgmtmultilink)#
```

**Related Commands**

| Command                                                     | Description                                                                               |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <a href="#">show controllers mgmtmultilink, on page 652</a> | Displays information about the state and the number of bundles of a multilink controller. |

# interface multilink

To configure a multilink interface and enter multilink interface configuration mode, use the **interface multilink** command in global configuration mode. To delete the interface configuration, use the **no** form of this command. To return to the default state, use the **no** form of this command.

**interface multilink** *interface-path-id* [*.subinterface* {**l2transport** | **point-to-point**}]

**no interface multilink** *interface-path-id* [*.subinterface* {**l2transport** | **point-to-point**}]

## Syntax Description

|                                                   |                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> [ <i>.subinterface</i> ] | Physical interface or virtual interface followed by the optional subinterface path ID. Naming notation is <i>interface-path-id.subinterface</i> . The period in front of the subinterface value is required as part of the notation.<br><br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>l2transport</b>                                | Configures interface to function as one endpoint on a Layer 2 link.                                                                                                                                                                                                                                                                               |
| <b>point-to-point</b>                             | Configures interface to function as one endpoint on a point-to-point link.                                                                                                                                                                                                                                                                        |

## Command Default

No interfaces are configured.

## Command Modes

Global configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The *subinterface* argument and keywords **l2transport** and **point-to-point** are only applicable if frame relay encapsulation is enabled using the **encapsulation frame-relay** command.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

## Examples

The following example shows how to enable frame relay encapsulation for a multilink bundle, and enter subinterface configuration mode.

```
RP/0/0/CPU0:routerRP/0/0/CPU0:router#
RP/0/0/CPU0:router# configure terminal
RP/0/0/CPU0:router(config)# interface multilink 0/3/0/0/1
RP/0/0/CPU0:router(config-if)# encapsulation frame-relay
RP/0/0/CPU0:router(config-if)# exit
RP/0/0/CPU0:router(config)# interface multilink 0/3/0/0/1.1 point-to-point
RP/0/0/CPU0:router(config-subif)# ipv4 address 10.86.10.48/24
```

The following example shows how to enter interface configuration mode for a multilink bundle with ppp encapsulation. ppp encapsulation is the default encapsulation type:

```
RP/0/0/CPU0:router# configure terminal
RP/0/0/CPU0:router(config)# interface multilink 0/3/0/0/1
RP/0/0/CPU0:router(config-if)#ipv4 address 10.86.10.48/24
```

## Related Commands

| Command                                                                 | Description                                       |
|-------------------------------------------------------------------------|---------------------------------------------------|
| <a href="#">show interfaces multilink</a> , <a href="#">on page 655</a> | Displays information about a multilink interface. |

# multilink

To enter the config-if-multilink submode, use the **multilink** command in the interface configuration mode.

**multilink**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.1 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For multilink interfaces, the **multilink** command provides access to the config-if-multilink submode to use the **multilink fragment-size** command.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |

## Examples

The following example shows how to enter the config-if-multilink submode:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# interface serial 0/1/0/1/1/1:0
RP/0/0/CPU0:router(config-if)# multilink
RP/0/0/CPU0:router(config-if-multilink)# group 1
RP/0/0/CPU0:router(config-if-multilink)# commit
```

## Related Commands

| Command                                               | Description                                                  |
|-------------------------------------------------------|--------------------------------------------------------------|
| <a href="#">multilink fragment-size</a> , on page 644 |                                                              |
| <a href="#">multilink group</a> , on page 646         | Attaches a serial interface to a multilink interface bundle. |

| Command                                                          | Description                                                                                                          |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <a href="#">ppp multilink minimum-active links</a> , on page 650 | Sets the minimum number of active links required before the multilink interface line can be brought to the up state. |

# multilink fragment-size

To set the Layer 2 fragmentation size and enable counting of fragmented packets, for a multilink interface which is controlled by the **mtu** command, use the **multilink fragment-size** command in interface configuration mode. To set the fragment size back to the default, no fragment size, use the **no** form of this command.

**multilink fragment-size** *size* [**fragment-counter**]

**no multilink fragment-size**

## Syntax Description

|                         |                                                                                                                                                                                                                                                                                                          |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>size</i>             | Fragment size. The allowed values are determined by the hardware. In the current release, the allowed values are 128, 256 and 512. The value 64 also appears in the CLI help for this parameter. However, 64 is not allowed in this release and will cause configuration problems in the system if used. |
| <b>fragment-counter</b> | Enables counting of the fragmented packets.                                                                                                                                                                                                                                                              |

## Command Default

The default is no multilink fragment-size, which means no fragmentation at Layer 2.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                                   |
|---------------|------------------------------------------------|
| Release 3.4.1 | This command was introduced.                   |
| Release 4.0.0 | The <b>fragment-counter</b> keyword was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Multilink fragmentation is only supported for ppp encapsulation, not for frame-relay encapsulation.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |

## Examples

The following example shows how to set the fragment size to 128:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface multilink 0/1/0/0/1
RP/0/0/CPU0:router(config-if)# multilink fragmentation-size 128
RP/0/0/CPU0:router(config-if)# commit
```

The following example shows how to set the fragment size to 128 and enable the fragmentation counters:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface multilink 0/1/0/0/1
RP/0/0/CPU0:router(config-if)# multilink fragmentation-size 128 fragment-counter
RP/0/0/CPU0:router(config-if)# commit
```

## Related Commands

| Command                                                                          | Description                                                                                                          |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <a href="#">multilink group</a> , <a href="#">on page 646</a>                    | Attaches a serial interface to a multilink interface bundle.                                                         |
| <a href="#">multilink</a> , <a href="#">on page 642</a>                          | Enters the config-if-multilink submode.                                                                              |
| <a href="#">ppp multilink minimum-active links</a> , <a href="#">on page 650</a> | Sets the minimum number of active links required before the multilink interface line can be brought to the up state. |

# multilink group

To attach a serial interface to a multilink interface bundle, use the **multilink group** command in interface configuration mode. To remove a serial interface from a multilink interface bundle, use the **no** form of this command.

**multilink group** *bundleID*

**no multilink group** *bundleID*

## Syntax Description

|                 |                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------|
| <i>bundleID</i> | Bundle ID number of the multilink interface, in the format <i>rack/slot/bay/controllerID/bundleID</i> ) |
|-----------------|---------------------------------------------------------------------------------------------------------|

## Command Default

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.1 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |

## Examples

The following examples show how to attach a serial interface to a multilink interface bundle:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface serial 0/1/0/1/1/1:0
RP/0/0/CPU0:router(config-if)# multilink group 1
RP/0/0/CPU0:router(config-if)# commit
```

or

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface serial 0/1/0/1/1/1:0
```



```
RP/0/0/CPU0:router(config-if)# multilink  
RP/0/0/CPU0:router(config-if-multilink)# group 1  
(config-if-multilink)# commit
```

**Related Commands**

| Command                                                         | Description                                                                                                          |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <a href="#">multilink fragment-size, on page 644</a>            |                                                                                                                      |
| <a href="#">multilink, on page 642</a>                          | Enters the config-if-multilink submode.                                                                              |
| <a href="#">ppp multilink minimum-active links, on page 650</a> | Sets the minimum number of active links required before the multilink interface line can be brought to the up state. |

# multilink interleave

To enable interleave on a multilink interface, use the **multilink interleave** command in interface configuration mode.

**multilink interleave**

## Syntax Description

This command has no keywords or arguments.

## Command Default

The default is no interleave.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.5.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Link Fragmentation and Interleaving (LFI) is designed for MLPPP interfaces and is required when integrating voice and data on low-speed interfaces that run at less than 768 Kbps.

Link Fragmentation and Interleaving (LFI) provides stability for delay-sensitive traffic, such as voice or video, traveling on the same circuit as data. Voice is susceptible to increased latency and jitter when the network processes large packets on low-speed interfaces that run at less than 768 Kbps. LFI reduces delay and jitter by fragmenting large datagrams and interleaving them with low-delay traffic packets.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |

## Examples

The following examples show how to enable interleave on a multilink interface.

```
RP/0/0/CPU0:router# configuration
RP/0/0/CPU0:router#(config)# interface multilink 0/1/0/0/1
RP/0/0/CPU0:router#(config-if)# multilink interleave
RP/0/0/CPU0:router#(config-if)# commit
or
```

```
RP/0/0/CPU0:router# configuration
```

```
RP/0/0/CPU0:router#(config)# interface multilink 0/1/0/0/1  
RP/0/0/CPU0:router#(config-if)# multilink  
RP/0/0/CPU0:router#(config-if-multilink)# interleave  
RP/0/0/CPU0:router#(config-if-multilink)# commit
```

**Related Commands**

| Command                                               | Description                             |
|-------------------------------------------------------|-----------------------------------------|
| <a href="#">multilink</a> , on page 642               | Enters the config-if-multilink submode. |
| <a href="#">multilink fragment-size</a> , on page 644 |                                         |

# ppp multilink minimum-active links

To set the minimum number of active links required before the multilink interface line can be brought to the up state, use the **ppp multilink minimum-active links** command in global configuration mode.

**ppp multilink minimum-active links** *value*

## Syntax Description

|              |                                                    |
|--------------|----------------------------------------------------|
| <i>value</i> | Number of active links. The range is 1 through 12. |
|--------------|----------------------------------------------------|

## Command Default

The default value is 1 active link.

## Command Modes

Global configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.1 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When multiple links are active and one link goes down, the whole bundle goes down.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| ppp     | read, write |

## Examples

The following example shows how to set the minimum number of active links to 6:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface Multilink 0/1/0/0/1
RP/0/0/CPU0:router(config-if)# ppp multilink minimum-active links 6
```

## Related Commands

| Command                                                               | Description                                                  |
|-----------------------------------------------------------------------|--------------------------------------------------------------|
| <a href="#">multilink fragment-size</a> , <a href="#">on page 644</a> |                                                              |
| <a href="#">multilink group</a> , <a href="#">on page 646</a>         | Attaches a serial interface to a multilink interface bundle. |

| Command                                 | Description                             |
|-----------------------------------------|-----------------------------------------|
| <a href="#">multilink</a> , on page 642 | Enters the config-if-multilink submode. |

# show controllers mgmtmultilink

To display information about the state and the number of bundles of a multilink controller, use the **show controller mgmtmultilink** command in EXEC mode.

**show controllers mgmtmultilink** *interface-path-id* [**all**|**brief**|**internal-state**|**tabular**]

## Syntax Description

|                          |                                                                                                                                                                                                                                                           |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | Displays all multilink management information.                                                                                                                                                                                                            |
| <b>brief</b>             | Displays brief multilink management information.                                                                                                                                                                                                          |
| <b>internal-state</b>    | Displays internal multilink management state.                                                                                                                                                                                                             |
| <b>tabular</b>           | Displays multilink management information in tabular format.                                                                                                                                                                                              |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.1 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/instance*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.

- *module*: Module number. A physical layer interface module (PLIM) is always 0.
- *instance*: Number of the controller instance. The instance is always 0.
- If specifying a virtual interface, the number range varies, depending on interface type.

**Task ID**

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

**Examples**

The following example shows how to display information for a management multilink controller:

```
RP/0/0/CPU0:router# show controllers mgmtmultilink 0/3/0/0 all

Controller MgmtMultilink0/3/0/0
State is up
Number of bundles: 2
  Bundle 1 - Multilink0/3/0/0/1 (0x06186240)
    Type: Full Framed Tls
    Bandwidth: 3072 kbps
    Encapsulation: Frame Relay
    Fragment size: 0
    Number of members: 2
    Ancestor name: SONET0/3/0/0
    Member(s):
      Serial0/3/0/0/1/1:0 (0x0619b640) Active
      Serial0/3/0/0/1/2:0 (0x06176980) Active

  Bundle 2 - Multilink0/3/0/0/2 (0x06176840)
    Type: Full Framed Tls
    Bandwidth: 3072 kbps
    Encapsulation: Frame Relay
    Fragment size: 0
    Number of members: 2
    Ancestor name: SONET0/3/0/0
    Member(s):
      Serial0/3/0/0/1/3:0 (0x0619b3c0) Active
      Serial0/3/0/0/1/4:0 (0x0618b9c0) Active

RP/0/0/CPU0:router# show controllers mgmtmultilink 0/3/0/0 brief

MgmtMultilink0/3/0/0 is up

RP/0/0/CPU0:router# show controllers mgmtmultilink 0/3/0/0 tabular

MgmtMultilink0/3/0/0 is up

RP/0/0/CPU0:router# show controllers mgmtmultilink 0/3/0/0 internal-state

Interface(layer)      admin up if_state
-----
MgmtMultilink0/3/0/0  up      up

RP/0/0/CPU0:router# show controllers mgmtmultilink 0/2/0/0

Controller MgmtMultilink0/2/0/0
State is up
Number of bundles: 1
  Bundle 1 - Multilink0/2/0/0/1 (0x0802e400)
    Type: Full Framed Tls
    Bandwidth: 1536 kbps
    Encapsulation: PPP
    Fragment size: 0
```

```
show controllers mgmtmultilink
```

```
Number of members: 1
Ancestor name: SONET0/2/0/0
Member(s):
    Serial0/2/0/0/1/1:0  (0x08023c00)  Active
```

## Related Commands

| Command                                                | Description                                       |
|--------------------------------------------------------|---------------------------------------------------|
| <a href="#">show interfaces multilink, on page 655</a> | Displays information about a multilink interface. |



# show interfaces multilink

To display information about a multilink interface, use the **show interfaces multilink** command in EXEC mode.

**show interfaces multilink** *interface-path-id*

## Syntax Description

*interface-path-id*

Physical interface or virtual interface.

**Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router.

For more information about the syntax for the router, use the question mark (?) online help function.

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

Examples

The following example shows how to display information about a multilink interface:

```
RP/0/0/CPU0:router# show interfaces multilink 0/1/0/0/1
Multilink0/1/0/0/1 is up, line protocol is up
  Interface state transitions: 1
  Hardware is Multilink network interface(s)
  Internet address is 10.1.1.1/24
  MTU 1504 bytes, BW 1536 Kbit
    reliability 255/255, txload 3/255, rxload 3/255
  Encapsulation PPP,  loopback not set, keepalive set (10 sec)
  LCP Open
  Open: IPCP
  Last input 00:00:00, output 00:00:00
  Last clearing of "show interface" counters 02:06:24
  5 minute input rate 19000 bits/sec, 5 packets/sec
  5 minute output rate 19000 bits/sec, 5 packets/sec
    48769 packets input, 12425740 bytes, 0 total input drops
      0 drops for unrecognized upper-level protocol
    Received 0 runts, 0 giants, 0 throttles, 0 parity
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    67905 packets output, 17400050 bytes, 0 total output drops
    0 output errors, 0 underruns, 0 applique, 0 resets
    0 output buffer failures, 0 output buffers swapped out
  Fragmentation Statistics
    Input Fragmented packets 0          Input Fragmented bytes 0
    Output Fragmented packets 0        Output Fragmented bytes 0
    Input Unfragmented packets 0       Input Unfragmented bytes 0
    Output Unfragmented packets 0      Output Unfragmented bytes 0
    Input Reassembled packets 0        Input Reassembled bytes 0
```



# Null Interface Commands on the Cisco IOS XR Software

---

This module provides command line interface (CLI) commands for configuring null interfaces on the Cisco XR 12000 Series Router.

- [interface null 0, page 658](#)
- [show controllers null interface, page 660](#)
- [show interfaces null0, page 662](#)

# interface null 0

To enter null0 interface configuration mode, use the **interface null 0** command in global configuration mode.

**interface null 0**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release     | Modification                      |
|-------------|-----------------------------------|
| Release 3.2 | This command was first supported. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you issue the **interface null 0** command in global configuration mode, the CLI prompt changes to “config-null0,” indicating that you have entered interface configuration mode for the null interface. In the following sample output, the question mark (?) online help function displays all the commands available under the interface configuration mode for the null interface:

```
RP/0/0/CPU0:router(config)# interface null 0
RP/0/0/CPU0:router(config-null0)#?

  commit      Commit the configuration changes to running
  describe    Describe a command without taking real actions
  do          Run an exec command
  exit        Exit from this submode
  no          Negate a command or set its defaults
  show        Show contents of configuration
```

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

## Examples

The following example shows how to enter null0 interface configuration mode:

```
RP/0/0/CPU0:router(config)# interface null 0
```

```
RP/0/0/CPU0:router(config-null0)#
```

# show controllers null interface

To display null interface counters, use the **show controllers null interface** command in EXEC mode.

**show controllers null interface**

**Syntax Description** This command has no keywords or arguments.

**Command Default** No default behavior or values

**Command Modes** EXEC

| Release     | Modification                      |
|-------------|-----------------------------------|
| Release 3.2 | This command was first supported. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

| Task ID | Task ID   | Operations |
|---------|-----------|------------|
|         | interface | read       |
|         | sysmgr    | read       |

**Examples** The following is sample output from the **show controllers null interface** command, which displays null interface counters:

```
RP/0/0/CPU0:router# show controllers null interface

Null interface:
name       : Null10
handle    : 0x00080010
rx_count   : 0
tx_count   : 0
drops     : 0
```

**Table 46: show controllers null interface Field Descriptions**

| Field    | Description                                                                                         |
|----------|-----------------------------------------------------------------------------------------------------|
| name     | Interface whose controller information is displayed.                                                |
| handle   | Number that identifies the caps node that hosts the node whose controller information is displayed. |
| rx_count | Total number of packets currently received by the interface.                                        |
| tx_count | Total number of packets currently transmitted by the interface.                                     |
| drops    | Total number of packets dropped by the interface.                                                   |

**Related Commands**

| Command                                             | Description                |
|-----------------------------------------------------|----------------------------|
| <a href="#">show interfaces null0</a> , on page 662 | Displays null0 interfaces. |

# show interfaces null0

To display null0 interfaces, use the **show interfaces null0** command with optional keywords in EXEC mode.

**show interfaces null0** [**accounting rates**| **brief**| **description**| **detail**] [**location** *node-id*]

## Syntax Description

|                                |                                                  |
|--------------------------------|--------------------------------------------------|
| <b>accounting</b>              | Shows interface accounting option.               |
| <b>rates</b>                   | Shows interface accounting (input/output) rates. |
| <b>brief</b>                   | Shows interface information in condensed format. |
| <b>description</b>             | Describes interface.                             |
| <b>detail</b>                  | Shows interface information in detail.           |
| <b>location</b> <i>node-id</i> | Specifies a fully qualified interface location.  |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                                                                   |
|---------------|--------------------------------------------------------------------------------|
| Release 3.6.0 | This command variant was added to the existing <b>show interfaces</b> command. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **show interfaces null0** command displays statistics about null interfaces. When no keywords are specified, information for all null interfaces is displayed.

## Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |



## Examples

The following example shows how to use the **show interfaces null0** command:

```
RP/0/0/CPU0:router# show interfaces null0

Null0 is up, line protocol is up
  Interface state transitions: 0
  Hardware is Null interface
  Internet address is Unknown
  MTU 1500 bytes, BW Unknown
    reliability 255/255, txload Unknown, rxload Unknown
  Encapsulation Null, loopback not set,
  Last clearing of "show interface" counters never
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 total input drops
    0 drops for unrecognized upper-level protocol
  Received 0 broadcast packets, 0 multicast packets
    0 packets output, 0 bytes, 0 total output drops
  Output 0 broadcast packets, 0 multicast packets
```

 `show interfaces null0`



## Packet-over-SONET Interface Commands on the Cisco IOS XR Software

---

This module provides command line interface (CLI) commands for configuring Packet-over-SONET/SDH (POS) on the Cisco XR 12000 Series Router.

This module describes the Cisco IOS XR commands used to configure, monitor, and troubleshoot Packet-over-SONET/SDH (POS).

POS provides a method for efficiently carrying data packets in SONET or Synchronous Digital Hierarchy (SDH) frames. High-bandwidth capacity and efficient link utilization are characteristics that make POS largely preferred for building the core of data networks. POS uses PPP in High-Level Data Link Control (HDLC)-like framing for data encapsulation at Layer 2 (data link) of the Open System Interconnection (OSI) stack. This method provides efficient packet delineation and error control.

In addition to high-bandwidth efficiency, POS offers secure and reliable transmission for data. Reliable data transfer depends on timing integrity.

The real-time POS functionality is performed in hardware, according to the hardware configuration setup. Configured hardware events are detected by the framer application-specific integrated circuits (ASICs) and the control is passed to the software. The generic POS driver is responsible for providing a mechanism to configure the hardware on a per-interface basis, to handle interface state transitions, and to collect POS-related statistics.

- [crc \(POS\), page 666](#)
- [encapsulation \(POS\), page 668](#)
- [interface pos, page 670](#)
- [keepalive \(POS\), page 672](#)
- [pos, page 674](#)
- [show interfaces pos, page 676](#)
- [transmit-delay, page 679](#)

## crc (POS)

To set the length of the cyclic redundancy check (CRC) on a Packet-over-SONET/SDH (POS) interface, use the **crc** command in POS configuration mode. To return the CRC setting on a POS interface to the 32-bit default setting, use the **no** form of this command.

**crc {16|32}**

**no crc [16|32]**

### Syntax Description

|           |                                               |
|-----------|-----------------------------------------------|
| <b>16</b> | Sets 16-bit CRC mode.                         |
| <b>32</b> | Sets 32-bit CRC mode. The default is 32 bits. |

### Command Default

The default CRC mode is 32 bits.

### Command Modes

POS configuration

### Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. The designators 16 and 32 indicate the length (in bits) of the frame check sequence (FCS). A CRC of 32 bits provides more powerful error detection, but adds overhead. Both the sender and receiver must use the same setting.

CRC-16, the most widely used error checking method throughout the United States and Europe, is used extensively with WANs. CRC-32 is specified by IEEE standard 802 and as an option by some point-to-point transmission standards. It is often used on Switched Multimegabit Data Service (SMDS) networks and LANs.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| pos-dpt | read, write |

## Examples

In the following example, the 32-bit CRC on POS interface 0/1/0/2 is enabled:

```
rack/slot/module (config) # interface POS 0/1/0/2  
rack/slot/module (config-if) # POS  
rack/slot/module (config-if-pos) # crc 32
```

## Related Commands

| Command                                      | Description                                                              |
|----------------------------------------------|--------------------------------------------------------------------------|
| <a href="#">transmit-delay</a> , on page 679 | Specifies a number of flag sequences to be inserted between the packets. |

## encapsulation (POS)

To set the Layer 2 encapsulation of an interface, use the **encapsulation** command in interface configuration mode. To restore the system to the default encapsulation, use the **no** form of this command.

**encapsulation** {hdlc| ppp| frame-relay [ietf] }

**no encapsulation** [hdlc| ppp| frame-relay [ietf] ]

### Syntax Description

|                     |                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>hdlc</b>         | Enables Cisco High-Level Data Link Control (cHDLC) encapsulation on the interface. This is the default encapsulation type. |
| <b>ppp</b>          | Enables Point-to-Point Protocol (PPP) encapsulation on the interface.                                                      |
| <b>frame -relay</b> | Enables Frame Relay encapsuation on the interface.                                                                         |
| <b>ietf</b>         | (Optional) Enables RFC1490/RFC2427 encapsulation.                                                                          |

### Command Default

For Packet-over-SONET/SDH (POS) interfaces, the default encapsulation is HDLC.

### Command Modes

Interface configuration

### Command History

| Release       | Modification                                                |
|---------------|-------------------------------------------------------------|
| Release 3.2   | This command was introduced.                                |
| Release 3.4.0 | The <b>frame-relay</b> and <b>ietf</b> keywords were added. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The task ID hdlc (r,w) is required for use of the keyword **hdlc**. The task ID ppp(r,w) is required for use of the keyword **ppp**. The task ID fr(r,w) is required for use of the keyword **frame-relay**.

### Task ID

| Task ID           | Operations  |
|-------------------|-------------|
| hdlc OR ppp OR fr | read, write |
| interface         | read, write |

## Examples

In the following example, PPP encapsulation is set on POS interface 0/3/0/1:

```
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1  
RP/0/0/CPU0:router(config-if)# encapsulation ppp
```

## Related Commands

| Command                                           | Description                                      |
|---------------------------------------------------|--------------------------------------------------|
| <a href="#">show interfaces pos</a> , on page 676 | Displays information about a POS interface.      |
| <a href="#">show ppp interfaces</a> , on page 711 | Displays PPP state information for an interface. |

# interface pos

To enter interface or subinterface configuration mode for a POS interface or subinterface, use the **interface pos** command in global configuration mode. To delete a POS configuration, use the **no** form of this command.

**interface pos** *interface-path-id* [.subinterface] {**l2 transport**| **point-to-point**}

**no interface pos** *interface-path-id* [.subinterface] {**l2 transport**| **point-to-point**}

## Syntax Description

|                                             |                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i><br>[.subinterface] | Physical interface or virtual interface followed by the optional subinterface path ID. Naming notation is <i>interface-path-id.subinterface</i> . The period in front of the subinterface value is required as part of the notation.<br><br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>l2transport</b>                          | (Optional) Configures the interface to function as an attachment circuit (AC) on one endpoint of a Layer 2 link.                                                                                                                                                                                                                                  |
| <b>point-to-point</b>                       | (Optional) Configures interface to function as one endpoint of a point-to-point link.                                                                                                                                                                                                                                                             |

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Subinterfaces of a POS interface can only be configured using the **l2transport** keyword, if Frame Relay encapsulation is configured on the POS interface, using the **encapsulation frame-relay** command. Interfaces configured to use HDLC or PPP encapsulation cannot be configured using the **l2transport** keyword.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.



- *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

**Examples**

The following example shows how to enter interface configuration mode for a POS interface:

```
RP/0/0/CPU0:router(config)# interface pos 0/1/0/0
RP/0/0/CPU0:router(config-if)#
```

The following example shows how to create a subinterface on a POS interface in slot 1, subslot 1, port 2 and enter subinterface configuration mode:

```
RP/0/0/CPU0:router(config)# interface pos 0/1/1/2.1
RP/0/0/CPU0:router(config-subif)#
```

The following example shows how to configure frame-relay encapsulation on the main POS interface before being able to configure an AC subinterface:

```
RP/0/0/CPU0:router# interface pos 0/1/0/0
RP/0/0/CPU0:router(config-if)# encapsulation frame-relay
RP/0/0/CPU0:router(config-if)# commit
RP/0/0/CPU0:router(config-if)# exit
RP/0/0/CPU0:router(config)# interface pos 0/1/0/0.1 l2transport
RP/0/0/CPU0:router(config-subif)# commit
```

**Related Commands**

| Command                                           | Description                                 |
|---------------------------------------------------|---------------------------------------------|
| <a href="#">show interfaces pos</a> , on page 676 | Displays information about a POS interface. |

# keepalive (POS)

To set the keepalive timer for a specific interface, use the **keepalive** command in interface configuration mode. To reset the keepalive timer to the default of 10 seconds, use the **no** form of this command.

**keepalive** {*interval* [*retry*] **disable**}

**no keepalive**

## Syntax Description

|                 |                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interval</i> | Number of seconds (from 1 to 30) between keepalive messages. The default is 10.                                                                                                                                                                              |
| <i>retry</i>    | (Optional) Number of keepalive messages (from 1 to 255) that can be sent to a peer without a response before transitioning the link to the down state. The default is 5 for interfaces with PPP encapsulation, and 3 for interfaces with HDLC encapsulation. |
| <b>disable</b>  | Turns off the keepalive timer.                                                                                                                                                                                                                               |

## Command Default

The default interval is 10 seconds between keepalive messages. The default number of retry keepalive messages that can be sent without a response is 5 for interfaces with PPP encapsulation, and 3 for interfaces with HDLC encapsulation. However, when more than 5 (or 3) keepalive messages are sent to a peer without a response, the link transitions to the down state.

## Command Modes

Interface configuration

## Command History

| Release       | Modification                         |
|---------------|--------------------------------------|
| Release 3.2   | This command was introduced.         |
| Release 3.9.0 | The <i>retry</i> argument was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

cHDLC keepalives require that the **keepalive** command is configured the same way on both routers. The two connected routers have no way of negotiating the keepalive value, because there is no way for the routers to tell each other what their configured values are. The keepalive value configured on each router (local and partner) sets the rate at which the Cisco IOS XR software sends packets. It also sets the rate at which the local end expects to receive incoming packets.

To set the keepalive value to the default value, use the **keepalive** command without specifying a value for the *seconds* argument.

If three keepalives are sent to the peer and no response is received from the peer, then the link makes the transition to the down state.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |
| ppp     | read,write  |

**Examples**

The following example shows how to configure keepalives for 3 seconds on POS interface 0/7/0/1:

```
RP/0/0/CPU0:router(config)# interface POS 0/7/0/1  
RP/0/0/CPU0:router(config-if)# keepalive 3
```

# pos

To access the POS configuration submode, use the **pos** command in interface configuration mode.

**pos**

## Command Default

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you issue the **pos** command in interface configuration mode for a POS interface, the CLI prompt changes to “config-if-pos,” indicating that you have entered POS configuration submode. In the following sample output, the question mark (?) online help function displays all the commands available under POS configuration submode:

```
RP/0/0/CPU0:router(config)# interface POS 0/1/0/2
RP/0/0/CPU0:router(config-if)# POS
RP/0/0/CPU0:router(config-if-pos)# ?

  commit          Commit the configuration changes to running
  crc             Set the CRC on a POS interface
  describe        Describe a command without taking real actions
  do              Run an exec command
  exit            Exit from this submode
  no              Negate a command or set its defaults
  show            Show contents of configuration
  transmit-delay  Set POS transmit delay on an interface
```

## Task ID

| Task ID | Operations  |
|---------|-------------|
| pos-dpt | read, write |

## Examples

The following example shows how to access the POS configuration submode from the POS configuration mode:

```
RP/0/0/CPU0:router(config)# interface POS 0/1/0/2
```

```
RP/0/0/CPU0:router(config-if)# POS  
RP/0/0/CPU0:router(config-if-pos)#
```

**Related Commands**

| Command                                                      | Description                                                              |
|--------------------------------------------------------------|--------------------------------------------------------------------------|
| <a href="#">crc (POS)</a> , <a href="#">on page 666</a>      | Sets the length of the CRC on a Packet-over-SONET/SDH (POS) interface.   |
| <a href="#">transmit-delay</a> , <a href="#">on page 679</a> | Specifies a number of flag sequences to be inserted between the packets. |

# show interfaces pos

To display information about a POS interface, use the **show interfaces pos** command in EXEC mode.

**show interfaces pos** *interface-path-id* [**accounting** [**rates**]] **brief** | **description** | **detail**] [**location** *node-id*]

## Syntax Description

|                                |                                                                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i>       | (Optional) Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>accounting</b>              | (Optional) Displays accounting information for all POS interfaces on the router, for a specific POS interface instance, or for all POS interfaces on a specific node.                                                                                                                      |
| <b>rates</b>                   | (Optional) Displays interface accounting rates for all POS interfaces on the router, for a specific POS interface instance, or for all POS interfaces on a specific node.                                                                                                                  |
| <b>brief</b>                   | (Optional) Displays brief output for all POS interfaces on the router, for a specific POS interface instance, or for all POS interfaces on a specific node.                                                                                                                                |
| <b>description</b>             | Displays descriptive output for all POS interfaces on the router, for a specific POS interface instance, or for all POS interfaces on a specific node.                                                                                                                                     |
| <b>detail</b>                  | (Optional) Displays detailed output for all POS interfaces on the router, for a specific POS interface instance, or for all POS interfaces on a specific node.                                                                                                                             |
| <b>location</b> <i>node-id</i> | (Optional) Displays detailed POS information for the designated node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                                      |

## Command Default

Enter the **show interfaces pos** command without including any of the optional keywords or arguments to display detailed information about all POS interfaces configured on the router.

## Command Modes

EXEC

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

### Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

### Examples

The following example shows how to display summarized information for a POS interface on a specific node:

```
RP/0/0/CPU0:router# show interfaces pos summary location 0/1/CPU0
```

| Interface Type | Total | UP | Down | Admin Down |
|----------------|-------|----|------|------------|
| ALL TYPES      | 4     | 1  | 1    | 2          |
| IFT_POS        | 4     | 1  | 1    | 2          |

**Table 47: show interfaces pos summary Field Descriptions**

| Field     | Description                                                              |
|-----------|--------------------------------------------------------------------------|
| Intf Type | Type of interface described in the display.                              |
| Total     | Total number of configured interfaces of the specified type.             |
| Up        | Number of interfaces of the specified type that are in the “Up” state.   |
| Down      | Number of interfaces of the specified type that are in the “Down” state. |

| Field      | Description                                                                    |
|------------|--------------------------------------------------------------------------------|
| Admin Down | Number of interfaces of the specified type that are in the “Admin Down” state. |

The following example shows how to display brief information for a specific POS interface:

```
RP/0/0/CPU0:router# show interfaces pos 0/2/0/0 brief
```

| Intf<br>Name | Intf<br>State | LineP<br>State | Encap<br>Type | MTU<br>(byte) | BW<br>(Kbps) |
|--------------|---------------|----------------|---------------|---------------|--------------|
| PO0/2/0/0    | admin-down    | admin-down     | HDLC          | 4474          | 2488320      |

**Table 48: show interfaces pos Field Descriptions**

| Field       | Description                                                                             |
|-------------|-----------------------------------------------------------------------------------------|
| Intf Name   | Interface identifier, in the <i>type*rack/slot/module/port</i> notation.                |
| Intf State  | Indicates whether the interface is in the admin-up or admin down state.                 |
| LineP State | Line protocol state.                                                                    |
| Encap Type  | Encapsulation type for the specified interface. Can be HDLC or PPP.                     |
| MTU (byte)  | Maximum transmission unit (MTU) value configured for the specified interface, in bytes. |
| BW (Kbps)   | Bandwidth of the interface, in kbps.                                                    |

## Related Commands

| Command                                             | Description                                                        |
|-----------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers pos, on page 851</a>   | Displays information on the POS controllers.                       |
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers. |



# transmit-delay

To specify a number of flag sequences to be inserted between the packets, use the **transmit-delay** command in POS configuration mode. To restore the default, use the **no** form of this command.

**transmit-delay** *microseconds*

**no transmit-delay** *microseconds*

## Syntax Description

|                     |                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------------------------|
| <i>microseconds</i> | Number of microseconds of minimum delay after sending a packet. Range is from 0 to 1023. Default is 0 (disabled). |
|---------------------|-------------------------------------------------------------------------------------------------------------------|

## Command Default

*microseconds* = 0 (disabled)

## Command Modes

POS configuration

## Command History

| Releases    | Modifications                |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| pos-dpt | read, write |

## Examples

In the following example, a delay of 2 microseconds is specified on POS interface 0/1/0/2:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/1/0/2
RP/0/0/CPU0:router(config-if)# pos
RP/0/0/CPU0:router(config-if-pos)# transmit-delay 2
```

In the following example, the transmit delay on POS interface 0/1/0/2 is disabled:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/1/0/2
RP/0/0/CPU0:router(config-if)# pos
```

```
RP/0/0/CPU0:router(config-if-pos)# no transmit-delay
```

**Related Commands**

| Command         | Description |
|-----------------|-------------|
| show interfaces |             |



## PPP Commands on the Cisco IOS XR Software

This module provides command line interface (CLI) commands for configuring Point-to-Point Protocol (PPP) on the Cisco XR 12000 Series Router.

Point-to-Point Protocol (PPP) is an encapsulation scheme that can be used on Packet-over-SONET (POS), serial, and multilink interfaces. PPP is a standard protocol used to send data over synchronous serial links. PPP also provides a Link Control Protocol (LCP) for negotiating properties of the link. LCP uses echo requests and responses to monitor the continuing availability of the link.

PPP provides the following Network Control Protocols (NCPs) for negotiating properties of data protocols that will run on the link:

- Cisco Discovery Protocol Control Protocol (CDPCP) to negotiate CDP properties
  - IP Control Protocol (IPCP) to negotiate IP properties
  - IP Version 6 Control Protocol (IPv6CP) to negotiate IPv6 properties
  - Multiprotocol Label Switching Control Protocol (MPLSCP) to negotiate MPLS properties
  - Open System Interconnection Control Protocol (OSICP) to negotiate OSI properties
- 
- [encapsulation ppp](#), page 683
  - [ppp authentication](#), page 685
  - [ppp chap password](#), page 688
  - [ppp chap refuse](#), page 690
  - [ppp max-bad-auth](#), page 692
  - [ppp max-configure](#), page 694
  - [ppp max-failure](#), page 696
  - [ppp max-terminate](#), page 698
  - [ppp ms-chap password](#), page 700
  - [ppp ms-chap refuse](#), page 702
  - [ppp pap refuse](#), page 704
  - [ppp pap sent-username password](#), page 706

- [ppp timeout authentication, page 708](#)
- [ppp timeout retry, page 710](#)
- [show ppp interfaces, page 711](#)

# encapsulation ppp

To enable encapsulation for communication with routers or bridges using the Point-to-Point Protocol (PPP), use the **encapsulation ppp** command in interface configuration mode. To disable PPP encapsulation, use the **no** form of this command.

**encapsulation ppp**

**no encapsulation ppp**

**Syntax Description** This command has no keywords or arguments.

**Command Default** PPP encapsulation is disabled.

**Command Modes** Interface configuration

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **encapsulation ppp** command to enable PPP encapsulation on an interface.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | ppp       | read, write |
|         | interface | read, write |

**Examples** The following example shows how to set up PPP encapsulation on interface POS 0/1/0/1:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/1/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
```

The following example shows how to set up PPP encapsulation on a serial interface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router# interface serial 0/0/1/2/4:3
```

RP/0/0/CPU0:router# **encapsulation ppp**

Related Commands

| Command                                          | Description                                      |
|--------------------------------------------------|--------------------------------------------------|
| <a href="#">show ppp interfaces, on page 711</a> | Displays PPP state information for an interface. |

# ppp authentication

To enable Challenge Handshake Authentication Protocol (CHAP), MS-CHAP, or Password Authentication Protocol (PAP), and to specify the order in which CHAP, MS-CHAP, and PAP authentication is selected on the interface, use the **ppp authentication** command in interface configuration mode. To disable PPP authentication, use the **no** form of this command.

**ppp authentication** *protocol* [*protocol* [*protocol* ]] {*list-name*| **default**}

**no ppp authentication**

## Syntax Description

|                  |                                                                                                                                                                                                                                                              |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>protocol</i>  | Name of the authentication protocol used for PPP authentication. See <a href="#">Table 49: PPP Authentication Protocols for Negotiation</a> , on page 686 for the appropriate keyword. You may select one, two, or all three protocols, in any order.        |
| <i>list-name</i> | (Optional) Used with authentication, authorization, and accounting (AAA). Name of a list of methods of authentication to use. If no list name is specified, the system uses the default. The list is created with the <b>aaa authentication ppp</b> command. |
| <b>default</b>   | (Optional) Specifies the name of the list of methods created with the <b>aaa authentication ppp</b> command.                                                                                                                                                 |

## Command Default

PPP authentication is not enabled.

## Command Modes

Interface configuration

## Command History

| Release     | Modification                                                                                        |
|-------------|-----------------------------------------------------------------------------------------------------|
| Release 3.2 | This command was introduced.                                                                        |
| Release 3.2 | This command was corrected to include the possibility of specifying three protocols simultaneously. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When you enable CHAP or PAP authentication (or both), the local router requires the remote device to prove its identity before allowing data traffic to flow. PAP authentication requires the remote device to send a name and a password, which is checked against a matching entry in the local username database or in the remote security server database. CHAP authentication sends a challenge message to the remote device. The remote device encrypts the challenge value with a shared secret and returns the encrypted value and its name to the

local router in a response message. The local router attempts to match the remote device’s name with an associated secret stored in the local username or remote security server database; it uses the stored secret to encrypt the original challenge and verify that the encrypted values match.

You can enable CHAP, MS-CHAP, or PAP in any order. If you enable all three methods, the first method specified is requested during link negotiation. If the peer suggests using the second method, or refuses the first method, the second method is tried. Some remote devices support only one method. Base the order in which you specify methods on the remote device’s ability to correctly negotiate the appropriate method, and on the level of data line security you require. PAP usernames and passwords are sent as clear text strings, which can be intercepted and reused.



**Note**

If you use a *list-name* value that was not configured with the **aaa authentication ppp** command, then authentication does not complete successfully and the line does not come up.

[Table 49: PPP Authentication Protocols for Negotiation, on page 686](#) lists the protocols used to negotiate PPP authentication.

**Table 49: PPP Authentication Protocols for Negotiation**

| Protocol | Description                                                    |
|----------|----------------------------------------------------------------|
| chap     | Enables CHAP on an interface.                                  |
| ms-chap  | Enables Microsoft’s version of CHAP (MS-CHAP) on an interface. |
| pap      | Enables PAP on an interface.                                   |

Enabling or disabling PPP authentication does not affect the ability of the local router to authenticate itself to the remote device.

MS-CHAP is the Microsoft version of CHAP. Like the standard version of CHAP, MS-CHAP is used for PPP authentication. In this case, authentication occurs between a personal computer using Microsoft Windows NT or Microsoft Windows 95 and a Cisco router or access server acting as a network access server.

Enabling or disabling PPP authentication does not affect the local router authenticating itself to the remote device.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| ppp     | read, write |
| aaa     | read, write |

**Examples**

In the following example, CHAP is enabled on POS 0/4/0/1 and uses the authentication list MIS-access:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/4/0/1
```



```
RP/0/0/CPU0:router(config-if)# encapsulation ppp  
RP/0/0/CPU0:router(config-if)# ppp authentication chap MIS-access
```

**Related Commands**

| Command                       | Description                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>aaa authentication ppp</b> | Specifies one or more AAA authentication methods for use on serial interfaces running PPP.          |
| <b>encapsulation</b>          | Sets the encapsulation method used by the interface.                                                |
| <b>username</b>               | Configures a new user with a username, establishes a password, and grants permissions for the user. |

# ppp chap password

To enable a router calling a collection of routers to configure a common Challenge Handshake Authentication Protocol (CHAP) secret password, use the **ppp chap password** command in interface configuration mode. To disable the password, use the **no** form of this command.

```
ppp chap password [clear| encrypted] password
no ppp chap password [clear| encrypted] password
```

|                    |           |                                                                           |
|--------------------|-----------|---------------------------------------------------------------------------|
| Syntax Description | clear     | (Optional) Specifies the cleartext encryption parameter for the password. |
|                    | encrypted | (Optional) Indicates that the password is already encrypted.              |
|                    | password  | Cleartext or already-encrypted password.                                  |

**Command Default** The password is disabled.

**Command Modes** Interface configuration

|                 |             |                              |
|-----------------|-------------|------------------------------|
| Command History | Release     | Modification                 |
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **ppp chap password** command is sent in CHAP responses and is used by the peer to authenticate the local router. This does not affect local authentication of the peer. This command is useful for routers that do not support this command (such as routers running older Cisco IOS XR images).

The CHAP secret password is used by the routers in response to challenges from an unknown peer.

|         |         |             |
|---------|---------|-------------|
| Task ID | Task ID | Operations  |
|         | ppp     | read, write |
|         | aaa     | read, write |

## Examples

In the following example, a password (xxxx) is entered as a cleartext password:

```
RP/0/0/CPU0:router(config-if)# ppp chap password xxxx
```

When the password is displayed (as shown in the following example, using the **show running-config** command), the password xxxx appears as 030752180500:

```
RP/0/0/CPU0:router(config)# show running-config interface POS 1/0/1/0

interface POS0/1/4/2

description Connected to P1_CRS-8 POS 0/1/4/3
ipv4 address 10.12.32.2 255.255.255.0
encapsulation ppp
ppp authentication chap pap
ppp chap password encrypted 030752180500
```

On subsequent logins, entering any of the three following commands would have the same effect of making xxxx the password for remote CHAP authentication:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 1/0/1/0
RP/0/0/CPU0:router(config-if)# ppp chap password xxxx
RP/0/0/CPU0:router(config-if)# ppp chap password clear xxxx
RP/0/0/CPU0:router(config-if)# ppp chap password encrypted 1514190900
```

## Related Commands

| Command                                         | Description                                                                                                                                                   |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>aaa authentication ppp</b>                   | Specifies one or more authentication, authorization, and accounting (AAA) methods for use on serial interfaces running PPP.                                   |
| <a href="#">ppp authentication, on page 685</a> | Enables CHAP, MS-CHAP, or PAP, and specifies the order in which CHAP, MS-CHAP, and PAP authentication is selected on the interface.                           |
| <a href="#">ppp chap refuse, on page 690</a>    | Refuses CHAP authentication from peers requesting it.                                                                                                         |
| <a href="#">ppp max-bad-auth, on page 692</a>   | Configures a PPP interface not to reset itself immediately after an authentication failure but instead to allow a specified number of authentication retries. |
| <b>show running-config</b>                      | Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information.                    |

# ppp chap refuse

To refuse Challenge Handshake Authentication Protocol (CHAP) authentication from peers requesting it, use the **ppp chap refuse** command in interface configuration mode. To allow CHAP authentication, use the **no** form of this command.

**ppp chap refuse**  
**no ppp chap refuse**

**Syntax Description** This command has no keywords or arguments.

**Command Default** CHAP authentication is disabled.

**Command Modes** Interface configuration

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **ppp chap refuse** command specifies that CHAP authentication is disabled for all calls, meaning that all attempts by the peer to force the user to authenticate using CHAP are refused.

If outbound Password Authentication Protocol (PAP) has been configured (using the **ppp authentication** command), PAP is suggested as the authentication method in the refusal packet.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | ppp     | read, write |
|         | aaa     | read, write |

**Examples**

The following example shows how to specify POS interface 0/3/0/1 and disable CHAP authentication from occurring if a peer calls in requesting CHAP authentication. The method of encapsulation on the interface is PPP.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
```

```
RP/0/0/CPU0:router(config-if)# encapsulation ppp
RP/0/0/CPU0:router(config-if)# ppp chap refuse
```

**Related Commands**

| Command                                                      | Description                                                                                                                                                           |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>aaa authentication ppp</b>                                | Specifies one or more authentication, authorization, and accounting (AAA) methods for use on serial interfaces running PPP.                                           |
| <a href="#">ppp authentication</a> , on page 685             | Enables CHAP, MS-CHAP, or PAP, and specifies the order in which CHAP, MS-CHAP, and PAP authentication is selected on the interface.                                   |
| <a href="#">ppp max-bad-auth</a> , on page 692               | Configures a PPP interface not to reset itself immediately after an authentication failure but instead to allow a specified number of authentication retries.         |
| <a href="#">ppp pap sent-username password</a> , on page 706 | Enables remote PAP support for an interface, and includes the <b>sent-username</b> and <b>password</b> commands in the PAP authentication request packet to the peer. |

# ppp max-bad-auth

To configure a PPP interface not to reset itself immediately after an authentication failure but instead to allow a specified number of authentication retries, use the **ppp max-bad-auth** command in the appropriate configuration mode. To reset to the default of immediate reset, use the **no** form of this command.

```
ppp max-bad-auth retries
no ppp max-bad-auth
```

|                    |         |                                                                                                              |
|--------------------|---------|--------------------------------------------------------------------------------------------------------------|
| Syntax Description | retries | Number of retries after which the interface is to reset itself. Range is from 0 to 10. Default is 0 retries. |
|--------------------|---------|--------------------------------------------------------------------------------------------------------------|

|                 |            |
|-----------------|------------|
| Command Default | retries: 0 |
|-----------------|------------|

|               |                                                           |
|---------------|-----------------------------------------------------------|
| Command Modes | Interface configuration<br>Dynamic template configuration |
|---------------|-----------------------------------------------------------|

|                 |             |                              |
|-----------------|-------------|------------------------------|
| Command History | Release     | Modification                 |
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **ppp max-bad-auth** command applies to any interface on which PPP encapsulation is enabled.

Use the **dynamic-template** command to enter the dynamic template configuration mode.

|         |         |             |
|---------|---------|-------------|
| Task ID | Task ID | Operations  |
|         | ppp     | read, write |
|         | aaa     | read, write |

## Examples

In this example, POS interface 0/3/0/1 is set to allow two additional retries after an initial authentication failure (for a total of three failed authentication attempts):

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
RP/0/0/CPU0:router(config-if)# ppp authentication chap
RP/0/0/CPU0:router(config-if)# ppp max-bad-auth 3
```

This example shows how to allow two additional retries after an initial authentication failure in the dynamic template configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# dynamic-template type ppp p1
RP/0/0/CPU0:router(config-dynamic-template-type)# ppp max-configure 5
```

ppp max-configure

To specify the maximum number of configure requests to attempt (without response) before stopping the requests, use the **ppp max-configure** command in interface configuration mode. To disable the maximum number of configure requests and return to the default, use the **no** form of this command.

```
ppp max-configure retries
no ppp max-configure
```

|                    |         |                                                                  |
|--------------------|---------|------------------------------------------------------------------|
| Syntax Description | retries | Maximum number of retries. Range is 4 through 20. Default is 10. |
|--------------------|---------|------------------------------------------------------------------|

|                 |             |
|-----------------|-------------|
| Command Default | retries: 10 |
|-----------------|-------------|

|               |                                                           |
|---------------|-----------------------------------------------------------|
| Command Modes | Interface configuration<br>Dynamic template configuration |
|---------------|-----------------------------------------------------------|

|                 |             |                              |
|-----------------|-------------|------------------------------|
| Command History | Release     | Modification                 |
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **ppp max-configure** command to specify how many times an attempt is made to establish a Link Control Protocol (LCP) session between two peers for a particular interface. If a configure request message receives a reply before the maximum number of configure requests are sent, further configure requests are abandoned.

Use the **dynamic-template** command to enter the dynamic template configuration mode.

|         |         |             |
|---------|---------|-------------|
| Task ID | Task ID | Operations  |
|         | ppp     | read, write |
|         | aaa     | read, write |



## Examples

This example shows a limit of four configure requests:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
RP/0/0/CPU0:router(config-if)# ppp max-configure 4
```

This example shows how a limit of four configure requests is specified in the dynamic template configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# dynamic-template type ppp p1
RP/0/0/CPU0:router(config-dynamic-template-type)# ppp ipcp
```

## Related Commands

| Command                                                       | Description                                                                                       |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <a href="#">ppp max-failure</a> , <a href="#">on page 696</a> | Configures the maximum number of consecutive CONFNAKs to permit before terminating a negotiation. |

# ppp max-failure

To configure the maximum number of consecutive Configure Negative Acknowledgments (CONFNAKs) to permit before terminating a negotiation, use the **ppp max-failure** command in the appropriate configuration mode. To disable the maximum number of CONFNAKs and return to the default, use the **no** form of this command.

```
ppp max-failure retries
no ppp max-failure
```

## Syntax Description

|                |                                                                                                             |
|----------------|-------------------------------------------------------------------------------------------------------------|
| <i>retries</i> | Maximum number of CONFNAKs to permit before terminating a negotiation. Range is from 2 to 10. Default is 5. |
|----------------|-------------------------------------------------------------------------------------------------------------|

## Command Default

*retries: 5*

## Command Modes

Interface configuration  
Dynamic template configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **dynamic-template** command to enter the dynamic template configuration mode.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| ppp     | read, write |
| aaa     | read, write |

## Examples

The **ppp max-failure** command specifies that no more than three CONFNAKs are permitted before terminating the negotiation:

```
RP/0/0/CPU0:router# configure
```

```
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1  
RP/0/0/CPU0:router(config-if)# encapsulation ppp  
RP/0/0/CPU0:router(config-if)# ppp max-failure 3
```

This example shows how no more than three CONFNAKs are permitted before terminating the negotiation in the dynamic template configuration mode:

```
RP/0/0/CPU0:router# configure  
RP/0/0/CPU0:router(config)# dynamic-template type ppp p1  
RP/0/0/CPU0:router(config-dynamic-template-type)# ppp max-failure 4i
```

#### Related Commands

| Command                                         | Description                                                                                                    |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <a href="#">ppp max-configure</a> , on page 694 | Specifies the maximum number of configure requests to attempt (without response) before stopping the requests. |

# ppp max-terminate

To configure the maximum number of terminate requests (TermReqs) to send without reply before closing down the Link Control Protocol (LCP) or Network Control Protocol (NCP), use the **ppp max-terminate** command in interface configuration mode. To disable the maximum number of TermReqs and return to the default, use the **no** form of this command.

```
ppp max-terminate number
no ppp max-terminate
```

|                    |        |                                                                                                                           |
|--------------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | number | Maximum number of TermReqs to send without reply before closing down the LCP or NCP. Range is from 2 to 10. Default is 2. |
|--------------------|--------|---------------------------------------------------------------------------------------------------------------------------|

|                 |           |
|-----------------|-----------|
| Command Default | number: 2 |
|-----------------|-----------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

|                 |             |                              |
|-----------------|-------------|------------------------------|
| Command History | Release     | Modification                 |
|                 | Release 3.2 | This command was introduced. |

|                  |                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|         |         |             |
|---------|---------|-------------|
| Task ID | Task ID | Operations  |
|         | ppp     | read, write |

Examples

In the following example, a maximum of five TermReqs are specified to be sent before terminating and closing LCP or NCP:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
RP/0/0/CPU0:router(config-if)# ppp max-terminate 5
```

**Related Commands**

| Command                                        | Description                                                                                                    |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <a href="#">ppp max-configure, on page 694</a> | Specifies the maximum number of configure requests to attempt (without response) before stopping the requests. |
| <a href="#">ppp max-failure, on page 696</a>   | Configures the maximum number of consecutive CONFNAKs to permit before terminating a negotiation.              |

# ppp ms-chap password

To configure a common Microsoft Challenge Handshake Authentication (MS-CHAP) secret password, use the **ppp ms-chap password** command in interface configuration mode. To disable the password, use the **no** form of this command.

```
ppp ms-chap password [clear| encrypted] password
no ppp ms-chap password [clear| encrypted] password
```

|                    |           |                                                                           |
|--------------------|-----------|---------------------------------------------------------------------------|
| Syntax Description | clear     | (Optional) Specifies the cleartext encryption parameter for the password. |
|                    | encrypted | (Optional) Indicates that the password is already encrypted.              |
|                    | password  | Cleartext or already-encrypted password.                                  |

**Command Default** The password is disabled.

**Command Modes** Interface configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.3.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **ppp ms-chap password** command is sent in CHAP responses and is used by the peer to authenticate the local router. This does not affect local authentication of the peer. The **ppp ms-chap password** command is useful for routers that do not support this command (such as routers running older software images).

The MS-CHAP secret password is used by the routers in response to challenges from an unknown peer.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | ppp     | read, write |

## Examples

The following example shows how to enter a password (xxxx) as a cleartext password:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
RP/0/0/CPU0:router(config-if)# ppp ms-chap password clear xxxx
```

# ppp ms-chap refuse

To refuse Microsoft Challenge Handshake Authentication Protocol (MS-CHAP) authentication from peers requesting it, use the **ppp ms-chap refuse** command in interface configuration mode. To allow MS-CHAP authentication, use the **no** form of this command.

**ppp ms-chap refuse**  
**no ppp ms-chap refuse**

|                    |                                            |                              |
|--------------------|--------------------------------------------|------------------------------|
| Syntax Description | This command has no keywords or arguments. |                              |
| Command Default    | MS-CHAP authentication is disabled.        |                              |
| Command Modes      | Interface configuration                    |                              |
| Command History    | Release                                    | Modification                 |
|                    | Release 3.3.0                              | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **ppp ms-chap refuse** command specifies that MS-CHAP authentication is disabled for all calls, meaning that all attempts by the peer to force the user to authenticate using MS-CHAP are refused.

If outbound Password Authentication Protocol (PAP) has been configured (using the **ppp authentication** command), PAP is suggested as the authentication method in the refusal packet.

|         |         |             |
|---------|---------|-------------|
| Task ID | Task ID | Operations  |
|         | ppp     | read, write |

**Examples**

The following example shows how to specify POS interface 0/3/0/1 and disable MS-CHAP authentication from occurring if a peer calls in requesting MS-CHAP authentication. The method of encapsulation on the interface is PPP.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
RP/0/0/CPU0:router(config-if)# ppp ms-chap refuse
```



**Related Commands**

| Command                                          | Description                                                                                                                         |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">ppp authentication</a> , on page 685 | Enables CHAP, MS-CHAP, or PAP, and specifies the order in which CHAP, MS-CHAP, and PAP authentication is selected on the interface. |

# ppp pap refuse

To refuse Password Authentication Protocol (PAP) authentication from peers requesting it, use the **ppp pap refuse** command in interface configuration mode. To allow PAP authentication, use the **no** form of this command.

**ppp pap refuse**  
**no ppp pap refuse**

| Syntax Description | This command has no keywords or arguments.                                                                                           |         |              |             |                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------|--------------|-------------|------------------------------|
| Command Default    | PAP authentication is disabled.                                                                                                      |         |              |             |                              |
| Command Modes      | Interface configuration                                                                                                              |         |              |             |                              |
| Command History    | <table> <tr> <th>Release</th><th>Modification</th></tr> <tr> <td>Release 3.2</td><td>This command was introduced.</td></tr> </table> | Release | Modification | Release 3.2 | This command was introduced. |
| Release            | Modification                                                                                                                         |         |              |             |                              |
| Release 3.2        | This command was introduced.                                                                                                         |         |              |             |                              |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **ppp pap refuse** command specifies that PAP authentication is disabled for all calls, meaning that all attempts by the peer to force the user to authenticate using PAP are refused.

If outbound Challenge Handshake Authentication Protocol (CHAP) has been configured (using the **ppp authentication** command), CHAP is suggested as the authentication method in the refusal packet.

| Task ID | <table> <tr> <th>Task ID</th><th>Operations</th></tr> <tr> <td>ppp</td><td>read, write</td></tr> <tr> <td>aaa</td><td>read, write</td></tr> </table> | Task ID | Operations | ppp | read, write | aaa | read, write |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------|-----|-------------|-----|-------------|
| Task ID | Operations                                                                                                                                           |         |            |     |             |     |             |
| ppp     | read, write                                                                                                                                          |         |            |     |             |     |             |
| aaa     | read, write                                                                                                                                          |         |            |     |             |     |             |

**Examples**

The following example shows how to specify POS 0/3/0/1 using PPP encapsulation on the interface. This example shows PAP authentication being specified as disabled if a peer calls in requesting PAP authentication.

```

RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp

```

```
RP/0/0/CPU0:router(config-if)# ppp pap refuse
```

**Related Commands**

| Command                                                      | Description                                                                                                                                                           |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| aaa authentication ppp                                       | Specifies one or more authentication, authorization, and accounting (AAA) methods for use on serial interfaces running PPP.                                           |
| <a href="#">ppp authentication</a> , on page 685             | Enables CHAP, MS-CHAP, or PAP, and specifies the order in which CHAP, MS-CHAP, and PAP authentication is selected on the interface.                                   |
| <a href="#">ppp max-bad-auth</a> , on page 692               | Configures a PPP interface not to reset itself immediately after an authentication failure but instead to allow a specified number of authentication retries.         |
| <a href="#">ppp pap sent-username password</a> , on page 706 | Enables remote PAP support for an interface, and includes the <b>sent-username</b> and <b>password</b> commands in the PAP authentication request packet to the peer. |

# ppp pap sent-username password

To enable remote Password Authentication Protocol (PAP) support for an interface, and to use the values specified for username and password in the PAP authentication request, use the **ppp pap sent-username password** command in interface configuration mode. To disable remote PAP support, use the **no** form of this command.

```
ppp pap sent-username username password [clear| encrypted] password  
no ppp pap sent-username username password [clear| encrypted] password
```

Syntax Description

|                  |                                                                           |
|------------------|---------------------------------------------------------------------------|
| <i>username</i>  | Username sent in the PAP authentication request.                          |
| <b>clear</b>     | (Optional) Specifies the cleartext encryption parameter for the password. |
| <b>encrypted</b> | (Optional) Indicates that the password is already encrypted.              |
| <i>password</i>  | Cleartext or already-encrypted password.                                  |

Command Default

Remote PAP support is disabled.

Command Modes

Interface configuration

Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **ppp pap sent-username password** command to enable remote PAP support (for example, to respond to the peer’s request to authenticate with PAP) and to specify the parameters to be used when sending the PAP authentication request.

You must configure the **ppp pap sent-username password** command for each interface.

Task ID

| Task ID | Operations  |
|---------|-------------|
| ppp     | read, write |
| aaa     | read, write |

## Examples

In the following example, a password is entered as a cleartext password, xxxx:

```
RP/0/0/CPU0:router(config-if)# ppp pap sent-username xxxx password notified
```

When the password is displayed (as shown in the following example, using the **show running-config** command), the password notified appears as 05080F1C2243:

```
RP/0/0/CPU0:router(config-if)# show running-config

interface POS0/1/0/0
description Connected to P1 CRS-8 POS 0/1/4/2
ipv4 address 10.12.32.2 255.255.255.0
encapsulation ppp
ppp pap sent-username P2_CRS-8 password encrypted 05080F1C2243
```

On subsequent logins, entering any of the three following commands would have the same effect of making xxxx the password for remote PAP authentication:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/1/0/0
RP/0/0/CPU0:router(config-if)# ppp pap sent-username xxxx password notified
RP/0/0/CPU0:router(config-if)# ppp pap sent-username xxxx password clear notified
RP/0/0/CPU0:router(config-if)# ppp pap sent-username xxxx encrypted 1514190900
```

## Related Commands

| Command                                                  | Description                                                                                                                                |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>aaa authentication ppp</b>                            | Specifies one or more authentication, authorization, and accounting (AAA) methods for use on serial interfaces running PPP.                |
| <a href="#">ppp authentication</a> , on page 685         | Enables CHAP, MS-CHAP, or PAP, and specifies the order in which CHAP, MS-CHAP, and PAP authentication is selected on the interface.        |
| <a href="#">ppp multilink multiclass</a>                 | Refuses PAP authentication from peers requesting it                                                                                        |
| <a href="#">ppp timeout authentication</a> , on page 708 | Sets PPP authentication timeout parameters.                                                                                                |
| <b>show running-config</b>                               | Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information. |

# ppp timeout authentication

To set PPP authentication timeout parameters, use the **ppp timeout authentication** command in interface configuration mode. To reset the default value, use the **no** form of this command.

```
ppp timeout authentication seconds
no ppp timeout authentication
```

|                    |         |                                                                                                                                     |
|--------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | seconds | Maximum time, in seconds, to wait for a response to an authentication packet. Range is from 3 to 30 seconds. Default is 10 seconds. |
|--------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------|

|                 |             |
|-----------------|-------------|
| Command Default | seconds: 10 |
|-----------------|-------------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

|                 |             |                              |
|-----------------|-------------|------------------------------|
| Command History | Release     | Modification                 |
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The default authentication time is 10 seconds, which should allow time for a remote router to authenticate and authorize the connection and provide a response. However, it is also possible that it will take much less time than 10 seconds. In such cases, use the **ppp timeout authentication** command to lower the timeout period to improve connection times in the event that an authentication response is lost.

  
**Note**

The timeout affects connection times only if packets are lost.

  
**Note**

Although lowering the authentication timeout is beneficial if packets are lost, sending authentication requests faster than the peer can handle them results in churn and a slower connection time.

|         |         |             |
|---------|---------|-------------|
| Task ID | Task ID | Operations  |
|         | ppp     | read, write |

## Examples

In the following example, PPP timeout authentication is set to 20 seconds:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
RP/0/0/CPU0:router(config-if)# ppp timeout authentication 20
```

## Related Commands

| Command                                          | Description                                                                                                                         |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>aaa authentication ppp</b>                    | Specifies one or more authentication, authorization, and accounting (AAA) methods for use on serial interfaces running PPP.         |
| <a href="#">ppp authentication</a> , on page 685 | Enables CHAP, MS-CHAP, or PAP, and specifies the order in which CHAP, MS-CHAP, and PAP authentication is selected on the interface. |

# ppp timeout retry

To set PPP timeout retry parameters, use the **ppp timeout retry** command in interface configuration mode. To reset the time value, use the **no** form of this command.

```
ppp timeout retry seconds
no ppp timeout retry
```

|                    |         |                                                                                                                               |
|--------------------|---------|-------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | seconds | Maximum time, in seconds, to wait for a response during PPP negotiation. Range is from 1 to 10 seconds. Default is 3 seconds. |
|--------------------|---------|-------------------------------------------------------------------------------------------------------------------------------|

|                 |            |
|-----------------|------------|
| Command Default | seconds: 3 |
|-----------------|------------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

|                 |             |                              |
|-----------------|-------------|------------------------------|
| Command History | Release     | Modification                 |
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **ppp timeout retry** command is useful for setting a maximum amount of time PPP should wait for a response to any control packet it sends.

|         |         |             |
|---------|---------|-------------|
| Task ID | Task ID | Operations  |
|         | ppp     | read, write |

**Examples**

The following example shows the retry timer being set to 8 seconds:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface POS 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
RP/0/0/CPU0:router(config-if)# ppp timeout retry 8
```



# show ppp interfaces

To display PPP state information for an interface, use the **show ppp interfaces** command in EXEC mode.

**show ppp interfaces** [**brief** | **detail**] {**all** | *type interface-path-id* | **location node-id**}

## Syntax Description

|                          |                                                                                                                                                                                                                                                                              |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>brief</b>             | (Optional) Displays brief output for all interfaces on the router, for a specific POS interface instance, or for all interfaces on a specific node.                                                                                                                          |
| <b>detail</b>            | (Optional) Displays detailed output for all interfaces on the router, for a specific interface instance, or for all interfaces on a specific node.                                                                                                                           |
| <i>type</i>              | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                        |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | (Optional) Displays detailed PPP information for all nodes.                                                                                                                                                                                                                  |
| <b>location node-id</b>  | (Optional) Displays detailed PPP information for the designated node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                        |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release     | Modification             |
|-------------|--------------------------|
| Release 3.2 | This command introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

There are seven possible PPP states applicable for either the Link Control Protocol (LCP) or the Network Control Protocol (NCP).

The command output displays a summary of the interface as it is in the PPP Interface Descriptor Block (IDB). The output includes the following information (where applicable):

- Interface state
- Line protocol state
- Link Control Protocol (LCP) state
- Network Control Protocol (NCP) state
- Multilink PPP state
- Multilink PPP configuration
- Keepalive configuration
- Authentication configuration
- Negotiated MRUs
- Negotiated IP addresses

This command can display information for a single interface, all interfaces on a specified node, or all interfaces on the router.

Task ID

| Task ID | Operations |
|---------|------------|
| ppp     | read       |

Examples

The following example shows how to display PPP state information for a POS interface:

```
RP/0/0/CPU0:router# show ppp interface POS 0/2/0/3
  POS0/2/0/3 is up, line protocol is up
    LCP: Open
      Keepalives enabled (10 sec)
      Local MRU: 4470 bytes
      Peer MRU: 4470 bytes
    Authentication
      Of Us: CHAP (Completed as 'test-user')
      Of Peer: PAP (Completed as 'peer-user')
    CDP: Listen
    IPCP: Open
      Local IPv4 address: 55.0.0.1
      Peer IPv4 address: 55.0.0.2
      Peer DNS Primary: 55.0.0.254
      Peer DNS Secondary: 155.0.0.254
    IPV6CP: Open
      Local IPv6 address: fe80::3531:35ff:fe55:5747/128
      Peer IPv6 address: fe80::3531:35ff:fe55:4213/128
    MPLSCP: Stopped
```

The following example shows how to display PPP state information for a POS interface that is running as a Layer 2 attachment circuit:

```
RP/0/0/CPU0:# show ppp interface POS0/2/0/2
```

```
POS0/2/0/2 is up, line protocol is up
LCP: Open
Running as L2 AC
```

The following example shows how to display PPP state information for a multilink interface:

```
RP/0/0/CPU0:router:# show ppp interface Multilink 0/3/0/0/100
```

```
Multilink0/3/0/0/100 is up, line protocol is down
LCP: Open
SSO-State: Standby-Up
Keepalives disabled
IPCP: Open
SSO-State: Standby-Up
Local IPv4 address: 100.0.0.1
Peer IPv4 address: 100.0.0.2
IPV6CP: Open
Local IPv6 address: fe80::3531:35ff:fe55:4600/128
Peer IPv6 address: fe80::3531:35ff:fe55:3215/128
Multilink
Local MRRU: 1500 bytes
Peer MRRU: 1500 bytes
Local Endpoint Discriminator: 1234567812345678
Peer Endpoint Discriminator: 1111222233334444
MCMP classes: Local 4, Remote 2
Member links: 2 active, 6 inactive (min-active 2)
- Serial0/3/1/3/1 ACTIVE
- Serial0/3/1/3/2 ACTIVE
- Serial0/3/1/3/3 INACTIVE : LCP not negotiated
- Serial0/3/1/3/4 INACTIVE : Mismatching peer endpoint
- Serial0/3/1/3/5 INACTIVE : Mismatching peer auth name
- Serial0/3/1/3/6 INACTIVE : MRRU option rejected by Peer
- Serial0/3/1/3/7 INACTIVE : Mismatching local MCMP classes
- Serial0/3/1/3/8 INACTIVE : MCMP option rejected by peer
```

The following example shows how to display PPP state information for a serial interface:

```
RP/0/0/CPU0:router# show ppp interface Serial 0/3/1/3/1
```

```
Serial0/3/1/3/1 is down, line protocol is down
LCP: Open
SSO-State: Standby-Up
Keepalives enabled (10 sec)
Local MRU: 1500 bytes
Peer MRU: 1500 bytes
Local Bundle MRRU: 1500 bytes
Peer Bundle MRRU: 1500 bytes
Local Endpoint Discriminator: 1234567812345678
Peer Endpoint Discriminator: 1111222233334444
Local MCMP Classes: Not negotiated
Remote MCMP Classes: Not negotiated
Authentication
Of Us: CHAP (Completed as 'test-user')
Of Peer: PAP (Completed as 'peer-user')
Multilink
Multilink group id: 100
Member status: ACTIVE
```

**Table 50: show ppp interfaces Field Descriptions**

| Field          | Description                                                                                                                                                                                                                                 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ack-Rcvd       | Configuration acknowledgement was received; waiting for peer to send configuration request.                                                                                                                                                 |
| Ack-Sent       | Configuration acknowledgement was sent; waiting for peer to respond to configuration request.                                                                                                                                               |
| Authentication | Type of user authentication configured on the local equipment and on the peer equipment. Possible PPP authentication protocols are Challenge Handshake Authentication Protocol (CHAP), MS-CHAP, and Password Authentication Protocol (PAP). |
| Closed         | Lower layer is up, but this layer is not required.                                                                                                                                                                                          |
| Closing        | Shutting down due to local change.                                                                                                                                                                                                          |
| Initial        | Connection is idle.                                                                                                                                                                                                                         |

| Field     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IPCP      | <p>IP Control Protocol (IPCP) state. The seven possible states that may be displayed are as follows:</p> <ul style="list-style-type: none"> <li>• Initial—Lower layer is unavailable (Down), and no Open has occurred. The Restart timer is not running in the Initial state.</li> <li>• Starting—An administrative Open has been initiated, but the lower layer is still unavailable (Down). The Restart timer is not running in the Starting state. When the lower layer becomes available (Up), a Configure-Request is sent.</li> <li>• Closed—IPCP is not currently trying to negotiate.</li> <li>• Stopped—A Terminate-Request has been sent and the Restart timer is running, but a Terminate-Ack has not yet been received.</li> <li>• Closing—A Terminate-Request has been sent and the Restart timer is running, but a Terminate-Ack has not yet been received. Upon reception of a Terminate-Ack, the Closed state is entered. Upon the expiration of the Restart timer, a new Terminate-Request is transmitted, and the Restart timer is restarted. After the Restart timer has expired Max-Terminate times, the Closed state is entered.</li> <li>• Stopping—A Terminate-Request has been sent and the Restart timer is running, but a IPCP-Ack has not yet been received. Req-Sent.</li> <li>• ACKsent—IPCP has received a request and has replied to it.</li> <li>• ACKrcvd—IPCP has received a reply to a request it sent.</li> <li>• Open—IPCP is functioning properly.</li> </ul> |
| Keepalive | Keepalive setting and interval in seconds for echo request packets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Field              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LCP                | <p>Indicates the current state of LCP. The state of the LCP will report the following states:</p> <ul style="list-style-type: none"> <li>• Initial—Lower layer is unavailable (Down), and no Open has occurred. The Restart timer is not running in the Initial state.</li> <li>• Starting—An administrative Open has been initiated, but the lower layer is still unavailable (Down). The Restart timer is not running in the Starting state. When the lower layer becomes available (Up), a Configure-Request is sent.</li> <li>• Closed— LCP is not currently trying to negotiate.</li> <li>• Stopped—A Terminate-Request has been sent and the Restart timer is running, but a Terminate-Ack has not yet been received.</li> <li>• Closing—A Terminate-Request has been sent and the Restart timer is running, but a Terminate-Ack has not yet been received. Upon reception of a Terminate-Ack, the Closed state is entered. Upon the expiration of the Restart timer, a new Terminate-Request is transmitted, and the Restart timer is restarted. After the Restart timer has expired Max-Terminate times, the Closed state is entered.</li> <li>• Stopping—A Terminate-Request has been sent and the Restart timer is running, but a Terminate-Ack has not yet been received. Req-Sent.</li> <li>• ACKsent—LCP has received a request and has replied to it.</li> <li>• ACKrcvd—LCP has received a reply to a request it sent.</li> <li>• Open—LCP is functioning properly</li> </ul> |
| Local IPv4 address | IPv4 address for the local interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Local MRU          | Maximum receive unit. The maximum size of the information transported, in bytes, in the PPP packet received by the local equipment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Open               | Connection open.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Field             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OSICP             | <p>Open System Interconnection Control Protocol (OSICP) state. The possible states that may be displayed are as follows:</p> <ul style="list-style-type: none"> <li>• Initial—Lower layer is unavailable (Down), and no Open has occurred. The Restart timer is not running in the Initial state.</li> <li>• Starting—An administrative Open has been initiated, but the lower layer is still unavailable (Down). The Restart timer is not running in the Starting state. When the lower layer becomes available (Up), a Configure-Request is sent.</li> <li>• Closed—OSICP is not currently trying to negotiate.</li> <li>• Stopped—A Terminate-Request has been sent and the Restart timer is running, but a Terminate-Ack has not yet been received.</li> <li>• Closing—A Terminate-Request has been sent and the Restart timer is running, but a Terminate-Ack has not yet been received. Upon reception of a Terminate-Ack, the Closed state is entered. Upon the expiration of the Restart timer, a new Terminate-Request is transmitted, and the Restart timer is restarted. After the Restart timer has expired Max-Terminate times, the Closed state is entered.</li> <li>• Stopping—A Terminate-Request has been sent and the Restart timer is running, but a Terminate-Ack has not yet been received. Req-Sent.</li> <li>• ACKsent—OSICP has received a request and has replied to it.</li> <li>• ACKrcvd—OSICP has received a reply to a request it sent.</li> <li>• Open—OSICP is functioning properly.</li> </ul> |
| Peer IPv4 address | IPv4 address for the peer equipment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Peer MRU          | Maximum receive unit. The maximum size of the information transported, in bytes, in the PPP packet received by the peer equipment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Req-Sent          | Configuration request was sent; waiting for peer to respond.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

show ppp interfaces

| Field    | Description                                          |
|----------|------------------------------------------------------|
| Starting | This layer is required, but lower layer is down.     |
| Stopped  | Listening for a configuration request.               |
| Stopping | Shutting down as a result of interactions with peer. |





# Serial Interface Commands on the Cisco IOS XR Software

---

This module provides CLI commands for configuring serial interfaces on the Cisco XR 12000 Series Router.

- [clear iphc ipv4](#), page 721
- [crc \(serial\)](#), page 723
- [description \(IPHC profile\)](#), page 725
- [encapsulation \(serial\)](#), page 726
- [feedback disable](#), page 728
- [fragment end-to-end](#), page 729
- [fragment-counter](#), page 731
- [interface serial](#), page 733
- [invert](#), page 736
- [iphc non-tcp connections](#), page 737
- [iphc profile](#), page 738
- [iphc tcp connections](#), page 740
- [ipv4 iphc profile](#), page 741
- [keepalive \(serial\)](#), page 743
- [max-header](#), page 745
- [non-tcp compression](#), page 746
- [non-tcp context absolute](#), page 747
- [pvc \(serial\)](#), page 749
- [refresh max-period](#), page 751
- [refresh rtp](#), page 753
- [rtp](#), page 754

- [scramble, page 755](#)
- [serial, page 757](#)
- [show iphc idb, page 758](#)
- [show iphc ipv4 rtp, page 760](#)
- [show iphc ipv4 tcp, page 762](#)
- [show iphc platform trace, page 764](#)
- [show iphc profile, page 766](#)
- [show iphc trace all, page 769](#)
- [show tech-support iphc, page 771](#)
- [tcp compression, page 773](#)
- [tcp context absolute, page 775](#)
- [transmit-delay \(serial\), page 777](#)

# clear iphc ipv4

To clear all Real Time Protocol (RTP) and Transport Control Protocol (TCP) statistics for IP header compression (IPHC) packets sent and received on an interface, use the **clear iphc ipv4** command in EXEC mode.

**clear iphc ipv4** {**interface** {**serial**|**multilink**} *interface-path-id*|**location** *node-id*}

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>interface</b>         | Specifies the interface to be configured, by type and the <i>interface-path-id</i> argument.                                                                                                                                                                                    |
| <b>serial</b>            | Specifies a serial network interface.                                                                                                                                                                                                                                           |
| <b>multilink</b>         | Specifies a multilink network interface.                                                                                                                                                                                                                                        |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>location</b>          | Specifies the interface to be configured by its <i>node-id</i> .                                                                                                                                                                                                                |
| <i>node-id</i>           | Fully qualified path of the node in the <i>rack/slot/module</i> notation.                                                                                                                                                                                                       |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

The **clear counters** command also clears the IPHC statistics for all the interfaces.

Task ID

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |

Examples

The following example shows how to clear RTP and TCP statistics on an interface:

```
RP/0/0/CPU0:router# clear iphc ipv4 interface Serial 0/1/0/1/26:0
Thu Jan  8 20:30:38.155 UTC
```

The following example shows how to clear RTP and TCP statistics on a node:

```
RP/0/0/CPU0:router# clear iphc ipv4 location 0/3/CPU0
Mon Oct 12 22:47:51.430 DST
```

## crc (serial)

To set the length of the cyclic redundancy check (CRC) on a serial interface, use the **crc** command in serial configuration mode. To return the CRC setting on a serial interface to the default setting, use the **no** form of this command.

**crc {16| 32}**

**no crc {16| 32}**

### Syntax Description

|           |                       |
|-----------|-----------------------|
| <b>16</b> | Sets 16-bit CRC mode. |
| <b>32</b> | Sets 32-bit CRC mode. |

### Command Default

The default is 16 bits for serial interfaces.

### Command Modes

Serial configuration

### Command History

|               |                              |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |
|---------------|------------------------------|

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

*CRC* is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. The designators 16 and 32 indicate the length (in bits) of the frame check sequence (FCS). A CRC of 32 bits provides more powerful error detection, but adds overhead. Both the sender and receiver must use the same setting.

CRC-16, the most widely used error checking method throughout the United States and Europe, is used extensively with WANs. CRC-32 is specified by IEEE standard 802 and as an option by some point-to-point transmission standards. It is often used on Switched Multimegabit Data Service (SMDS) networks and LANs.

### Task ID

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |

Examples

In the following example, the 32-bit CRC on serial interface 0/3/0/0:10 is enabled:

```
RP/0/0/CPU0:router(config)# interface serial 0/3/0/0:10
RP/0/0/CPU0:router(config-if)# serial
RP/0/0/CPU0:router(config-if-serial)# crc 32
```

Related Commands

| Command                                      | Description                                                                             |
|----------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">show interfaces, on page 549</a> | Displays statistics for all interfaces configured on the router or for a specific node. |

## description (IPHC profile)

To add a description to an IPHC profile, use the **description** command in IPHC profile configuration mode. To remove a description for an IPHC profile, use the **no** form of this command.

**description** *description*

**no description**

### Syntax Description

|                    |                                              |
|--------------------|----------------------------------------------|
| <i>description</i> | Description to be added to the IPHC profile. |
|--------------------|----------------------------------------------|

### Command Default

By default, no description is attached to an IPHC profile.

### Command Modes

IPHC profile configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |

### Examples

In the following example, a description is attached to the IPHC profile test:

```
RP/0/0/CPU0:router(config)# config
RP/0/0/CPU0:router(config)# iphc profile test type iphc
RP/0/0/CPU0:router(config-iphc-profile)# description testprofile
RP/0/0/CPU0:router(config-iphc-profile)# commit
```

# encapsulation (serial)

To set the Layer 2 encapsulation of an interface, use the **encapsulation** command in interface configuration mode. To restore the system to the default encapsulation, use the **no** form of this command.

**encapsulation** {hdlc| ppp| frame-relay| mfr}

**no encapsulation**

## Syntax Description

|                     |                                                                                                                           |
|---------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>hdlc</b>         | Enables Cisco High-Level Data Link Control (HDLC) encapsulation on the interface. This is the default encapsulation type. |
| <b>ppp</b>          | Enables PPP encapsulation on the interface.                                                                               |
| <b>frame -relay</b> | Enables Frame Relay encapsulation on the interface.                                                                       |
| <b>mfr</b>          | Enables multilink Frame Relay encapsulation on the interface.                                                             |

## Command Default

For serial interfaces, the default encapsulation is HDLC.

## Command Modes

Interface configuration

## Command History

|               |                                                                         |
|---------------|-------------------------------------------------------------------------|
| Release 3.2   | This command was first supported.                                       |
| Release 3.4.0 | Frame Relay encapsulation was supported on serial interfaces.           |
| Release 3.6.0 | Multilink Frame Relay encapsulation was supported on serial interfaces. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| hdlc      | read, write |
| interface | read, write |



## Examples

The following example shows how to enable PPP encapsulation on serial interface 0/3/0/1:

```
RP/0/0/CPU0:router(config)# interface serial 0/3/0/1
RP/0/0/CPU0:router(config-if)# encapsulation ppp
```

## Related Commands

| Command                                          | Description                                                                             |
|--------------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">show interfaces, on page 549</a>     | Displays statistics for all interfaces configured on the router or for a specific node. |
| <a href="#">show ppp interfaces, on page 711</a> | Displays PPP state information for an interface.                                        |

# feedback disable

To disable the IP header compression (IPHC) context status feedback messages on an interface, use the **feedback disable** command in IPHC profile configuration mode. To re-enable feedback messages after they are disabled, use the **no** form of this command.

**feedback disable**  
**no feedback disable**

| Syntax Description | This command has no keywords or arguments. |                              |
|--------------------|--------------------------------------------|------------------------------|
| Command Default    | Feedback messages are enabled by default.  |                              |
| Command Modes      | IPHC profile configuration                 |                              |
| Command History    | Release                                    | Modification                 |
|                    | Release 3.9.0                              | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



**Note**

Feedback disable can be configured only within an IPHC profile.

| Task ID | Task ID     | Operations  |
|---------|-------------|-------------|
|         | ip-services | read, write |

**Examples**

The following example shows how to disable the IP header compression (IPHC) context status feedback messages within an IPHC profile:

```
RP/0/0/CPU0:router(config)# config
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc
RP/0/0/CPU0:router(config-iphc-profile)# feedback disable
```

# fragment end-to-end

To enable fragmentation of Frame Relay frames on an interface and enter Frame Relay virtual circuit fragment configuration mode, use the **fragment end-to-end** command in serial Frame Relay PVC configuration mode. To disable Frame Relay fragmentation, use the **no** form of this command.

**fragment end-to-end** *fragment-size* [**fragment-counter**]

**no fragment end-to-end**

## Syntax Description

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>fragment-size</i>    | Number of payload bytes from the original Frame Relay frame that go into each fragment. This number excludes the Frame Relay header of the original frame.<br><br>All the fragments of a Frame Relay frame, except the last, have a payload size equal to <i>fragment-size</i> ; the last fragment has a payload less than or equal to <i>fragment-size</i> . Valid values are from 64 to 512 bytes, depending on your hardware. |
| <b>fragment-counter</b> | (Optional) Enables fragmentation counters.                                                                                                                                                                                                                                                                                                                                                                                       |

## Command Default

## Command Modes

## Command History

|               |                                                                                                                                                                          |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Release 3.5.0 | This command was introduced.                                                                                                                                             |
| Release 4.0.0 | <ul style="list-style-type: none"><li>The supported fragment size range was changed to 64 to 512 bytes.</li><li>The <b>fragment-counter</b> keyword was added.</li></ul> |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The Cisco 8-Port Channelized T1/E1 SPA supports fragment sizes of 128, 256, and 512 bytes.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

Examples

The following example shows how to enter serial Frame Relay virtual circuit configuration mode, set the fragmentation size of Frame Relay frames on subinterface 0/6/2/4.1 to 512 bytes and enable fragmentation counters:

```
RP/0/0/CPU0:router(config)# interface serial 0/6/2/4.1 point-to-point
RP/0/0/CPU0:router(config-subif)# pvc 100
RP/0/0/CPU0:router(config-fr-vc)# fragment end-to-end 512 fragment-counter
```

Related Commands

| Command                                        | Description                                                                                                      |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <a href="#">interface serial</a> , on page 733 | Configures a serial interface and enters interface or subinterface configuration mode.                           |
| <a href="#">pvc (serial)</a> , on page 749     | Creates a Frame Relay PVC under a serial subinterface and enters Frame Relay virtual circuit configuration mode. |
| <a href="#">fragment-counter</a> , on page 731 | Enables fragmentation counters for a Frame Relay subinterface and PVC.                                           |

# fragment-counter

To enable fragmentation counters for a Frame Relay subinterface and PVC, use the **fragment-counter** command in Frame Relay virtual circuit fragment configuration mode. To disable collection of fragmentation counters, use the **no** form of this command.

**fragment-counter**

**no fragment-counter**

**Syntax Description** This command has no keywords or arguments.

**Command Default** Fragmentation counters are disabled.

**Command Modes** Frame Relay virtual circuit fragment configuration

| Release       | Modification                 |
|---------------|------------------------------|
| Release 4.0.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

**Examples** The following example shows how to enter serial Frame Relay PVC configuration mode, set the fragmentation size of Frame Relay frames on subinterface 0/6/2/4.1 to 512 bytes and enable the fragmentation counter:

```
RP/0/0/CPU0:router(config)# interface serial 0/6/2/4.1 12transport
RP/0/0/CPU0:router(config-subif)# pvc 100
RP/0/0/CPU0:router(config-fr-vc)# fragment end-to-end 512
RP/0/0/CPU0:router(config-fr-vc-frag)# fragment-counter
```

| Command                                        | Description                                                                            |
|------------------------------------------------|----------------------------------------------------------------------------------------|
| <a href="#">interface serial</a> , on page 733 | Configures a serial interface and enters interface or subinterface configuration mode. |

| Command                                           | Description                                                                                                      |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <a href="#">pvc (serial), on page 749</a>         | Creates a Frame Relay PVC under a serial subinterface and enters Frame Relay virtual circuit configuration mode. |
| <a href="#">fragment end-to-end, on page 729</a>  |                                                                                                                  |
| <a href="#">show frame-relay pvc, on page 518</a> | Displays statistics about Frame Relay PVCs.                                                                      |

# interface serial

To configure a serial interface and enter interface or subinterface configuration mode, use the **interface serial** command in global configuration mode. To delete a serial configuration, use the **no** form of this command.

**interface serial** *interface-path-id* [. *subinterface*] {**point-to-point**| **l2transport**}

**no interface serial** *interface-path-id* [. *subinterface*] {**point-to-point**| **l2transport**}

## Syntax Description

*interface-path-id*[.*subinterface*] Physical interface or virtual interface followed by the optional subinterface path ID. Naming notation is *interface-path-id.subinterface*. The period in front of the subinterface value is required as part of the notation.

For more information about the syntax for the router, use the question mark (?) online help function.

**point-to-point** Interface functions as one endpoint of a point-to-point link.

**l2transport** Interface functions as one endpoint on an Layer 2 link.

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

|               |                                                                                                 |
|---------------|-------------------------------------------------------------------------------------------------|
| Release 3.3.0 | This command was introduced.                                                                    |
| Release 3.5.0 | The <b>l2transport</b> keyword was added to support Layer 2 configuration on serial interfaces. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:



### Note

A slash between values is required as part of the notation.

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*—Chassis number of the rack.

- *slot*—Physical slot number of the line card.
  - *module*—Module number. A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.
  - The naming notation for T1 interfaces on a channelized SPA is *rack/slot/module/port/channel-num:channel-group-number*, as shown in the following example:
 

```
interface serial 0/0/1/2/4:3
```
  - If a subinterface is configured under the serial interface, then the router includes the subinterface number at the end of the serial interface address. In this case, the naming notation is *rack/slot/module/port[/channel-num:channel-group-number].subinterface*, as shown in the following example:
 

```
interface serial 0/0/1/2.1
```
  - The naming notation syntax for serial interfaces is as follows:
    - *rack*—Chassis number of the rack.
    - *slot*—Physical slot number of the modular services card or line card.
    - *module*—Module number. Shared port adapters (SPAs) are referenced by their subslot number.
    - *port*—Physical port number of the controller.
    - *channel-num*:—T1 channel number. T1 channels range from 0 to 23.
    - *channel-group-number*:—Time slot number. T1 time slots range from 1 to 24. The *channel-group-number* is preceded by a colon and not a slash.
    - *subinterface*—Subinterface number.
  - Use the question mark (?) online help function following the **serial** keyword to view a list of all valid interface choices.

Serial interfaces on channelized T3 can be deleted using the **no channel-group** command in T1 configuration mode. If there are nondefault serial parameters defined, you need to use the **no interface serial** command first to revert to the default configuration, and then delete the serial interface using the **no channel-group** command.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

## Examples

The following example shows how to enter interface configuration mode for a serial interface in slot 6, subslot 2, port 4, T1 channel number 10 and channel group 8:

```
RP/0/0/CPU0:router(config)# interface serial 0/6/2/4/10:8
```



```
RP/0/0/CPU0:router(config-if)#
```

The following example shows how to create a subinterface on a serial interface in slot 6, subslot 2, port 3 and enter subinterface configuration mode:

```
RP/0/0/CPU0:router(config)# interface serial 0/6/2/3.1  
RP/0/0/CPU0:router(config-if)#
```

The following example shows how to reference the serial interface on channel group 3 of T1 channel group 4 on port 2 of a SPA in subslot 1 and enter subinterface configuration mode:

```
RP/0/0/CPU0:router(config)# interface serial 0/0/1/2/4:3  
RP/0/0/CPU0:router(config-if)#
```

## Related Commands

| Command                                       | Description                                                                             |
|-----------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">channel-group</a> , on page 910   | Configures a DS0 channel group and enters channel group configuration mode.             |
| <a href="#">show interfaces</a> , on page 549 | Displays statistics for all interfaces configured on the router or for a specific node. |

# invert

To invert the data stream on a serial interface, use the **invert** command in serial configuration mode. To disable data inversion, use the **no** form of this command.

**invert**

**no invert**

**Syntax Description** This command has no keywords or arguments.

**Command Default** Data is not inverted.

**Command Modes** Serial configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.3.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

To verify that data inversion is configured on the interface, use the **show interfaces serial** command.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | hdlc    | read, write |

**Examples** In the following example, data inversion is enabled on serial interface 0/3/0/0/10:

```
RP/0/0/CPU0:router(config)# interface serial 0/3/0/0/10
RP/0/0/CPU0:router(config-if)# serial
RP/0/0/CPU0:router(config-if-serial)# invert
```

| Related Commands | Command                                       | Description                                                                             |
|------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------|
|                  | <a href="#">show interfaces</a> , on page 549 | Displays statistics for all interfaces configured on the router or for a specific node. |

## iphc non-tcp connections

To set the maximum number of non-TCP connections that may be configured for IP header compression (IPHC) on a line card, use the **iphc tcp connections** command in configuration mode. To remove this setting, use the **no** form of this command.

**iphc non-tcp connections** *max-number* **location** *node-id*

**no iphc non-tcp connections** *max-number* **location** *node-id*

### Syntax Description

|                   |                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------|
| <i>max-number</i> | Maximum number of non-TCP connections that may be configured for IPHC. The range is 1 to 20000.     |
| <b>location</b>   | Location, specified by <i>node-id</i> , on which to set the maximum number of connections for IPHC. |
| <i>node-id</i>    | Fully qualified path of the node in the format <i>rack/slot/port</i> .                              |

### Command Default

No default behavior or values

### Command Modes

Configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |

### Examples

The following example shows how to set the maximum number of non-TCP connections that may be configured for IP header compression (IPHC) on a line card:

```
RP/0/0/CPU0:router# config
RP/0/0/CPU0:router(config)# iphc non-tcp connections 20000 location 0/1/cpu0
```

# iphc profile

To create an IP header compression (IPHC) profile and enter the IPHC profile configuration mode, use the **iphc profile** command in configuration mode. To remove the profile, use the **no** form of this command.

```
iphc profile profile-name type {ietf| iphc}
no iphc profile profile-name [type {ietf| iphc}]
```

Syntax Description

|              |                                                                                                                 |
|--------------|-----------------------------------------------------------------------------------------------------------------|
| profile-name | Text name for the IPHC profile. The maximum number of characters is 50.                                         |
| type         | Specifies the type of compression format.                                                                       |
| ietf         | Specifies Internet Engineering Task Force (IETF) standard format. Uses RFC2507 and RFC2508 compression schemes. |
| iphc         | Specifies Internet Protocol Header Compression (IPHC) format.Provides options similar to IETF.                  |

Command Default

No default behavior or values

Command Modes

Configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

After you create a profile and enter the IPHC profile configuration mode, you can configure IPHC features in the profile and attach the profile to multiple interfaces. The maximum number of profiles allowed on a router is 250.

A profile cannot be deleted if it is attached to any interfaces. You must remove the profile from all interfaces first. Then, delete the profile using the **no** form of this command.

On-the-fly modifications to IPHC profiles are not supported.

A profile name cannot exceed 50 characters. If you attempt to create a profile name that exceeds 50 characters, you receive the following error message:

```
iphc profile test1test1test1test1test1test1test1test1test1test1 type iphc
!!! 'iphc_profilemgr' detected the 'warning' condition
```

```
'Name is longer than allowed character length of 50'  
!
```

**Task ID**

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |

**Examples**

The following example shows how to create the IPHC profile Profile\_1

```
RP/0/0/CPU0:router(config)# config  
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc  
RP/0/0/CPU0:router(config-iphc-profile)#
```

## iphc tcp connections

To set the maximum number of TCP connections that may be configured for IP header compression (IPHC) on a line card, use the **iphc tcp connections** command in configuration mode. To remove this setting, use the **no** form of this command.

**iphc tcp connections** *max-number* **location** *node-id*

**no iphc tcp connections** *max-number* **location** *node-id*

### Syntax Description

|                   |                                                                                            |
|-------------------|--------------------------------------------------------------------------------------------|
| <i>max-number</i> | Maximum number of TCP connections that may be configured for IPHC. The range is 1 to 2000. |
| <b>location</b>   | Location of the card, specified by <i>node-id</i> .                                        |
| <i>node-id</i>    | Fully qualified path of the node in the format <i>rack/slot/port</i> .                     |

### Command Default

No default behavior or values

### Command Modes

Configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |

### Examples

The following example shows how to set the maximum number of TCP connections that may be configured for IP header compression (IPHC) on a line card:

```
RP/0/0/CPU0:router(config)# config
RP/0/0/CPU0:router(config)# iphc tcp connections 2000 location 0/1/cpu0
```

## ipv4 iphc profile

To attach an IP header compression (IPHC) profile to an interface, use the **ipv4 iphc profile** command in interface configuration mode. To remove the profile from the interface, use the **no** form of this command.

**ipv4 iphc profile** *profile-name* [**mode service-policy**]

**no ipv4 iphc profile** [*profile-name* [**mode service-policy**]]

### Syntax Description

|                            |                                                                             |
|----------------------------|-----------------------------------------------------------------------------|
| <i>profile-name</i>        | Text name of the configured IPHC profile to attach to this interface.       |
| <b>mode service-policy</b> | (Optional) Specifies that the IPHC profile applies to a QoS service policy. |

### Command Default

No default behavior or values

### Command Modes

Interface configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the profile name is not recognized the system returns the following error message:

```
!!% 'iphc_ma' detected the 'warning' condition 'Profile doesn't exist'
```

If the encapsulation on the interface is not supported, the system returns the following error message:

```
!!% 'iphc_ma' detected the 'warning' condition 'IPHC capability: Encap type not supported'
```

### Task ID

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |
| ipv4        | read, write |

## Examples

The following example shows how to attach an IP header compression (IPHC) profile to an interface.

```
RP/0/0/CPU0:router(config)# config  
RP/0/0/CPU0:router(config)# interface serial 0/1/0/1  
RP/0/0/CPU0:router(config-if)# ipv4 iphc profile Profile_1
```

The following example shows how to attach an IPHC profile that applies to a QoS service policy to an interface:

```
RP/0/0/CPU0:router(config)# config  
RP/0/0/CPU0:router(config)# interface serial 0/1/0/1  
RP/0/0/CPU0:router(config-if)# ipv4 iphc profile Profile_1 mode service-policy
```



# keepalive (serial)

To set the keepalive timer for a specific serial interface, use the **keepalive** command in interface configuration mode. To reset the keepalive timer to the default of 10 seconds, use the **no** form of this command.

**keepalive** {*interval* [*retry* ]} **disable**}

**no keepalive**

## Syntax Description

|                 |                                                                                                                                                                      |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interval</i> | Number of seconds (from 1 to 30) between keepalive messages. The default is 10.                                                                                      |
| <b>disable</b>  | Turns off the keepalive timer.                                                                                                                                       |
| <i>retry</i>    | (Optional) Number of keepalive messages (from 1 to 255) that can be sent to a peer without a response before transitioning the link to down state. The default is 5. |

## Command Default

The default interval is 10 seconds between keepalive messages. The default retry is 5 keepalive messages that can be sent without a response. However, when more than 5 keepalive messages are sent to a peer without a response, the link transitions to the down state.

## Command Modes

Interface configuration

## Command History

|             |                          |
|-------------|--------------------------|
| Release 3.2 | This command introduced. |
|-------------|--------------------------|

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

HDLC keepalives require that the **keepalive** command is configured the same way on both ends of a single connection. The two connected routers have no way of negotiating the keepalive value because there is no way for one router to tell the other about its configured values. The keepalive value configured on each router (local or partner) sets the rate at which the Cisco IOS XR software sends packets. It also sets the rate at which the local end expects to receive incoming packets.

To set the keepalive value to the default value, use the **keepalive** command without specifying a value for the *interval* argument.

By default, if more than five keepalive messages are sent to a peer and no response is received from the peer, then the link transitions to the down state.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |

**Examples**

The following example shows how to configure keepalives for 3 seconds on serial interface 0/7/0/1:

```
RP/0/0/CPU0:router(config)# interface serial 0/7/0/1  
RP/0/0/CPU0:router(config-if)# keepalive 3
```

**Related Commands**

| Command                                       | Description                                                                             |
|-----------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">show interfaces</a> , on page 549 | Displays statistics for all interfaces configured on the router or for a specific node. |

# max-header

To define the maximum size header that can be compressed, use the **max-header** command in IPHC profile configuration mode. To return to the default maximum size, use the **no** form of this command.

**max-header** *number-of-bytes*

**no max-header** [ *number-of-bytes* ]

## Syntax Description

|                        |                                                                                                            |
|------------------------|------------------------------------------------------------------------------------------------------------|
| <i>number-of-bytes</i> | Maximum size, in bytes, of a header that can be compressed. The range is from 20 to 40. The default is 40. |
|------------------------|------------------------------------------------------------------------------------------------------------|

## Command Default

*Number-of-bytes*; 40.

## Command Modes

IPHC profile configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



### Note

The maximum header size can be configured only within an IPHC profile.

## Task ID

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |

## Examples

The following example shows how to define the maximum size header that can be compressed.

```
RP/0/0/CPU0:router(config)# config
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc
RP/0/0/CPU0:router(config-iphc-profile)# max-header 20
```

## non-tcp compression

To enable non-TCP compression in an IP header compression (IPHC) profile, use the **non-tcp compression** command in IPHC profile configuration mode. To disable non-TCP compression in the profile, use the **no** form of this command.

**non-tcp compression**

**no non-tcp**

**Syntax Description** This command has no keywords or arguments.

**Command Default** No default behavior or values

**Command Modes** IPHC profile configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.9.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



**Note**

NON-TCP compression can be enabled only within an IPHC profile. Non-TCP compression does not work unless it is enabled under a profile.

| Task ID | Task ID     | Operations  |
|---------|-------------|-------------|
|         | ip-services | read, write |

**Examples** The following example shows how to enable NON-TCP compression within an IP header compression (IPHC) profile:

```
RP/0/0/CPU0:router(config)# config
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc
RP/0/0/CPU0:router(config-iphc-profile)# non-tcp compression
```

## non-tcp context absolute

To configure the maximum number of non-TCP contexts that are allowed for IPHC under a profile, use the **non-tcp context absolute** command in IPHC profile configuration mode. To remove the non-TCP context from the profile, use the **no** form of this command.

**non-tcp context absolute** *number-of-contexts*

**no non-tcp context** [**absolute** [ *number-of-contexts* ]]

### Syntax Description

|                           |                                                                                                                                       |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <i>number-of-contexts</i> | Numeric value that specifies the maximum number of non-TCP contexts allowed for IPHC under this profile. The range is from 0 to 6000. |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------|

### Command Default

If the number of contexts is not specified, and only non-TCP compression is enabled, the default number of contexts is 16.

### Command Modes

IPHC profile configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The maximum allowed number of non-tcp contexts on a Line Card, across all IPHC profiles and interfaces, is 6000.



#### Note

Non-TCP context can be set only within an IPHC profile.

### Task ID

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |

## Examples

The following example shows how to enable non-TCP compression within an IP header compression (IPHC) profile:

```
RP/0/0/CPU0:router(config)# config  
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc  
RP/0/0/CPU0:router(config-iphc-profile)# non-tcp context absolute 255
```

## pvc (serial)

To create a Frame Relay permanent virtual circuit (PVC) under a serial subinterface and enter Frame Relay virtual circuit configuration mode, use the **pvc** command in subinterface configuration mode. To remove a PVC from a subinterface, use the **no** form of this command.

**pvc** *dlci*

**no pvc** *dlci*

### Syntax Description

|             |                                                                 |
|-------------|-----------------------------------------------------------------|
| <i>dlci</i> | DLCI number used to identify the PVC. Range is from 16 to 1007. |
|-------------|-----------------------------------------------------------------|

### Command Default

No PVC is defined.

### Command Modes

Subinterface configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.4.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **pvc** command creates a PVC and attaches it to the specified DLCI.

The Cisco IOS XR software dynamically creates rate queues as necessary to satisfy the requests of the PVC commands.

When you issue the **pvc** command in global configuration mode, the CLI prompt changes to “config-fr-vc,” indicating that you have entered the Frame Relay virtual circuit configuration submode.

In the following sample output, the question mark (?) online help function displays all the commands available under the Frame Relay virtual circuit configuration submode for the serial subinterface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface serial 0/3/2/0.1
RP/0/0/CPU0:router(config-subif)# pvc 20
RP/0/0/CPU0:router(config-fr-vc)# ?

commit      Commit the configuration changes to running
describe    Describe a command without taking real actions
do          Run an exec command
exit        Exit from this submode
no          Negate a command or set its defaults
show        Show contents of configuration
```

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| fr      | read, write |

**Examples**

The following example shows how to create a Frame Relay PVC on a serial subinterface, and enter Frame Relay virtual circuit configuration mode:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface serial 0/6/0/1.1 point-to-point
RP/0/0/CPU0:router(config-if)# pvc 16
RP/0/0/CPU0:router(config-fr-vc)#
```



# refresh max-period

To configure the maximum number of compressed IP header packets exchanged on a link before IPHC context is refreshed, use the **refresh max-period** command in IPHC profile configuration mode. To return to the default context refresh settings, use the **no** form of this command.

**refresh max-period** {*max-number*| **infinite**}

**no refresh max-period** [*max-number*| **infinite**]

## Syntax Description

|                   |                                                                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <i>max-number</i> | Maximum number of compressed IP header packets allowed between full headers or before the context is refreshed. Range is from 0 to 65535. |
| <b>infinite</b>   | Allows an unlimited number of packets to be exchanged before context refresh.                                                             |

## Command Default

*max-number*: 256

## Command Modes

IPHC profile configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

To enable the configured context refresh settings for RTP packets, the **refresh rtp** command must be used.



### Note

The maximum period between context refreshes can be set only within an IPHC profile.

## Task ID

| Task ID     | Operations  |
|-------------|-------------|
| ip-services | read, write |

## Examples

The following example shows how to configure the maximum number of compressed IP header packets that are exchanged on a link before the context is refreshed, in an IPHC profile.

```
RP/0/0/CPU0:router(config)# config  
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc  
RP/0/0/CPU0:router(config-iphc-profile)# refresh max-period 50
```

# refresh rtp

To enable the configured context refresh settings for RTP packets, use the **refresh rtp** command in IPHC profile configuration mode. To disable context refresh settings for RTP packets, use the **no** form of this command.

**refresh rtp**

**no refresh rtp**

**Syntax Description** This command has no keywords or arguments.

**Command Default** By default, refresh RTP is disabled and only the first packet in the flow is sent as a ‘full-header’ packet.

**Command Modes** IPHC profile configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.9.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

| Task ID | Task ID     | Operations  |
|---------|-------------|-------------|
|         | ip-services | read, write |

**Examples** The following example shows how to enable the configured refresh settings for RTP packets:

```
RP/0/0/CPU0:router(config)# config
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc
RP/0/0/CPU0:router(config-iphc-profile)# refresh rtp
```

# rtp

To enable Real Time Protocol (RTP) compression and decompression on the interface, use the **rtp** command in IPHC profile configuration mode. To remove RTP from the interface, use the **no** form of this command.

**rtp**  
**no rtp**

**Syntax Description** This command has no keywords or arguments.

**Command Default** No default behavior or values

**Command Modes** IPHC profile configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.9.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



**Note** RTP can be enabled only within an IPHC profile.

You must enable RTP before attaching a profile to an interface. If you do not enable RTP first, the router will display the following message: '!!% 'iphc\_capability' detected the 'warning' condition 'IPHC Capability: RTP Compression NOT enabled in the profile'!'

| Task ID | Task ID     | Operations  |
|---------|-------------|-------------|
|         | ip-services | read, write |

**Examples** The following example shows how to

```
RP/0/0/CPU0:router(config)# config
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc
RP/0/0/CPU0:router(config-iphc-profile)# rtp
```

# scramble

To enable payload scrambling (encryption) on a serial interface, use the **scramble** command in interface configuration mode. To disable scrambling, use the **no** form of this command.

**scramble**

**no scramble**

**Syntax Description** This command has no keywords or arguments.

**Command Default** Scrambling is disabled.

**Command Modes** Interface configuration

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Scrambling is used to assist clock recovery on the receiving end. Scrambling is designed to randomize the pattern of 1s and 0s carried in the physical layer frame. Randomizing the digital bits can prevent continuous, nonvariable bit patterns—in other words, long strings of all 1s or all 0s. Several physical layer protocols rely on transitions between 1s and 0s to maintain clocking.

Scrambling can prevent some bit patterns from being mistakenly interpreted as alarms by switches placed between the Data Service Units (DSUs).

The local interface configuration must match the remote interface configuration. For example, if you enable scrambling on the local port, you must also do the same on the remote port.

To verify that scrambling is configured on the interface, use the **show interfaces serial** command.

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |

Task ID

Examples

In the following example, scrambling is enabled on serial interface 0/3/0/0/0:10:

```
RP/0/0/CPU0:router(config)# interface serial 0/3/0/0/0:10
RP/0/0/CPU0:router(config-if)# serial
RP/0/0/CPU0:router(config-if-serial)# scramble
```

Related Commands

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# serial

To configure the serial parameters and enter serial configuration mode, use the **serial** command in interface configuration mode. To return to the default state of the serial interface, use the **no** form of this command.

**serial**

**no serial**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no keywords or arguments. |
|---------------------------|--------------------------------------------|

|                        |                               |
|------------------------|-------------------------------|
| <b>Command Default</b> | No default behavior or values |
|------------------------|-------------------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|------------------------|----------------|------------------------------|
|                        | Release 3.3.0  | This command was introduced. |

|                         |                                                                                                                                                                                                                                       |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial interfaces are automatically created for unchannelized ports; for channelized ports, serial interfaces are created when you add T1/E1 channel groups. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Task ID</b> | <b>Task ID</b> | <b>Operations</b> |
|----------------|----------------|-------------------|
|                | hdlc           | read, write       |

|                 |                                                                     |
|-----------------|---------------------------------------------------------------------|
| <b>Examples</b> | The following example shows how to enter serial configuration mode: |
|-----------------|---------------------------------------------------------------------|

```
RP/0/0/CPU0:router(config-if)# serial
RP/0/0/CPU0:router(config-if-serial)#
```

# show iphc idb

To display status information for an IP header compression (IPHC) interface description block (IDB), use the **show iphc idb** command in EXEC mode.

**show iphc idb** {**detail**| **interface** *interface-path-id* [**detail**]| **location** *node-id* [**detail**]}

Syntax Description

|                          |                                                                                                                                                                                                                                                                             |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>detail</b>            | Includes statistics information and internal data.                                                                                                                                                                                                                          |
| <b>interface</b>         | Specifies the interface for which IPHC information is to be displayed.                                                                                                                                                                                                      |
| <i>type</i>              | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                       |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>location</b>          | Specifies the node location for which IPHC information is to be displayed.                                                                                                                                                                                                  |
| <i>node-id</i>           | Specifies the fully qualified path of a node.<br>For more information about the syntax for the router, use the question mark (?) online help function.                                                                                                                      |

Command Default

The default (no parameters) displays information for all interfaces configured for IPHC.

Command Modes

EXEC

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

| Task ID     | Operations |
|-------------|------------|
| ip-services | read       |



## Examples

The following examples show how to display status information for an IP header compression (IPHC) interface description block (IDB).

```
RP/0/0/CPU0:router# show iphc idb interface Serial 0/1/0/1/26:0
```

```
Thu Jan  8 20:25:41.079 UTC
EA Status Codes:                      Neg Status Code:
  CFG_AS: Cfg Apply Succeed           NEG_I: Negotiation Init
  CFG_AF: Cfg Apply Failed            NEG_P: Negotiation Progress
  NEG_AS: Neg Apply Succeed           NEG_D: Negotiation Done
  NEG_AF: Neg Apply Failed            NEG_F: Negotiation Failed

Interface_Name:  Serial0/1/0/1/26:0   Ifhandle   : 0x02008e00
EA Status       : NEG_AS              Neg Status: NEG_D
MQC Mode        : F                  Prof_Name   : iphcfmt
```

```
RP/0/0/CPU0:router# show iphc idb interface Serial 0/1/0/1/26:0 detail
```

```
Thu Jan  8 20:25:44.731 UTC
EA Status Codes:                      Neg Status Code:
  CFG_AS: Cfg Apply Succeed           NEG_I: Negotiation Init
  CFG_AF: Cfg Apply Failed            NEG_P: Negotiation Progress
  NEG_AS: Neg Apply Succeed           NEG_D: Negotiation Done
  NEG_AF: Neg Apply Failed            NEG_F: Negotiation Failed

Interface_Name:  Serial0/1/0/1/26:0   Ifhandle   : 0x02008e00
EA Status       : NEG_AS              Neg Status: NEG_D
MQC Mode        : F                  Prof_Name   : iphcfmt
```

|            | Tcp<br>Space | Non-Tcp<br>Space | Max<br>Header | Max<br>Period | Max<br>Time | RTP |
|------------|--------------|------------------|---------------|---------------|-------------|-----|
| Cfg_Option | 1            | 60               | 40            | 256           | 5           | T   |
| Neg_Option | 1            | 50               | 40            | 256           | 5           | T   |

# show iphc ipv4 rtp

To display IPv4 statistics for Real Time Protocol (RTP) and User Datagram Protocol (UDP) packets sent and received on an interface, use the **show iphc ipv4 rtp** command in EXEC mode.

**show iphc ipv4 rtp interface** *type interface-path-id* [**location** *node-id*]

Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>              | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>location</b>          | (Optional) Specifies the location of the interface                                                                                                                                                                                                                              |
| <i>node-id</i>           | (Optional) Node-id entered in the <i>rack/slot/module</i> notation.                                                                                                                                                                                                             |

Command Default

No default behavior or values

Command Modes

EXEC

Command History

|               |                              |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |
|---------------|------------------------------|

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.



Caution

These Cisco support commands are normally reserved for use by Cisco Technical Support personnel only. If used incorrectly, there is some risk that they may cause performance or other issues that impact products, and we highly recommend that you contact Cisco Technical Support before using any of these commands.

Task ID

| Task ID     | Operations |
|-------------|------------|
| ip-services | read       |

| Task ID       | Operations |
|---------------|------------|
| cisco-support | read       |

## Examples

The following example shows how to display IPv4, Real Time Protocol (RTP), User Datagram Protocol (UDP), and Non-Transmission Control Protocol (non-TCP) statistics about IP header compression (IPHC) packets sent and received on an interface:

```
RP/0/0/CPU0:router# show iphc ipv4 rtp interface Serial 0/1/0/1/26:0

Thu Jan  8 20:28:47.569 UTC
RTP/UDP/IP header compression statistics:
  Interface Serial0/1/0/1/26:0
    Rcvd:    100 total, 93 compressed, 7 full header
             0 dropped, 0 status msgs
    Sent:    0 total, 0 compressed, 0 fullheader, 0 status msgs
             0 bytes saved, 0 bytes sent
             1.00 efficiency improvement factor
```

# show iphc ipv4 tcp

To display IPv4 Transport Control Protocol (TCP) statistics about IP header compression (IPHC) packets sent and received on an interface, use the **show iphc ipv4 tcp** command in EXEC mode.

**show iphc ipv4 tcp interface** *type interface-path-id* [**location** *node-id*]

|                    |                          |                                                                                                                                                                                                                                                                                 |
|--------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>type</i>              | Interface type. For more information, use the question mark (?) online help function.                                                                                                                                                                                           |
|                    | <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
|                    | <b>location</b>          | (Optional) Specifies the location of the interface                                                                                                                                                                                                                              |
|                    | <i>node-id</i>           | (Optional) Node-id entered in the <i>rack/slot/module</i> notation.                                                                                                                                                                                                             |
|                    |                          |                                                                                                                                                                                                                                                                                 |

**Command Default** No default behavior or values

**Command Modes** EXEC

|                 |               |                              |
|-----------------|---------------|------------------------------|
| Command History | Release 3.9.0 | This command was introduced. |
|                 |               |                              |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

  
**Caution**

These Cisco support commands are normally reserved for use by Cisco Technical Support personnel only. If used incorrectly, there is some risk that they may cause performance or other issues that impact products, and we highly recommend that you contact Cisco Technical Support before using any of these commands.

| Task ID | Task ID       | Operations |
|---------|---------------|------------|
|         | ip-services   | read       |
|         | cisco-support | read       |
|         |               |            |

## Examples

The following example shows how to display IPv4, Transport Control Protocol (TCP) statistics about IP header compression (IPHC) packets sent and received on an interface:

```
RP/0/0/CPU0:router# show iphc ipv4 tcp interface Serial 0/1/0/1/26:0

Thu Jan  8 20:28:54.407 UTC
TCP/IP header compression statistics:
Interface Serial0/1/0/1/26:0
  Rcvd:    100 total, 93 compressed, 7 full header
          0 dropped, 0 status msgs
  Sent:    0 status msgs
```

# show iphc platform trace

**show iphc platform trace** [**error**| **internal** [**error**]] [**flow**] [**unique**| **wrapping**] [**hexdump**] [**last** *number-of-entries*] [**reverse**] [**stats**] [**tailf**] [**verbose**] [**file** *file-name* **original** *location* *node-id*] **location** {*node-id*| **all**| **mgmt-nodes**}]

## Syntax Description

|                                      |                                                                                                               |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>events</b>                        | (Optional) Displays event platform trace information.                                                         |
| <b>error</b>                         | (Optional) Displays errors found in the trace.                                                                |
| <b>internal</b>                      | (Optional) Displays internal trace information.                                                               |
| <b>flow</b>                          | (Optional) Displays trace information for the flow.                                                           |
| <b>unique</b>                        | (Optional) Displays trace information for unique entries with counts.                                         |
| <b>wrapping</b>                      | (Optional) Displays wrapping entries.                                                                         |
| <b>hexdump</b>                       | (Optional) Displays trace information in hexadecimal format.                                                  |
| <b>last</b> <i>number_of_entries</i> | (Optional) Displays trace information for the last specified number of entries. The range is 1 to 4294967295. |
| <b>reverse</b>                       | (Optional) Displays trace information in reverse order (latest traces first).                                 |
| <b>stats</b>                         | (Optional) Displays statistics information for the trace.                                                     |
| <b>tailf</b>                         | (Optional) Displays new traces as they are added.                                                             |
| <b>verbose</b>                       | (Optional) Displays internal debugging information.                                                           |
| <b>file</b> <i>file_name</i>         | (Optional) Displays trace information for the specified file.                                                 |
| <b>original</b>                      | (Optional) Specifies the original location of file.                                                           |
| <b>location</b> <i>node_id</i>       | (Optional) Displays trace information for the specified card location.                                        |
| <b>all</b>                           | (Optional) Displays trace information for all nodes.                                                          |
| <b>mgmt-nodes</b>                    | (Optional) Displays trace information for all management nodes.                                               |

## Command Default

No default behavior or values

## Command Modes

EXEC

**Command History**

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The keywords **hexdump**, **last**, **reverse**, **stats**, **tailf**, and **verbose** may be entered in any order.

Use of the keywords **file** and **location** allows any number of desired files or locations to be entered. For more information, use the question mark (?) online help function.

**Caution**

These Cisco support commands are normally reserved for use by Cisco Technical Support personnel only. If used incorrectly, there is some risk that they may cause performance or other issues that impact products, and we highly recommend that you contact Cisco Technical Support before using any of these commands.

**Task ID**

| Task ID       | Operations |
|---------------|------------|
| ip-services   | read       |
| cisco-support | read       |

**Examples**

The following example shows how to display platform trace information for a specified location:

```
RP/0/0/CPU0:router# show iphc platform trace location 0/3/CPU0
```

```
Thu Aug 13 14:41:13.983 UTC
5 wrapping entries (8192 possible, 0 filtered, 5 total)
Aug 6 12:27:16.840 iphc_ea/internal 0/3/CPU0 t1 Platform IPHC - Calling LC Platform init
Aug 6 12:27:17.183 iphc_ea/internal 0/3/CPU0 t1 Registering with hfa
Aug 6 12:27:19.481 iphc_ea/internal 0/3/CPU0 t1 Registering with uIDB Manager
Aug 6 12:27:19.841 iphc_ea/internal 0/3/CPU0 t1 Registering with fm
Aug 6 12:27:21.733 iphc_ea/internal 0/3/CPU0 t1 fsram_virtual_addr = 0x46000000
```

# show iphc profile

To display the configuration information of an IP header compression (IPHC) profile, use the **show iphc profile** command in EXEC mode.

**show iphc profile** *{profile-name| all}* [**detail**]

## Syntax Description

|                     |                                                                      |
|---------------------|----------------------------------------------------------------------|
| <i>profile-name</i> | Text name of the IPHC profile for which to display information.      |
| <b>all</b>          | Displays information for all profiles on the router.                 |
| <b>detail</b>       | (Optional) Displays the interfaces to which the profile is attached. |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID     | Operations |
|-------------|------------|
| ip-services | read       |

## Examples

The following examples show how to display information about an IPHC profile:

```
RP/0/0/CPU0:router# show iphc profile ietf-test1
Tue Aug 10 06:53:19.711 PDT
IPHC Profile: ietf-test1
Type: IETF
Compressing : TCP NON-TCP (RTP)
Context     : TCP fixed at 1 NON-TCP fixed at 10
Refresh     : NON-TCP every 60 seconds or 100 packets
Feedback    : ON
```



```
Max_Header : 40
Refresh RTP : OFF
```

```
RP/0/0/CPU0:router# show iphc profile Profile_1 detail
Thu Jan  8 20:22:24.276 UTC
IPHC Profile: Profile_1
Type: IPHC
  Compressing : TCP  NON-TCP (RTP)
  Context     : TCP fixed at 1 NON-TCP fixed at 60
  Refresh     : NON-TCP every 5 seconds or 256 packets
  Feedback    : ON
  Max_Header  : 40

*** No of Intf 1 ****
Serial0_4_3_1_1:0
```

```
RP/0/0/CPU0:router# show iphc profile all
Thu Mar 12 11:05:35.987 UTC
IPHC Profiles : 3
IPHC Profile: p1
Type: IETF
  Compressing : TCP  NON-TCP (RTP)
  Context     : TCP fixed at 1 NON-TCP fixed at 16
  Refresh     : NON-TCP every 5 seconds or 256 packets
  Feedback    : ON
  Max_Header  : 40

IPHC Profile: p2
Type: IETF
  Compressing : TCP  NON-TCP (RTP)
  Context     : TCP fixed at 1 NON-TCP fixed at 16
  Refresh     : NON-TCP every 5 seconds or 256 packets
  Feedback    : ON
  Max_Header  : 40

IPHC Profile: test
Type: IETF
  Compressing : TCP  NON-TCP (RTP)
  Context     : TCP fixed at 1 NON-TCP fixed at 16
  Refresh     : NON-TCP every 5 seconds or 256 packets
  Feedback    : ON
  Max_Header  : 40
```

```
RP/0/0/CPU0:router# show iphc profile all detail
Thu Mar 12 11:06:26.902 UTC
IPHC Profiles : 3
IPHC Profile: p1
Type: IETF
  Compressing : TCP  NON-TCP (RTP)
  Context     : TCP fixed at 1 NON-TCP fixed at 16
  Refresh     : NON-TCP every 5 seconds or 256 packets
  Feedback    : ON
  Max_Header  : 40

*** No of Intf 1 ****
Serial0_4_3_1_1:0

IPHC Profile: p2
Type: IETF
  Compressing : TCP  NON-TCP (RTP)
  Context     : TCP fixed at 1 NON-TCP fixed at 16
  Refresh     : NON-TCP every 5 seconds or 256 packets
  Feedback    : ON
  Max_Header  : 40

*** No of Intf 2 ****
Serial0_4_3_1_2:0
Serial0_4_3_1_8:0

IPHC Profile: test
```

**show iphc profile**

```
Type: IETF
Compressing : TCP  NON-TCP (RTP)
Context      : TCP fixed at 1 NON-TCP fixed at 16
Refresh      : NON-TCP every 5 seconds or 256 packets
Feedback     : ON
Max_Header   : 40

*** No of Intf 0 ****
```

# show iphc trace all

To display trace results for all IP header compression (IPHC) configurations on the router, use the **show iphc trace all** command in EXEC mode.

**show iphc trace all** [**unique**] [**wrapping**] [**hexdump**] [**last number-of-entries**] [**reverse**] [**stats**] [**tailf**] [**verbose**] [**file file-name**] [**original location node-id**] [**location {node-id}**] [**all**] [**mgmt-nodes**]

## Syntax Description

|                               |                                                                                                                    |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>unique</b>                 | (Optional) Displays trace information for unique entries with counts.                                              |
| <b>wrapping</b>               | (Optional) Displays wrapping entries.                                                                              |
| <b>hexdump</b>                | (Optional) Displays trace information in hexadecimal format.                                                       |
| <b>last number_of_entries</b> | (Optional) Displays trace information for the last specified number of entries. The range is from 1 to 4294967295. |
| <b>reverse</b>                | (Optional) Displays trace information in reverse order (latest traces first).                                      |
| <b>stats</b>                  | (Optional) Displays statistics information for the trace.                                                          |
| <b>tailf</b>                  | (Optional) Displays new traces as they are added.                                                                  |
| <b>verbose</b>                | (Optional) Displays internal debugging information.                                                                |
| <b>file file_name</b>         | (Optional) Displays trace information for the specified file.                                                      |
| <b>original</b>               | (Optional) Specifies the original location of file.                                                                |
| <b>location node_id</b>       | (Optional) Displays trace information for the specified card location.                                             |
| <b>all</b>                    | (Optional) Displays trace information for all nodes.                                                               |
| <b>mgmt-nodes</b>             | (Optional) Displays trace information for all management nodes.                                                    |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

Release 3.9.0

This command was introduced.

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The keywords **hexdump**, **last**, **reverse**, **stats**, **tailf**, and **verbose** may be entered in any order. The keywords **unique** or **wrapping** may only be entered as the first keyword in the command. The keywords **file** or **location** may only be entered as the last keyword in the command.

Use of the keywords **file** and **location** allows any number of desired files or locations to be entered. For more information, use the question mark (?) online help function.

**Caution**

These Cisco support commands are normally reserved for use by Cisco Technical Support personnel only. If used incorrectly, there is some risk that they may cause performance or other issues that impact products, and we highly recommend that you contact Cisco Technical Support before using any of these commands.

**Task ID**

| Task ID       | Operations |
|---------------|------------|
| ip-services   | read       |
| cisco-support | read       |

**Examples**

The following example shows how to display IPHC trace information:

```
RP/0/0/CPU0:router# show iphc trace all
```

```
Wed Jul 22 21:48:07.339 DST
20 wrapping entries (3072 possible, 0 filtered, 20 total)
Jul 22 03:31:39.770 iphc/profilemgr/int 0/5/CPU0 t1 : Event Mgr Create Successful
Jul 22 03:31:39.799 iphc/profilemgr/int 0/5/CPU0 t1 : Sysmgr Init Successful
Jul 22 03:31:39.894 iphc/profilemgr/int 0/5/CPU0 t1 : Ens Init Successful
Jul 22 03:31:39.910 iphc/profilemgr/int 0/5/CPU0 t1 : Sysdb Init Successful
Jul 22 03:31:39.911 iphc/profilemgr/int 0/5/CPU0 t1 : Stats thread Init Successful
Jul 22 03:31:39.942 iphc/profilemgr/int 0/5/CPU0 t1 : Cfg thread Init Successful
Jul 22 03:31:39.951 iphc/profilemgr/int 0/5/CPU0 t1 : Registered verifier call7
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Scanning Profile: *** Pr*
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Scanning Option (format))
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Scanning Option (tcp_com)
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Scanning Option (tcp_con)
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Scanning Option (non_tcp)
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Scanning Option (rtpt) in
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Scanning Option (max-per)
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Scanning Option (non_tcp)
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : +++++ Profile Verificati+
Jul 22 03:31:39.952 iphc/profilemgr/eve 0/5/CPU0 t1 : Verify Profile (Profile n
Jul 22 03:31:39.959 iphc/profilemgr/eve 0/5/CPU0 t1 : +++++ Profile Verificati+
Jul 22 03:31:39.981 iphc/profilemgr/int 0/5/CPU0 t1 : Registered applier calle7
Jul 22 03:31:39.999 iphc/profilemgr/eve 0/5/CPU0 t1 : Registered Profile (Profy
```

# show tech-support iphc

**show tech-support iphc** [**file** | **interface** *type interface-path-id* [**location** *node-id* | **rack** *rack\_name*]] [**location** *node-id* | **rack** *rack\_name*] **file** *location file\_name* [**background**] [**compressed** | **uncompressed**]

## Syntax Description

|                     |                                                 |
|---------------------|-------------------------------------------------|
| <b>background</b>   | (Optional) Runs this command in the background. |
| <b>compressed</b>   | (Optional) Compresses the output.               |
| <b>uncompressed</b> | (Optional) Does not compress the output.        |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID        | Operations |
|----------------|------------|
| basic-services | read       |
| cisco-support  | read       |
| ipv4           | read       |

## Examples

The following example shows how to collect and display IP header compression (IPHC) data:

```
RP/0/0/CPU0:router# show tech-support iphc

Mon Oct 12 20:30:58.660 DST
++ Show tech start time: 2009-Oct-12.203059.DST ++
Mon Oct 12 20:31:05 DST 2009 Waiting for gathering to complete
.....
```

 show tech-support iphc

```
Mon Oct 12 20:31:46 DST 2009 Compressing show tech output
Show tech output available at 0/5/CPU0 : disk0:/showtech/showtech-iphc-2009-Octz
++ Show tech end time: 2009-Oct-12.203148.DST ++
```

# tcp compression

To enable TCP compression in an IP header compression (IPHC) profile, use the **tcp compression** command in IPHC profile configuration mode. To disable TCP compression in the profile, use the **no** form of this command.

**tcp compression**

**no tcp**

**Syntax Description** This command has no keywords or arguments.

**Command Default** No default behavior or values

**Command Modes** IPHC profile configuration

| Command History |                              |
|-----------------|------------------------------|
| Release 3.9.0   | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Where the IPHC profile used by a router is configured using this command, the router will negotiate TCP compression with its peer router and decompress any compressed TCP packets sent by its peer. TCP packets transmitted to the peer are transmitted uncompressed.



**Note**

TCP compression can be enabled only within an IPHC profile. TCP compression does not work unless it is enabled under a profile.

| Task ID     | Task ID | Operations  |
|-------------|---------|-------------|
| ip-services |         | read, write |

## Examples

The following example shows how to enable TCP compression within an IP header compression (IPHC) profile:

```
RP/0/0/CPU0:router(config)# config
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc
RP/0/0/CPU0:router(config-iphc-profile)# tcp compression
```

```
RP/0/0/CPU0:router(config-iphc-profile)#
```



# tcp context absolute

To configure the maximum number of TCP contexts that are allowed for IPHC under a profile, use the **tcp context absolute** command in IPHC profile configuration mode. To remove the TCP context from the profile, use the **no** form of this command.

**tcp context absolute** *number-of-contexts*

**no tcp context [absolute] [ *number-of-contexts* ]**

## Syntax Description

*number-of-contexts*

Numeric value that specifies the maximum number of TCP contexts allowed for IPHC under this profile. The range is from 0 to 255.

## Command Default

If *number-of-contexts* is not specified, and only TCP compression is enabled, the default *number-of-contexts* is 1.

## Command Modes

IPHC profile configuration

## Command History

Release 3.9.0

This command was introduced.

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The maximum allowed number of tcp contexts on a Line Card, across all IPHC profiles and interfaces, is 255.



### Note

TCP context can be set only within an IPHC profile.

## Task ID

### Task ID

### Operations

ip-services

read, write

## Examples

The following example shows how to enable TCP compression within an IP header compression (IPHC) profile:

```
RP/0/0/CPU0:router(config)# config  
RP/0/0/CPU0:router(config)# iphc profile Profile_1 type iphc
```

```
RP/0/0/CPU0:router(config-iphc-profile)# tcp context absolute 255
```

# transmit-delay (serial)

**transmit-delay** *microseconds*

**no transmit-delay** *microseconds*

## Command Default

## Command Modes

## Command History

|             |                              |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |
|-------------|------------------------------|

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations  |
|---------|-------------|
| hdlc    | read, write |

## Examples

In the following example, a delay of 2 microseconds is specified on serial interface 0/3/0/0/0:0:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface serial 0/3/0/0/0:0
RP/0/0/CPU0:router(config-if)# serial
RP/0/0/CPU0:router(config-if-serial)# transmit-delay 2
```

In the following example, the transmit delay on serial interface 0/3/0/0/0:0 is disabled:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface serial 0/3/0/0/0:0
RP/0/0/CPU0:router(config-if)# serial
RP/0/0/CPU0:router(config-if-serial)# no transmit-delay
```

## Related Commands

| Command                                                       | Description                                                                             |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">show interfaces</a> , <a href="#">on page 549</a> | Displays statistics for all interfaces configured on the router or for a specific node. |

transmit-delay (serial)



# SONET Controller Commands on the Cisco IOS XR Software

---

This module provides command line interface (CLI) commands for configuring SONET operation, using Layer 1 SONET transport technology, on the Cisco XR 12000 Series Router.

The configuration of the SONET controller includes SONET Automatic Protection Switch (APS), which is a feature offering recovery from fiber (external) or equipment (interface and internal) failures at the SONET line layer. You must configure a SONET controller before you can configure a Packet-over-SONET/SDH (POS) interface or a Spatial Reuse Protocol (SRP) interface.

All SONET-related configurations of a SONET-based physical port are grouped under the SONET controller configuration submode. The SONET path-related configuration commands are grouped under the SONET path submode.

- [ais-shut \(SONET\), page 781](#)
- [ais-shut \(SONET path\), page 783](#)
- [aps group, page 785](#)
- [aps group \(global\), page 788](#)
- [au, page 790](#)
- [authenticate \(PGP\), page 792](#)
- [b3-ber-prdi, page 794](#)
- [channel local, page 795](#)
- [channel remote, page 797](#)
- [clear counters sonet, page 799](#)
- [clock source \(SONET\), page 801](#)
- [controller \(SONET\), page 803](#)
- [delay clear, page 805](#)
- [delay trigger, page 807](#)
- [down-when-looped, page 809](#)
- [force, page 810](#)

- framing (SONET), page 812
- line delay clear, page 814
- line delay trigger, page 816
- lockout, page 818
- loopback (SONET), page 820
- manual, page 822
- mode (SONET), page 824
- overhead (SONET), page 826
- overhead (SONET path), page 828
- path delay clear, page 830
- path delay trigger, page 832
- path (SONET), page 834
- report (SONET), page 836
- report (SONET path), page 838
- revert, page 840
- scrambling disable (SONET path), page 842
- show aps, page 844
- show aps agents, page 846
- show aps group, page 848
- show controllers pos, page 851
- show controllers sonet, page 857
- show sonet-local trace frt, page 865
- shutdown (SONET), page 867
- signalling, page 869
- sts, page 871
- timers (APS), page 872
- threshold (SONET), page 874
- threshold (SONET path), page 876
- tug3, page 878
- uneq-shut (SONET path), page 880
- unidirectional, page 881
- width, page 883

## ais-shut (SONET)

To enable automatic insertion of a line alarm indication signal (LAIS) in the sent SONET signal whenever the SONET port enters the administrative shutdown state, use the **ais-shut** command in SONET/SDH configuration mode. To disable automatic insertion of a LAIS, use the **no** form of this command.

**ais-shut**

**no ais-shut**

**Syntax Description** This command has no keywords or arguments.

**Command Default** This command is disabled by default; no AIS is sent.

**Command Modes** SONET/SDH configuration

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When the line is placed in administrative shutdown state, use the **ais-shut** command to send a signal to downstream equipment that indicates that there is a problem with the line.

The **ais-shut** command is ignored if automatic protection switching (APS) is running for the corresponding port, because the setting must be enabled for proper APS operation.

For SONET ports that do not have hardware support for LAIS insertion, the **ais-shut** command is disabled.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

**Examples** In the following example, the alarm indication is forced on the SONET OC-3 controller:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/0  
RP/0/0/CPU0:router(config-sonet)# ais-shut
```

Related Commands

| Command                                             | Description                                                        |
|-----------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers. |



## ais-shut (SONET path)

To enable automatic insertion of path alarm indication signal (PAIS) in the sent SONET signal whenever the SONET path enters the administratively down state, use the **ais-shut** command in SONET/SDH path configuration mode. To disable automatic insertion of PAIS in the SONET signal, use the **no** form of this command.

**ais-shut**

**no ais-shut**

**Syntax Description** This command has no keywords or arguments.

**Command Default** This command is disabled by default; no AIS is sent.

**Command Modes** SONET/SDH path configuration

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **ais-shut** command to enable automatic insertion of PAIS in the appropriate sent SONET path overhead whenever the corresponding SONET path enters the administratively down state.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

**Examples** The following example shows the alarm indication being enabled on all paths:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
RP/0/0/CPU0:router(config-sonet)# path
RP/0/0/CPU0:router(config-sonet-path)# ais-shut
```

Related Commands

| Command                                             | Description                                                        |
|-----------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers. |

## aps group

To manually switch an automatic protection switching (APS) channel, use the **aps group** command in EXEC configuration mode.

**aps group** *number* {**force**| **manual**} {**0**| **1**} {**disable**| **enable**}

### Syntax Description

|                |                                                                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i>  | Number of the APS group. Range is from 1 to 255.                                                                                                                                                     |
| <b>force</b>   | Sends a forced APS request at the local end of a SONET link with the assigned channel number.                                                                                                        |
| <b>manual</b>  | Sends a manual APS request at the local end of a SONET link with the assigned channel number, which is implemented when no other higher-priority user-initiated or automatic requests are in effect. |
| <b>0</b>       | Specifies that the protect channel should be switched.                                                                                                                                               |
| <b>1</b>       | Specifies that the working channel should be switched.                                                                                                                                               |
| <b>disable</b> | Stops sending the SONET K1/K2 bit pattern that informs the remote end to switch ports.                                                                                                               |
| <b>enable</b>  | Starts sending a SONET K1/K2 bit pattern to inform the remote end to switch ports.                                                                                                                   |

### Command Default

No default behavior or values

### Command Modes

EXEC

### Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

In a multirouter APS topology, a manual or force request is supported only on the protect router.

Specify **0** or **1** to identify on which channel the traffic should be stopped and switched to the other channel. Therefore, **force 0** or **manual 0** moves traffic from the protect to the working channel, and **force 1** or **manual 1** moves traffic from the working to the protect channel.

Use the **force** keyword to manually switch the traffic to a protect channel. For example, if you need to change the fiber connection, you can manually force the working channel to switch to the protect interface.

A forced switch can be used to override an automatic (Signal Failed Signal Degraded) or a manual switch request. A lockout request (using the **lockout** command) overrides a force request.

**Note**

If a request of equal or higher priority is in effect, you cannot use the **force** keyword to initiate a forced APS request at the local end of the SONET link.

Use the **manual** keyword to manually switch the circuit to a protect channel. For example, you can use this feature when you need to perform maintenance on the working channel. If a protection switch is already up, you can also use the **manual** keyword to revert the communication link to the working channel before the wait to restore (WTR) time period has expired. The WTR time period is set by the **revert** command. Use the **no** form of this command to cancel the switch.

A manual switch request can be used to control which channel carries the traffic when no other higher-priority user-initiated or automatic requests are in effect.

The manual request has the lowest priority among all user-initiated or automatic requests. Any other such requests override a manual request.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following examples show how to use the **aps group** command in EXEC mode to force or manually switch traffic, and enable and disable sending of the K1/K2 bit pattern to signal the switchover to the remote end:

```
RP/0/0/CPU0:router# aps group 1 force 1 enable
RP/0/0/CPU0:router# aps group 1 force 1 disable
```

```
RP/0/0/CPU0:router# aps group 1 manual 1 enable
RP/0/0/CPU0:router# aps group 1 manual 1 disable
```

```
RP/0/0/CPU0:router# aps group 1 force 0 enable
RP/0/0/CPU0:router# aps group 1 force 0 disable
```

```
RP/0/0/CPU0:router# aps group 1 manual 0 enable
RP/0/0/CPU0:router# aps group 1 manual 0 disable
```

**Related Commands**

| Command                                         | Description                                                                                                                       |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode.                                        |
| <a href="#">lockout, on page 818</a>            | Overrides a manual or forced APS request at the local end of the SONET link and block the protect channel from receiving traffic. |

| Command                                 | Description                                                                                                                     |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">revert, on page 840</a>     | Enables automatic switchover from the protect interface to the working interface after the working interface becomes available. |
| <a href="#">signalling, on page 869</a> | Configures the K1K2 overhead byte signaling protocol used for APS.                                                              |
| <a href="#">show aps, on page 844</a>   | Displays the operational status for all configured SONET APS groups.                                                            |

## aps group (global)

To add an automatic protection switching (APS) group and enter APS group configuration mode, use the **aps group** command in global configuration mode. To remove a group, use the **no** form of this command.

**aps group** *number*

**no aps group** *number*

### Syntax Description

|               |                                              |
|---------------|----------------------------------------------|
| <i>number</i> | Number of the group. Range is from 1 to 255. |
|---------------|----------------------------------------------|

### Command Default

No APS groups are defined.

### Command Modes

Global configuration

### Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

An APS group contains one protect (P) SONET port and one working (W) SONET port. The working and protect ports can reside on the same logical channel (LC), on different LCs in the same router, or on different routers. One APS group must be configured for each protect port and its corresponding working ports.

Use the **aps group (global)** command to enter APS group configuration mode and configure APS connections with other SONET equipment.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows how to use the **aps group** command in global configuration mode to configure APS group 1 and enter APS group configuration mode:

```
RP/0/0/CPU0:router(config)# aps group 1
RP/0/0/CPU0:router(config-aps)#
```

**Related Commands**

| Command                                         | Description                                                                                                                              |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">aps group, on page 785</a>          | Manually switches an APS channel.                                                                                                        |
| <a href="#">authenticate (PGP), on page 792</a> | Configures the authentication string for the PGP message exchange between the protect and working routers.                               |
| <a href="#">channel local, on page 795</a>      | Assigns local SONET physical ports as SONET APS channels in the current APS group.                                                       |
| <a href="#">channel remote, on page 797</a>     | Assigns a port and interface that is physically located in a remote router as a SONET working or protect APS channel.                    |
| <a href="#">lockout, on page 818</a>            | Overrides a manual or forced APS request at the local end of the SONET link and block the protect channel from receiving traffic.        |
| <a href="#">revert, on page 840</a>             | Enables automatic switchover from the protect interface to the working interface after the working interface becomes available.          |
| <a href="#">signalling, on page 869</a>         | Configures the K1K2 overhead byte signaling protocol used for APS.                                                                       |
| <a href="#">timers (APS), on page 872</a>       | Changes the time between hello packets and the time before the protect interface process declares a working interface router to be down. |
| <a href="#">unidirectional, on page 881</a>     | Configures a protect interface for unidirectional mode.                                                                                  |
| <a href="#">show aps, on page 844</a>           | Displays the operational status for all configured SONET APS groups.                                                                     |

# au

To specify the administrative unit (AU) group number and enter the AU controller configuration mode, use the **au** command in SONET controller configuration mode.

**au** *number*

## Syntax Description

|               |                                                             |
|---------------|-------------------------------------------------------------|
| <i>number</i> | Administrative unit group number in the range from 1 to 48. |
|---------------|-------------------------------------------------------------|

## Command Default

The default is 1.

## Command Modes

SONET controller configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.5.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **au** command enables you to begin configuring the interface in the AU controller configuration mode, where you can configure tributary unit groups (TUGs), virtual containers (VCs), and DS3s, such as shown in the following path example:

STM-1 -> AU-4 -> TUG-3 -> VC-3 -> DS-3

One AU-4 path is equivalent to three AU-3 paths. An administrative unit type 4 (AU-4) consists of three STM-1s or one STM-3. An administrative unit type 3 (AU-3) consists of one STM-1.



### Note

Use the **au** command to configure one of the AUGs available for your card. The **au** command is not used to configure the *type* of AU path that you are configuring, such as AU-3 or AU-4, but rather is used to identify one AU group number in the supported range for the card and AU type that you are configuring. For example, the 1-Port Channelized OC-48/STM-16 SPA supports 16 AU-4 groups. Therefore, you can specify a number between 1 and 16 for the **au** command to configure SDH AU-4 on that card. The 1-Port Channelized OC-3/STM-1 SPA supports 1 AUG for AU-4, so you would specify **au 1**.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |



## Examples

The following example shows how to specify AU 1.

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/0  
RP/0/0/CPU0:router(config-sonet)# au 1  
RP/0/0/CPU0:router(config-auPath)#
```

## Related Commands

| Command                                            | Description                                                                                        |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <a href="#">tug3</a> , <a href="#">on page 878</a> | Specifies the tributary unit group (TUG) number and enters the TUG3 controller configuration mode. |

# authenticate (PGP)

To configure the authentication string for the Protect Group Protocol (PGP) message exchange between the protect and working routers, use the **authenticate** command in APS group configuration mode. To revert to the default authentication string, use the **no** form of this command.

**authenticate** *string*

**no authenticate** *string*

## Syntax Description

|               |                                                                                                                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>string</i> | Authentication string that the router uses to authenticate PGP message exchange between protect or working routers. The maximum length of the string is eight alphanumeric characters. Spaces are not accepted. |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default authentication string is “cisco.”

## Command Modes

APS group configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **authenticate** command to configure the authentication string for the PGP message exchange between the protect and working routers. Use the **no** form of this command to revert to the default authentication string.

The **authenticate** command applies only in multirouter automatic protection switching (APS) group configurations.

In multirouter APS topologies, the protect and working routers communicate with each other through the User Datagram Protocol (UDP)-based Pretty Good Privacy protocol. Each Pretty Good Privacy packet contains an authentication string used for packet validation. The authentication string on all routers involved in the same APS group operation must match for proper APS operation.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example enables authentication for APS group 1 in abctown:

```
RP/0/0/CPU0:router(config)# aps group 1  
RP/0/0/CPU0:router(config-aps)# authenticate abctown
```

## Related Commands

| Command                                         | Description                                                                                                           |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode.                            |
| <a href="#">channel local, on page 795</a>      | Assigns local SONET physical ports as SONET APS channels in the current APS group.                                    |
| <a href="#">channel remote, on page 797</a>     | Assigns a port and interface that is physically located in a remote router as a SONET working or protect APS channel. |
| <a href="#">show aps, on page 844</a>           | Displays the operational status for all configured SONET APS groups.                                                  |

## b3-ber-prdi

To enable sending of a path-level remote defect indication (PRDI) when the bit error rate (BER) bit interleaved parity (BIP) B3 threshold is exceeded, use the **b3-ber-prdi** command in SONET/SDH path configuration mode. To disable sending a PRDI, use the **no** form of this command.

**b3-ber-prdi**

**no b3-ber-prdi**

### Syntax Description

This command has no keywords or arguments.

### Command Default

This command is disabled by default; a PRDI is not sent.

### Command Modes

SONET/SDH path configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows a PRDI enabled on all paths:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
RP/0/0/CPU0:router(config-sonet)# path
RP/0/0/CPU0:router(config-sonet-path)# b3-ber-prdi
```

### Related Commands

| Command                                              | Description                                                        |
|------------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">path (SONET)</a> , on page 834           | Enters SONET/SDH path configuration mode.                          |
| <a href="#">show controllers sonet</a> , on page 857 | Displays information about the operational status of SONET layers. |

# channel local

To assign local SONET physical ports as SONET automatic protection switching (APS) channels in the current APS group, use the **channel local** command in APS group configuration mode. To return to the default setting, use the **no** form of this command.

**channel** {0|1} **local** [**preconfigure**] **sonet** *interface-path-id*

**no channel** {0|1} **local** [**preconfigure**] **sonet** *interface-path-id*

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>{0 1}</b>             | Assigns a protect or working channel type. <b>0</b> is protect, <b>1</b> is working.                                                                                                                                                                                                    |
| <b>preconfigure</b>      | (Optional) Specifies a SONET preconfiguration. This keyword is used only when a modular services or line card is not physically installed in a slot.                                                                                                                                    |
| <b>sonet</b>             | Specifies a SONET interface type.                                                                                                                                                                                                                                                       |
| <b>interface-path-id</b> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show controllers sonet</b> command to see a list of all controllers currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

## Command Default

A SONET APS local channel is not assigned.

## Command Modes

APS group configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.

- *module*: Module number. A physical layer interface module (PLIM) is always 0.
- *port*: Physical port number of the interface.

- If specifying a virtual interface, the number range varies, depending on interface type.

Use the **channel local** command to designate SONET physical ports as SONET APS channels in the current APS group. Use the **channel remote** command to assign channels that are physically located in a different router.

Preconfigured interfaces are supported.

If the protect channel is local, it must be assigned using a **channel** command *before* any of the working channels are assigned. The reason is that having only a working channel assigned is a valid configuration for a working router in a multirouter APS topology and further attempts to configure a local protect channel are rejected.

The interface type must be a SONET controller.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to configure SONET 0/2/0/2 as a local protect channel:

```
RP/0/0/CPU0:router(config)# aps group 1
RP/0/0/CPU0:router(config-aps)# channel 0 local SONET 0/2/0/2
```

## Related Commands

| Command                                         | Description                                                                                                           |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode.                            |
| <a href="#">channel remote, on page 797</a>     | Assigns a port and interface that is physically located in a remote router as a SONET working or protect APS channel. |
| <a href="#">show aps, on page 844</a>           | Displays the operational status for all configured SONET APS groups.                                                  |

## channel remote

To assign a port and interface that is physically located in a remote router as a SONET working or protect automatic protection switching (APS) channel, use the **channel remote** command in APS group configuration mode. To return to the default setting, use the **no** form of this command.

**channel** {0|1} **remote** *ip-address*

**no channel** {0|1} **remote** *ip-address*

### Syntax Description

|                   |                                                                                      |
|-------------------|--------------------------------------------------------------------------------------|
| {0 1}             | Assigns a protect or working channel type. <b>0</b> is protect, <b>1</b> is working. |
| <i>ip-address</i> | Remote router IP address in A.B.C.D format.                                          |

### Command Default

A SONET APS remote channel is not assigned.

### Command Modes

APS group configuration

### Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **channel remote** command to assign working or protect channels that are physically located in a different router.

Use the **channel local** command to assign channels in the local router.



#### Note

The **channel remote** command should not be used in single-router APS topologies.

The *IP address* of the remote router is required only if a working channel configured as the protect router contacts all working routers.

Specifying a remote protect channel is optional. If you do not specify a remote protect channel, the default value of 0.0.0.0 is used. The protect router is always the one that contacts the working router. The working router replies to the protect router using the source address extracted from the incoming messages as the destination address. If an address other than 0.0.0.0 (the default value) is specified, the working router always uses that address when sending messages to the protect router.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

In the following examples, a remote channel with IP address 192.168.1.1 is assigned as the working channel:

```
RP/0/0/CPU0:router(config)# aps group 1
RP/0/0/CPU0:router(config-aps)# channel 1 remote 192.168.1.1
```

**Related Commands**

| Command                                         | Description                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode. |
| <a href="#">channel local, on page 795</a>      | Assigns local SONET physical ports as SONET APS channels in the current APS group.         |
| <a href="#">show aps, on page 844</a>           | Displays the operational status for all configured SONET APS groups.                       |



# clear counters sonet

To clear SONET counters for a specific SONET controller, use the **clear counters sonet** command in EXEC mode.

**clear counters sonet** *interface-path-id*

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show controllers sonet</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

Use the **clear counters sonet** command to clear SONET counters for a specific SONET controller.

**Task ID**

| Task ID        | Operations  |
|----------------|-------------|
| sonet-sdh      | read, write |
| basic-services | read, write |

**Examples**

The following example shows the SONET counters being cleared on the SONET interface:

```
RP/0/0/CPU0:router# clear counters sonet 0/1/0/0
```

**Related Commands**

| Command                                             | Description                                                        |
|-----------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers. |

## clock source (SONET)

To set the clock source of the sent signal on SONET ports, use the **clock source** command in SONET/SDH configuration mode. To cancel a clock source setting, use the **no** form of this command.

**clock source** {internal| line}

**no clock source** {internal| line}

### Syntax Description

|                 |                                                                                                                                                    |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>internal</b> | Specifies that the controller will clock its sent data from its internal clock.                                                                    |
| <b>line</b>     | Specifies that the controller will clock its sent data from a clock recovered from the receive data stream of the line. This is the default value. |

### Command Default

The clock source for the controller is **line**.

### Command Modes

SONET/SDH configuration

### Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **clock source** command to configure which reference clock is used by the sender.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

In the following example, the SONET controller is configured to clock its sent data from its internal clock:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2  
RP/0/0/CPU0:router(config-sonet)# clock source internal
```

Related Commands

| Command                                             | Description                                                        |
|-----------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers. |

# controller (SONET)

To enter SONET/SDH configuration mode so that you can configure a specific SONET controller, use the **controller (SONET)** command in global configuration mode. To return to the default state, use the **no** form of this command.

**controller** [**preconfigure**] **sonet** *interface-path-id*

**no controller** [**preconfigure**] **sonet** *interface-path-id*

## Syntax Description

|                          |                                                                                                                                                                                                                                                                             |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>preconfigure</b>      | (Optional) Specifies a SONET preconfiguration. Use the <b>preconfigure</b> keyword only when a modular services card is not physically installed in a slot.                                                                                                                 |
| <b>sonet</b>             | Enters the SONET configuration mode or configures the SONET port controller specified by <i>interface-path-id</i> .                                                                                                                                                         |
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.

◦ *port*: Physical port number of the interface.

- If specifying a virtual interface, the number range varies, depending on interface type.

Use the **path (SONET)** command to enter SONET/SDH path configuration mode to specify other SONET options for a SONET path.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

## Task ID

## Examples

The following example shows how to enter SONET/SDH configuration mode for the SONET controller in slot number 2:

```
RP/0/0/CPU0:router(config)# controller SONET 0/2/0/1
RP/0/0/CPU0:router(config-sonet)#
```

The following example shows how to configure the SONET controller path (0/2/0/1) to send a path-level remote defect indication (PRDI) when the bit error rate (BER) bit interleaved parity (BIP) B3 threshold is exceeded. :

```
RP/0/0/CPU0:router(config)# controller SONET 0/2/0/1 path b3-ber-prdi
RP/0/0/CPU0:router(config-sonet)#
```

## Related Commands

| Command                                                              | Description                                                        |
|----------------------------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">path (SONET)</a> , <a href="#">on page 834</a>           | Enters SONET/SDH path configuration mode.                          |
| <a href="#">show controllers sonet</a> , <a href="#">on page 857</a> | Displays information about the operational status of SONET layers. |

# delay clear

To configure the amount of time before a Synchronous Transport Signal (STS) path delay trigger alarm is cleared, use the **delay clear** command in STS path configuration mode. To return the command to its default setting, use the **no** form of this command.

**delay clear** *value*

**no delay clear** *value*

## Syntax Description

|              |                                                                                                                                      |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <i>value</i> | Value, in milliseconds, before an STS path delay trigger alarm is cleared. The range is from 0 to 180000. The default is 10 seconds. |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default is 10 seconds.

## Command Modes

STS path configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.8.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to specify that STS path delay trigger alarms should be cleared after 7000 milliseconds:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/3
RP/0/0/CPU0:router(config-sonet)# sts 1
RP/0/0/CPU0:router(config-stsPath)# delay clear 7000
```

delay clear

Related Commands

| Command                                    | Description                                             |
|--------------------------------------------|---------------------------------------------------------|
| <a href="#">delay trigger, on page 807</a> | Configures a time value for the STS path delay trigger. |



# delay trigger

To configure a time value for the Synchronous Transport Signal (STS) path delay trigger, use the **delay trigger** command in STS path configuration mode. To return the command to its default setting, use the **no** form of this command.

**delay trigger** *value*

**no delay trigger** *value*

## Syntax Description

|              |                                                                                                                                                          |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>value</i> | Value, in milliseconds, for the STS path delay trigger. The range is from 0 through 60000. The default is 0 seconds, which means that there is no delay. |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default is 0 seconds, which means that there is no delay.

## Command Modes

STS path configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.8.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the timer for the STS path delay trigger expires, an alarm is declared.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to set the STS path delay trigger to 6000 milliseconds:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/3  
RP/0/0/CPU0:router(config-sonet)# sts 1  
RP/0/0/CPU0:router(config-stsPath)# delay trigger 6000
```

Related Commands

| Command                                  | Description                                                                     |
|------------------------------------------|---------------------------------------------------------------------------------|
| <a href="#">delay clear, on page 805</a> | Configures the amount of time before a STS path delay trigger alarm is cleared. |

# down-when-looped

To configure a SONET controller to inform the system that it is down when loopback is detected, use the **down-when-looped** command in SONET/SDH configuration mode.

## down-when-looped

**Syntax Description** This command has no keywords or arguments.

**Command Default** The default is disabled.

**Command Modes** SONET/SDH configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.6.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command does not have a **no** form.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

**Examples** The following example shows how to configure a SONET controller to inform the system that the associated line is down if a loopback is detected:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/0
RP/0/0/CPU0:router(config-sonet)# down-when-looped
```

down-when-looped is a traffic-affecting operation

| Related Commands | Command                                                        | Description                                        |
|------------------|----------------------------------------------------------------|----------------------------------------------------|
|                  | <a href="#">loopback (SONET)</a> , <a href="#">on page 820</a> | Configures the SONET controller for loopback mode. |

# force

To initiate a forced automatic protection switching (APS) request at the local end of the SONET link, use the **force** command in EXEC configuration mode.

**Note**

Effective with Cisco IOS XR Release 3.8.0, this command is replaced by the **aps group force** command. See the [aps group, on page 785](#) command for more information.

**force** {0| 1}

**Syntax Description**

|              |                                                                                                                                                                       |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>0   1</b> | initiate a forced automatic protection switching (APS) request at the local end of the SONET link<br>Assigned channel number. <b>0</b> = protect, <b>1</b> = working. |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Command Default**

No default behavior or values

**Command Modes**

EXEC

**Command History**

| Release       | Modification                                               |
|---------------|------------------------------------------------------------|
| Release 3.2   | This command was introduced.                               |
| Release 3.8.0 | This command was replaced by the <b>aps group</b> command. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

**Note**

If a request of equal or higher priority is in effect, you cannot use the **force** command to initiate a forced APS request at the local end of the SONET link.

Use the **force** command to manually switch the traffic to a protect channel. For example, if you need to change the fiber connection, you can manually force the working channel to switch to the protect interface.

The **0** or **1** keyword (by default 1) identifies on which channel the traffic should be stopped and moved on the protect channel. The **force 1 command** moves traffic from the working channel to the protect channel; the **force 0 command** moves traffic from the protect channel back to the working channel.

A forced switch can be used to override an automatic (Signal Failed Signal Degraded) or a manual switch request. A lockout request (via the **lockout** command) overrides a force request.

In a multirouter APS topology, a force request is allowed only on the protect router.

This command remains in effect until it is unconfigured by using the **no** form of the command.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows how to move traffic from the working channel back to the protect channel:

```
RP/0/0/CPU0:router(config)# aps group 1  
RP/0/0/CPU0:router(config-aps)# force 1
```

### Related Commands

| Command                               | Description                                                                                                                       |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">lockout</a> , on page 818 | Overrides a manual or forced APS request at the local end of the SONET link and block the protect channel from receiving traffic. |
| <a href="#">manual</a> , on page 822  | Initiates a manual APS request at the local end of the SONET link.                                                                |

## framing (SONET)

To specify the framing used on the SONET controller, use the **framing** command in SONET/SDH configuration mode. To disable framing on the SONET controller, use the **no** form of this command.

**framing** {sdh|sonet}

**no framing** {sdh|sonet}

### Syntax Description

|              |                                                                                                     |
|--------------|-----------------------------------------------------------------------------------------------------|
| <b>sdh</b>   | Selects Synchronous Digital Hierarchy (SDH) framing. This framing mode is typically used in Europe. |
| <b>sonet</b> | Selects SONET framing. This is the default.                                                         |

### Command Default

The default framing on SONET controllers is **sonet**.

### Command Modes

SONET/SDH configuration

### Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **framing** command to select either SONET or SDH framing on the selected physical port, if supported. For physical ports that do not support either of these two options, the **framing** command is disabled.

Use the **no** form of this command to disable SONET or SDH framing on the SONET controller.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

In the following example, the SONET controller is configured for SDH framing:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
RP/0/0/CPU0:router(config-sonet)# framing sdh
```

In the following example, the SONET controller is configured for SONET framing:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2  
RP/0/0/CPU0:router(config-sonet)# framing sonet
```

#### Related Commands

| Command                                                              | Description                                                        |
|----------------------------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet</a> , <a href="#">on page 857</a> | Displays information about the operational status of SONET layers. |

# line delay clear

To configure the amount of time before a SONET/SDH line delay trigger alarm is cleared, use the **line delay clear** command in SONET controller configuration mode. To return the command to its default setting, use the **no** form of this command.

**line delay clear** *value*

**no line delay clear**

## Syntax Description

|              |                                                                                                                                 |
|--------------|---------------------------------------------------------------------------------------------------------------------------------|
| <i>value</i> | Value, in milliseconds, before a SONET/SDH line delay trigger alarm is cleared. The range is 1000 to 180000. The default is 10. |
|--------------|---------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default is 10.

## Command Modes

SONET controller configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.8.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the timer for the SONET/SDH line delay clear expires, an alarm is cleared.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to specify that SONET/SDH line delay trigger alarms should be cleared after 4000 milliseconds:

```
RP/0/0/CPU0:router(config)# controller SONET 0/0/0/2
RP/0/0/CPU0:router(config-sonet)# line delay clear 4000
```



**Related Commands**

| Command                                          | Description                                                   |
|--------------------------------------------------|---------------------------------------------------------------|
| <a href="#">line delay trigger</a> , on page 816 | Configures a time value for the SONET/SDH line delay trigger. |

# line delay trigger

To configure a time value for the SONET/SDH line delay trigger, use the **line delay trigger** command in SONET controller configuration mode. To return the command to its default setting, use the **no** form of this command.

**line delay trigger** *value*

**no line delay trigger**

## Syntax Description

|              |                                                                                        |
|--------------|----------------------------------------------------------------------------------------|
| <i>value</i> | Value, in milliseconds, for the SONET/SDH line delay trigger. The range is 0 to 60000. |
|--------------|----------------------------------------------------------------------------------------|

## Command Default

The default is 0, which means that there is no delay.

## Command Modes

SONET controller configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.8.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the timer for the SONET/SDH line delay trigger expires, an alarm is raised.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to set the SONET/SDH line delay trigger to 3000 milliseconds:

```
RP/0/0/CPU0:router(config)# controller SONET 0/0/0/2
RP/0/0/CPU0:router(config-sonet)# line delay trigger 3000
```

**Related Commands**

| Command                                        | Description                                                                           |
|------------------------------------------------|---------------------------------------------------------------------------------------|
| <a href="#">line delay clear</a> , on page 814 | Configures the amount of time before a SONET/SDH line delay trigger alarm is cleared. |

# lockout

To override a manual or forced APS request at the local end of the SONET link and block the protect channel from receiving traffic, use the **lockout** command in APS group configuration mode. To remove the lockout, use the **no** form of this command.

**lockout** [0]

**no lockout** [0]

## Syntax Description

|     |                                                                                                                |
|-----|----------------------------------------------------------------------------------------------------------------|
| [0] | (Optional) Specifies blocking of the protect channel from a manual or forced APS request. This is the default. |
|-----|----------------------------------------------------------------------------------------------------------------|

## Command Default

The default is 0.

## Command Modes

APS group configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

A lockout switch request can be used to override a force, an automatic (Signal Failed or Signal Degraded), or a manual switch request. No other request can override a lockout request; it has the highest possible priority.

In a multirouter APS topology, a **lockout** request is allowed only on the protect router.

This command remains in effect until it is unconfigured by using the **no** form of the command.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to lock out or prevent the channel from switching to a protect router in the event that the working channel becomes unavailable:

```
RP/0/0/CPU0:router(config)# aps group 1
```

```
RP/0/0/CPU0:router(config-aps)# lockout 0
```

**Related Commands**

| Command                                         | Description                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode. |
| <a href="#">aps group, on page 785</a>          | Manually switches an APS channel.                                                          |

# loopback (SONET)

To configure the SONET controller for loopback mode, use the **loopback** command in SONET/SDH configuration mode. To remove the loopback SONET command from the configuration file, use the **no** form of this command.

**loopback** {internal| line}

**no loopback** {internal| line}

## Syntax Description

|                 |                                                                                  |
|-----------------|----------------------------------------------------------------------------------|
| <b>internal</b> | Specifies that all the packets be looped back from the source.                   |
| <b>line</b>     | Specifies that the incoming network packets be looped back to the SONET network. |

## Command Default

This command is disabled by default.

## Command Modes

SONET/SDH configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The SONET and Synchronous Digital Hierarchy (SDH) transport layers support two loopback operation modes for diagnostic purposes: internal and line. In the terminal (internal) loopback, the sent signal is looped back to the receiver. In the facility (line) loopback, the signal received from the far end is looped back and sent on the line. The two loopback modes cannot be active at the same time. In normal operation mode, neither of the two loopback modes is enabled.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

In the following example, all packets are looped back to the SONET controller:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
```

```
RP/0/0/CPU0:router(config-sonet)# loopback internal
```

**Related Commands**

| Command                                             | Description                                                        |
|-----------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers. |

# manual

To initiate a manual automatic protection switching (APS) request at the local end of the SONET link, use the **manual** command in APS group configuration mode. To cancel the switch, use the **no** form of this command.

**Note**

Effective with Cisco IOS XR Release 3.8.0, this command is replaced by the **aps group manual** command. See the [aps group, on page 785](#) command for more information.

**manual** *channel-number* {0| 1}

**no manual** *channel-number* {0| 1}

**Syntax Description**

|                       |                                                                      |
|-----------------------|----------------------------------------------------------------------|
| <i>channel-number</i> | The assigned channel number: <b>0</b> = protect, <b>1</b> = working. |
|-----------------------|----------------------------------------------------------------------|

**Command Default**

No circuit is switched.

**Command Modes**

APS group configuration

**Command History**

| Release       | Modification                                               |
|---------------|------------------------------------------------------------|
| Release 3.2   | This command was introduced.                               |
| Release 3.8.0 | This command was replaced by the <b>aps group</b> command. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **manual** command to manually switch the circuit to a protect channel. For example, you can use this feature when you need to perform maintenance on the working channel. If a protection switch is already up, you can also use the **manual** command to revert the communication link to the working channel before the wait to restore (WTR) time period has expired. The WTR time period is set by the **revert** command. Use the **no** form of this command to cancel the switch.

A manual switch request can be used to control which channel carries the traffic when no other higher-priority user-initiated or automatic requests are in effect.

The **0** or **1** keyword identifies the channel from which the traffic should be moved on the protect channel:

- The **manual 1** command moves traffic on to the protect channel.



- The **manual 0** command moves traffic on to the working channel.

The manual request has the lowest priority among all user-initiated or automatic requests. Any other such requests override a manual request.

In a multirouter APS topology a **manual** request is allowed only on the protect router.

This command remains in effect until it is unconfigured by using the **no** form of the command.

#### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

#### Examples

The following example shows how to move traffic on to the protect router:

```
RP/0/0/CPU0:router(config)# aps group 1  
RP/0/0/CPU0:router(config-aps)# manual 1
```

#### Related Commands

| Command                              | Description                                                                                                                       |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">force, on page 810</a>   | Initiates a forced APS request at the local end of the SONET link.                                                                |
| <a href="#">lockout, on page 818</a> | Overrides a manual or forced APS request at the local end of the SONET link and block the protect channel from receiving traffic. |

## mode (SONET)

To set the mode of an STS path, AU path, T3 controller, or TUG3 controller, use the **mode** command in the applicable controller configuration mode. To disable the mode, use the **no** form of this command.

### STS Controller Configuration Mode

**mode** {t3| vt15-t1| pos}

**no mode** {t3| vt15-t1| pos}

### AU Controller Configuration Mode

**mode** {e3| t3| tug 3}

**no mode** {e3| t3| tug 3}

### T3 Controller Configuration Mode

**mode** {e1| serial| t1}

**no mode** {e1| serial| t1}

### TUG3 Controller Configuration Mode

**mode** {c12| c12-e1| e3| serial| t3}

**no mode** {c12| c12-e1| e3| serial| t3}

### Syntax Description

|                |                                                                                        |
|----------------|----------------------------------------------------------------------------------------|
| <b>t3</b>      | Specifies the mode of the port to be channelized as an AU3 or a TUG3 path carrying T3. |
| <b>vt15-t1</b> | Specifies the mode of the port to be channelized VT15-T1.                              |
| <b>pos</b>     | Specifies the mode of the port to be channelized POS.                                  |
| <b>tug3</b>    | Specifies the mode of the port to be channelized TUG3.                                 |
| <b>e1</b>      | Specifies the mode of the port to be channelized E1.                                   |
| <b>serial</b>  | Specifies the mode of the port to be clear channel serial.                             |
| <b>t1</b>      | Specifies the mode of the port to be channelized T1.                                   |
| <b>c12</b>     | Specifies the mode of the port to be channelized as a TUG3 path carrying TU-12.        |
| <b>c12-e1</b>  | Specifies the mode of the port to be channelized be TUG3 path carrying c12 to E1.      |
| <b>e3</b>      | Specifies the mode of the port to be channelized as an AU3 or a TUG3 path carrying E3. |

**Command Default** No default behavior or values

**Command Modes** STS controller configuration  
AU controller configuration  
T3 controller configuration  
TUG3 controller configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.5.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For channelized SPAs, you must use the **mode** command before you can configure any channelized controllers.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

**Examples** The following example shows how to set the mode of a T3 controller to channelized T1:

```
RP/0/0/CPU0:router(config)# controller t3 0/1/0/0/1  
RP/0/0/CPU0:router(config-t3)# mode t1
```

| Related Commands | Command                            | Description                           |
|------------------|------------------------------------|---------------------------------------|
|                  | <a href="#">width, on page 883</a> | Sets the number of paths in a stream. |

## overhead (SONET)

To set the SONET overhead bytes in the frame header to a specific standards requirement, or to ensure interoperability with equipment from another vendor, use the **overhead** command in SONET/SDH configuration mode. To remove the setting of the SONET overhead bytes from the configuration file and restore the default condition, use the **no** form of this command.

**overhead** {**j0**| **s1s0**} *byte-value*

**no overhead** {**j0**| **s1s0**} *byte-value*

### Syntax Description

|                   |                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>j0</b>         | Sets the J0/C1 byte value in the SONET section overhead. For interoperability with Synchronous Digital Hierarchy (SDH) equipment in Japan, use the value 0x1. Default is 0xcc.                                                                                                                                                                                         |
| <b>s1s0</b>       | Sets the SS bits value of the H1 byte in the SONET line overhead.<br>Use the following values to tell the SONET transmission equipment the S1 and S0 bit: <ul style="list-style-type: none"> <li>For SONET mode, use <b>0</b> (this is the default).</li> <li>For SDH mode, use <b>2</b>.</li> </ul> Range is from 0 to 3. Default is 0. Values 1 and 3 are undefined. |
| <b>byte-value</b> | Byte value to which the <b>j1</b> or <b>s1s0</b> keyword should be set. Range is from 0 to 255.                                                                                                                                                                                                                                                                        |

### Command Default

*byte-value*: 0x01 (j0)

*byte-value*: 0 (s1s0)

### Command Modes

SONET/SDH configuration

### Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **overhead** command to set the SONET overhead bytes in the frame header to a specific standards requirement.

Use the **no** form of this command to remove the setting of the SONET overhead bytes from the configuration file and restore the default condition.

For the **j0** keyword, the value that you use for the trace byte depends on the type of equipment being used. For the **s1s0** keyword, the value that you use depends on whether you are using the SONET or SDH mode. For SONET mode, use the value 0 (the default). For SDH mode, use the value 2.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to set the SS bits value of the H1 byte in the SONET line overhead to 2 for SDH:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/1  
RP/0/0/CPU0:router(config-sonet)# overhead s1s0 2
```

The following example shows how to set the SS bits value of the H1 byte in the SONET line overhead to 0 for SONET:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/1  
RP/0/0/CPU0:router(config-sonet)# overhead s1s0 0
```

# overhead (SONET path)

To set the SONET path overhead bytes in the frame header to a specific standards requirement or to ensure interoperability with equipment from another vendor, use the **overhead** command in SONET/SDH path configuration mode. To remove the setting of the SONET path overhead bytes from the configuration file and restore the system to its default condition, use the **no** form of this command.

**overhead** {**c2** *byte-value*| **expected-trace** *LINEascii-text*| **j1** *ascii-value*}

**no overhead** {**c2** *byte-value*| **expected-trace** *LINEascii-text*| **j1** *ascii-value*}

## Syntax Description

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>c2</b> <i>byte-value</i>                  | Specifies Synchronous Transport Signal (STS) synchronous payload envelope (SPE) content (C2) byte. The transmitted <b>c2</b> value is automatically set to 0xCF for unscrambled payload and 0x16 for scrambled payload. If <b>c2</b> is configured to a user-specified value, the user-specified value is always applied regardless of scrambling.<br><br>Replace the <i>byte-value</i> argument with the byte value to which the <b>c2</b> keyword should be set. Range is from 0 to 255. Default value is 0.                                                                                                  |
| <b>j1</b> <i>ascii-value</i>                 | Configures the SONET path trace (j1) buffer.<br><br>Replace the <i>ascii-value</i> argument with a text string that describes the SONET path trace buffer. Default is a 64-byte path trace ASCII message, which includes default information such as router name, (Layer 2 —POS ) interface name, and IP address, if applicable.                                                                                                                                                                                                                                                                                |
| <b>expected-trace</b> <i>LINE ascii-text</i> | Configures the SONET/SDH path trace. The trace monitoring feature allows a node to perform trace monitoring by using the SONET/SDH capabilities.<br><br>Replace the <i>LINE</i> with the expected trace message<br><br>Replace the <i>ascii-text</i> argument with a text string that describes the SONET path trace buffer. Default is a 64-byte path trace ASCII message, which includes default information such as router name, (Layer 2 —POS ) interface name, and IP address, if applicable.<br><br>the <i>LINE</i> is the expected trace message which should match else ptim mismatch would be reported |

## Command Default

*byte-value*: 0xCF

*byte-value*: 0

## Command Modes

SONET/SDH path configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The SONET standards permit or require user access for configuration of some bytes or bits in the SONET path overhead. Use the **overhead** command to set the SONET path overhead bytes in the frame header to a specific standards requirement. Use the **no** form of this command to remove the setting of the SONET path overhead bytes from the configuration file and restore the system to its default condition.

Use the **c2** keyword to configure the desired C2 byte value in the SONET path overhead.

Use the **j1** keyword to configure a user-defined path trace message in the j1 bytes of the SONET path overhead. For the **j1** keyword, use the default message or insert your own message that has a maximum of 62 characters. If no user-defined message is configured, a default message is automatically generated, containing the router name, the controller name, its IP address, and the values of the sent and received K1 and K2 bytes in the SONET line overhead.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows how to set the STS SPE C2 byte in the SONET path frame header:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
RP/0/0/CPU0:router(config-sonet)# path
RP/0/0/CPU0:router(config-sonet-path)# overhead c2 0x13
```

### Related Commands

| Command                                                      | Description                                  |
|--------------------------------------------------------------|----------------------------------------------|
| <a href="#">scrambling disable (SONET path), on page 842</a> | Disables payload scrambling on a SONET path. |

# path delay clear

To configure the amount of time before a SONET/SDH path delay trigger alarm is cleared, use the **path delay clear** command in SONET controller configuration mode. To return the command to its default setting, use the **no** form of this command.

**path delay clear** *value*

**no path delay clear**

## Syntax Description

|              |                                                                                                                                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <i>value</i> | Value, in milliseconds, before a SONET/SDH path delay trigger alarm is cleared. The range is 1000 to 180000. The default is 10 seconds. |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default is 10 seconds.

## Command Modes

SONET controller configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.8.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to specify that SONET/SDH path delay trigger alarms should be cleared after 7000 milliseconds:

```
RP/0/0/CPU0:router(config)# controller SONET 0/0/0/1
RP/0/0/CPU0:router(config-sonet)# path delay clear 7000
```



**Related Commands**

| Command                                          | Description                                                   |
|--------------------------------------------------|---------------------------------------------------------------|
| <a href="#">path delay trigger</a> , on page 832 | Configures a time value for the SONET/SDH path delay trigger. |

# path delay trigger

To configure a time value for the SONET/SDH path delay trigger, use the **path delay trigger** command in SONET controller configuration mode. To return the command to its default setting, use the **no** form of this command.

**path delay trigger** *value*

**no path delay trigger**

## Syntax Description

|              |                                                                                        |
|--------------|----------------------------------------------------------------------------------------|
| <i>value</i> | Value, in milliseconds, for the SONET/SDH path delay trigger. The range is 0 to 60000. |
|--------------|----------------------------------------------------------------------------------------|

## Command Default

The default is 0, which means that there is no delay.

## Command Modes

SONET controller configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.8.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the timer for the SONET/SDH path delay trigger expires, an alarm is declared.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to set the SONET/SDH path delay trigger to 6000 milliseconds:

```
RP/0/0/CPU0:router(config)# controller SONET 0/0/0/1
RP/0/0/CPU0:router(config-sonet)# path delay trigger 6000
```

**Related Commands**

| Command                                       | Description                                                                           |
|-----------------------------------------------|---------------------------------------------------------------------------------------|
| <a href="#">path delay clear, on page 830</a> | Configures the amount of time before a SONET/SDH path delay trigger alarm is cleared. |

## path (SONET)

To enter SONET/SDH path configuration mode, use the **path** command in SONET controller configuration mode.

**path**

### Syntax Description

This command has no keywords or arguments.

### Command Default

No default behavior or values

### Command Modes

SONET controller configuration

### Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows how to access SONET path submode from SONET controller configuration mode:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/0
RP/0/0/CPU0:router(config-sonet)# path
```

### Related Commands

| Command                                            | Description                                                                                                                  |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">ais-shut (SONET path), on page 783</a> | Enables automatic insertion of PAIS in the sent SONET signal whenever the SONET path enters the administratively down state. |
| <a href="#">b3-ber-prdi, on page 794</a>           | Enables sending of a PRDI when the BER bit interleaved parity (BIP) B3 threshold is exceeded.                                |

| Command                                                       | Description                                                                                                                                                  |
|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">delay clear</a> , on page 805                     | Configures the amount of time before a STS path delay trigger alarm is cleared.                                                                              |
| <a href="#">delay trigger</a> , on page 807                   | Configures a time value for the STS path delay trigger.                                                                                                      |
| <a href="#">overhead (SONET path)</a> , on page 828           | Sets the SONET path overhead bytes in the frame header to a specific standards requirement or to ensure interoperability with equipment from another vendor. |
| <a href="#">report (SONET path)</a> , on page 838             | Configures whether or not selected SONET alarms are logged to the console for a SONET path controller.                                                       |
| <a href="#">scrambling disable (SONET path)</a> , on page 842 | Disables payload scrambling on a SONET path.                                                                                                                 |
| <a href="#">threshold (SONET path)</a> , on page 876          | Sets the bit error rate (BER) threshold values of the specified alarms for a SONET path.                                                                     |
| <a href="#">uneq-shut (SONET path)</a> , on page 880          | Enables automatic insertion of P-UNEQ code (0x00) in the sent SONET path overhead C2 byte.                                                                   |

# report (SONET)

To permit selected SONET alarms to be logged to the console for a SONET controller, use the **report** command in SONET/SDH configuration mode. To disable logging of select SONET alarms, use the **no** form of this command.

**report** [b1-tca| b2-tca| lais| lrdi| sd-ber| sf-ber| slof| slos]  
**no report** [b1-tca| b2-tca| lais| lrdi| sd-ber| sf-ber| slof| slos]

## Syntax Description

|               |                                                                                           |
|---------------|-------------------------------------------------------------------------------------------|
| <b>b1-tca</b> | (Optional) Reports bit 1 (B1) bit error rate (BER) threshold crossing alert (TCA) errors. |
| <b>b2-tca</b> | (Optional) Reports bit 2 (B2) BER TCA errors.                                             |
| <b>lais</b>   | (Optional) Reports line alarm indication signal (LAIS) errors.                            |
| <b>lrdi</b>   | (Optional) Reports line remote defect indication errors.                                  |
| <b>sd-ber</b> | (Optional) Reports signal degradation BER errors.                                         |
| <b>sf-ber</b> | (Optional) Reports signal failure BER errors.                                             |
| <b>slof</b>   | (Optional) Reports section loss of frame (SLOF) errors.                                   |
| <b>slos</b>   | (Optional) Reports section loss of signal (SLOS) errors.                                  |

## Command Default

Alarms from the following keywords are reported by default:

- b1-tca
- b2-tca
- sf-ber
- slof
- slos

## Command Modes

SONET/SDH configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Reporting an alarm means that the alarm can be logged to the console, but it is no guarantee that it is logged. SONET alarm hierarchy rules dictate that only the most severe alarm of an alarm group is reported. Whether an alarm is reported or not, you can check the current state of masked alarm, a problem indication that is a candidate for an alarm, by displaying the “Masked Alarms” line in the **show controllers sonet** command output.

For B1, the bit interleaved parity (BIP) error report is calculated by comparing the BIP-8 code with the BIP-8 code that is extracted from the B1 byte of the following frame. Differences indicate that section-level bit errors have occurred.

For B2, the BIP error report is calculated by comparing the BIP-8/24 code with the BIP-8 code that is extracted from the B2 byte of the following frame. Differences indicate that line-level bit errors have occurred.

Path AIS is sent by line terminating equipment to alert the downstream path terminating equipment (PTE) that it has detected a defect on its incoming line signal.

Path loss of pointer (LOP) is reported as a result of an invalid pointer (H1, H2) or an excess number of new data flag enabled indications.

SLOF is detected when an error-framing defect on the incoming SONET signal persists for 3 microseconds.

SLOS is detected when an all-zeros pattern on the incoming SONET signal is observed. This defect might also be reported if the received signal level drops below the specified threshold.

To determine the alarms that are reported on the controller, use the **show controllers sonet** command.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to enable the reporting of line AIS alarms on the path controller:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/1
RP/0/0/CPU0:router(config-sonet)# report lais
```

**Related Commands**

| Command                                                              | Description                                                        |
|----------------------------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet</a> , <a href="#">on page 857</a> | Displays information about the operational status of SONET layers. |

# report (SONET path)

To configure whether or not selected SONET alarms are logged to the console for a SONET path controller, use the **report** command in SONET/SDH path configuration mode. To disable or re-enable the logging of select SONET alarms, use the **no** form of this command.

**report** [b3-tca| pais| plop| pplm| prdi| ptim]

**no report** [b3-tca| pais| plop| pplm| prdi| ptim]

## Syntax Description

|               |                                                                                           |
|---------------|-------------------------------------------------------------------------------------------|
| <b>b3-tca</b> | (Optional) Reports bit 3 (B3) bit error rate (BER) threshold crossing alert (TCA) errors. |
| <b>pais</b>   | (Optional) Reports path alarm indication signal (PAIS) errors.                            |
| <b>plop</b>   | (Optional) Reports path loss of pointer (PLOP) errors.                                    |
| <b>pplm</b>   | (Optional) Reports path payload mismatch (PPLM) defect errors.                            |
| <b>prdi</b>   | (Optional) Reports path remote defect indication (PRDI) errors.                           |
| <b>ptim</b>   | (Optional) Reports path trace identity mismatch (PTIM) defect errors.                     |

## Command Default

Alarms from the following keywords are reported:

- b3-tca
- plop

## Command Modes

SONET/SDH path configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Reporting an alarm means that the alarm can be logged to the console, but it is no guarantee that it is logged. SONET alarm hierarchy rules dictate that only the most severe alarm of an alarm group is reported. Whether an alarm is reported or not, you can view the current state of a masked alarm, a problem indication that is a



candidate for an alarm, by inspecting the “Masked Alarms” line displayed in the **show controllers sonet** command output.

For B3, the bit interleaved parity (BIP) error report is calculated by comparing the BIP-8 code with the BIP-8 code that is extracted from the B3 byte of the following frame. Differences indicate that path-level bit errors have occurred.

Path AIS is sent by line-terminating equipment to alert the downstream path-terminating equipment (PTE) that it has detected a defect on its incoming line signal.

Path LOP is reported as a result of an invalid pointer (H1, H2) or an excess number of new data flag enabled indications.

To determine the alarms that are reported on the controller, use the **show controllers sonet** command.

All report commands accept the default option. The default reporting values are determined based upon the SONET standards specifications and are clearly identified in the corresponding command’s help string.

**Note**

The reporting of B3 BER TCA errors and path LOP errors is enabled by default.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

In the following example, reporting of path PAIS alarms is enabled:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
RP/0/0/CPU0:router(config-sonet)# path
RP/0/0/CPU0:router(config-sonet-path)# report pais
```

**Related Commands**

| Command                                             | Description                                                        |
|-----------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers. |

# revert

To enable automatic switchover from the protect interface to the working interface after the working interface becomes available, use the **revert** command in APS configuration mode. To disable automatic switchover, use the **no** form of this command.

**revert** *minutes*

**no revert** *minutes*

## Syntax Description

|                |                                                                                                                         |
|----------------|-------------------------------------------------------------------------------------------------------------------------|
| <i>minutes</i> | Number of minutes until the circuit is switched back to the working interface after the working interface is available. |
|----------------|-------------------------------------------------------------------------------------------------------------------------|

## Command Default

*minutes*: 0  
Automatic switchover is disabled.

## Command Modes

APS group configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **revert** command to enable and disable revertive APS operation mode, if needed. The revertive APS operation mode of the routers should be matched with the APS operation mode of the connected SONET equipment. Use the **no** form of this command to disable automatic switchover.

The revertive APS operation mode is the recommended operation mode because it offers better traffic protection during various possible software failures and upgrade or downgrade scenarios.

The *minutes* argument indicates how many minutes will elapse until automatic protection switching (APS) decides to switch traffic back from protect to working after the condition that caused an automatic (Signal Failed or Signal Degrade) switch to protect disappears. A value of 0 (default) disables APS revertive mode.

In a multirouter APS topology, the **revert** command is allowed only on the protect router.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to enable APS to revert to the protect or working channel after 5 minutes have elapsed:

```
RP/0/0/CPU0:router(config)# aps group 1  
RP/0/0/CPU0:router(config-aps)# revert 5
```

## Related Commands

| Command                                         | Description                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode. |
| <a href="#">show aps, on page 844</a>           | Displays the operational status for all configured SONET APS groups.                       |

## scrambling disable (SONET path)

To disable payload scrambling on a SONET path, use the **scrambling disable** command in SONET/SDH path configuration mode. To enable payload scrambling after it has been disabled, use the **no** form of this command.

**scrambling disable**

**no scrambling disable**

**Syntax Description** This command has no keywords or arguments.

**Command Default** The default is enable (SONET payload scrambling is on).

**Command Modes** SONET/SDH path configuration

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

SONET payload scrambling applies a self-synchronous scrambler (x43+1) to the synchronous payload envelope (SPE) of the controller to ensure sufficient bit transition density. Both ends of the connection must be configured using SONET path scrambling.

If the hardware payload scrambling support is not user-configurable, or is not supported, the **scrambling disable** command may be rejected.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

**Examples** In the following example, scrambling is disabled for the path:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
RP/0/0/CPU0:router(config-sonet)# path
RP/0/0/CPU0:router(config-sonet-path)# scrambling disable
```

**Related Commands**

| Command                                                              | Description                                                        |
|----------------------------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet</a> , <a href="#">on page 857</a> | Displays information about the operational status of SONET layers. |

# show aps

To display the operational status for all configured SONET automatic protection switching (APS) groups, use the **show aps** command in EXEC mode.

**show aps**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **show aps** command to display operational status for all configured SONET APS groups.

Displaying the SONET APS operational data is considered of lower priority than the APS operation itself. Because the information is collected from several sources scattered across the various nodes involved, there is a small probability that some states will change while the command is being run.

The command should be reissued for confirmation before decisions are made based on the results displayed.

## Task ID

| Task ID   | Operations |
|-----------|------------|
| sonet-sdh | read       |

## Examples

The following is sample output from the **show aps** command:

```
RP/0/0/CPU0:router# show aps

APS Group 1:
Protect ch 0 (SONET3_0):Enabled
  SONET framing, SONET signalling, bidirectional, revertive (300 sec)
  Rx K1:0x21 (Reverse Request - Working)
    K2:0x15 (bridging Working, 1+1, bidirectional)
  Tx K1:0x81 (Manual Switch - Working)
    K2:0x15 (bridging Working, 1+1, bidirectional)
```

```

Working ch 1 (SONET2_0):Disabled
  Rx K1:0x00 (No Request - Null)
  K2:0x00 (bridging Null, 1+1, non-aps)
  Tx K1:0x00 (No Request - Null)
  K2:0x00 (bridging Null, 1+1, non-aps)
APS Group 3:
PGP:protocol version: native 2 adopted 2
PGP:Authentication "cisco", hello timeout 1 sec, hold timeout 3 sec
Protect ch 0 (SONET3_1):Disabled
  SONET framing, SONET signalling, bidirectional, non-revertive
  Rx K1:0x00 (No Request - Null)
  K2:0x05 (bridging Null, 1+1, bidirectional)
  Tx K1:0x00 (No Request - Null)
  K2:0x05 (bridging Null, 1+1, bidirectional)
Working ch 1 (192.168.1.1):Enabled
APS Group 49:
Protect ch 0 (SONET0_2_0_0):Disabled
  SONET framing, SONET signalling, unidirectional, non-revertive
  Rx K1:0x00 (No Request - Null)
  K2:0x00 (bridging Null, 1+1, non-aps)
  Tx K1:0x00 (No Request - Null)
  K2:0x04 (bridging Null, 1+1, unidirectional)
Working ch 1 (SONET0_2_0_1):Enabled
  SONET framing, unidirectional
  Rx K1:0x00 (No Request - Null)
  K2:0x00 (bridging Null, 1+1, non-aps)
  Tx K1:0x00 (No Request - Null)
  K2:0x00 (bridging Null, 1+1, non-aps)
APS Group 6:
PGP:protocol version: native 2 adopted 2
PGP:Authentication "cisco", hello timeout 1 sec, hold timeout 3 sec
Protect ch 0 (192.168.3.2 - auto):Disabled
Working ch 1 (SONET6_0):Enabled
  Rx K1:0x00 (No Request - Null)
  K2:0x00 (bridging Null, 1+1, non-aps)
  Tx K1:0x00 (No Request - Null)
  K2:0x00 (bridging Null, 1+1, non-aps)

```

**Table 51: show aps Field Descriptions**

| Field      | Description                                                    |
|------------|----------------------------------------------------------------|
| APS Group  | Assigned number of the APS group. Range is from 1 through 255. |
| Protect ch | Number and address of the protect channel interface.           |
| Working ch | Number and address of the working channel interface.           |

**Related Commands**

| Command                                       | Description                                                            |
|-----------------------------------------------|------------------------------------------------------------------------|
| <a href="#">show aps agents</a> , on page 846 | Displays the status of the APS WP distributed communication subsystem. |
| <a href="#">show aps group</a> , on page 848  | Displays information about the APS groups.                             |

# show aps agents

To display the status of the automatic protection switching (APS) working to protect (WP) distributed communication subsystem, use the **show aps agents** command in EXEC mode.

## show aps agents

| <b>Syntax Description</b> | This command has no keywords or arguments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |              |             |                              |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------|-------------|------------------------------|
| <b>Command Default</b>    | No default behavior or values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |              |             |                              |
| <b>Command Modes</b>      | EXEC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |              |             |                              |
| <b>Command History</b>    | <table> <tr> <th>Release</th><th>Modification</th></tr> <tr> <td>Release 3.2</td><td>This command was introduced.</td></tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Release | Modification | Release 3.2 | This command was introduced. |
| Release                   | Modification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |              |             |                              |
| Release 3.2               | This command was introduced.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |              |             |                              |
| <b>Usage Guidelines</b>   | <p>To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.</p> <p>Use the <b>show aps agents</b> command to display the status of the APS WP distributed communication subsystem. The WP communication is critical for the APS functionality. The <b>show aps agents</b> command is typically used as a debugging aid for unexpected or unusual APS operation.</p> <p>Displaying the APS operational data is considered of lower priority than the APS operation itself. Because the information is collected from several sources scattered across the various nodes involved, there is a small probability that some states will change while the command is being run.</p> <p>The command should be reissued for confirmation before decisions are made based on the results displayed.</p> |         |              |             |                              |

| <b>Task ID</b> | <table> <tr> <th>Task ID</th><th>Operations</th></tr> <tr> <td>sonet-sdh</td><td>read</td></tr> </table> | Task ID | Operations | sonet-sdh | read |
|----------------|----------------------------------------------------------------------------------------------------------|---------|------------|-----------|------|
| Task ID        | Operations                                                                                               |         |            |           |      |
| sonet-sdh      | read                                                                                                     |         |            |           |      |

The following is sample output from the **show aps agents** command:

```
RP/0/0/CPU0:router# show aps agents
SONET APS Manager working-Protect (WP) connections:
Remote peer (192.168.3.2 - auto) is up:
  Group 6   [P.Ch0] 192.168.3.2 == Manager --- SONET6_0 (node6) --- [W.Ch1]
Remote peer (10.1.1.1) is up:
```



```

Group 3    [W.Ch1] 192.168.1.1 === Manager --- SONET3_1 (node3) --- [P.Ch0]
Local agent (node2) is up:
Group 1    [W.Ch1] --- SONET2_0 --- SONET3_0 (node3) --- [P.Ch0]
Local agent (node3) is up:
Group 1    [P.Ch0] --- SONET3_0 --- SONET2_0 (node2) --- [W.Ch1]
Group 3    [P.Ch0] --- SONET3_1 --- Manager === 192.168.1.1 [W.Ch1]
Group 5    [P.Ch0] --- SONET3_2 --- SONET3_3 (node3) --- [W.Ch1]
Group 5    [W.Ch1] --- SONET3_3 --- SONET3_2 (node3) --- [P.Ch0]
Local agent (node6) is up:
Group 6    [W.Ch1] --- SONET6_0 --- Manager === 192.168.3.2 [P.Ch0]

```

**Table 52: show aps agents Field Descriptions**

| Field       | Description                                                                                                                                                                                                                                                                                |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remote peer | IP address of the remote Protect Group Protocol (PGP) peer for the working router in an APS group. An IP address of 0.0.0.0 indicates a dynamically discovered PGP peer not yet contacted, shown on working routers only. (The protect router contacts the working router.)                |
| Local agent | Node name of the local agent, such as (node2).                                                                                                                                                                                                                                             |
| Group       | The interface location or IP address of the SONET APS group.<br><br>Internal WP communication channel segments are represented as “---” if the segment is operational or “-/-” if the connection is broken.<br><br>PGP segments are represented as “===” if operational or “==” if broken. |

**Related Commands**

| Command                                                | Description                                                          |
|--------------------------------------------------------|----------------------------------------------------------------------|
| <a href="#">show aps</a> , <a href="#">on page 844</a> | Displays the operational status for all configured SONET APS groups. |

# show aps group

To display information about the automatic protection switching (APS) groups, use the **show aps group** command in EXEC mode.

**show aps group** [ *number* ]

| Syntax Description |                                                     |
|--------------------|-----------------------------------------------------|
|                    | <i>number</i> (Optional) The assigned group number. |

| Command Default | No default behavior or values |
|-----------------|-------------------------------|
|-----------------|-------------------------------|

| Command Modes | EXEC |
|---------------|------|
|---------------|------|

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

| Usage Guidelines | <p>To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.</p> <p>The <b>show aps group</b> command displays information about APS groups, and is useful if multiple APS groups are configured.</p> <p>Displaying the APS operational data is considered of lower priority than the APS operation itself. Because the information is collected from several sources scattered across the various nodes involved, there is a small probability that some states will change while the command is being run.</p> <p>The command should be reissued for confirmation before decisions are made based on the results displayed.</p> |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Task ID | Task ID   | Operations |
|---------|-----------|------------|
|         | sonet-sdh | read       |

| Examples | The following is sample output from the <b>show aps group</b> command: |
|----------|------------------------------------------------------------------------|
|----------|------------------------------------------------------------------------|

```
RP/0/0/CPU0:router# show aps group 3
APS Group 3:
  PGP:Authentication "cisco", hello timeout 1 sec, hold timeout 3 sec
  Protect ch 0 (SONET3_1):Admin Down, Disabled
```

```

SONET framing, SONET signalling, bidirectional, non-revertive
Rx K1:0x00 (No Request - Null)
   K2:0x05 (bridging Null, 1+1, bidirectional)
Tx K1:0x00 (No Request - Null)
   K2:0x05 (bridging Null, 1+1, bidirectional)
Working ch 1 (192.168.1.1):Admin Down, Enabled

```

**Table 53: show aps group Field Descriptions**

| Field      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| APS Group  | <p>Group number assigned to the displayed APS group. For each channel in the group, the following information is displayed:</p> <ul style="list-style-type: none"> <li>• Authentication string</li> <li>• Hello timer value</li> <li>• Hold timer value</li> <li>• Role of the channel (working or protect)</li> <li>• Channel number</li> <li>• Name of the assigned physical port</li> <li>• Channel status (Enabled, Disabled, Admin Down, Signal Fail, Signal Degraded, or Not Contacted)</li> <li>• Group-related information (for protect channels only) that includes: <ul style="list-style-type: none"> <li>◦ Framing of the SONET port</li> <li>◦ Kilobytes signaling protocol</li> <li>◦ Unidirectional or bidirectional APS mode</li> <li>◦ APS revert time, in seconds (in revertive operation mode only)</li> </ul> </li> </ul> |
| Rx         | Received error signaling bytes and their APS decoded information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Tx         | Sent error signaling bytes and their APS decoded information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Working ch | IP address of the corresponding Protect Group Protocol (PGP) peer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

The information displayed for the channels local to the routers is identical to the channel information displayed for single-router APS groups.

show aps group

Related Commands

| Command                                      | Description                                                            |
|----------------------------------------------|------------------------------------------------------------------------|
| <a href="#">show aps, on page 844</a>        | Displays the operational status for all configured SONET APS groups.   |
| <a href="#">show aps agents, on page 846</a> | Displays the status of the APS WP distributed communication subsystem. |

# show controllers pos

To display information on the Packet-over-SONET/SDH (POS) controllers, use the **show controllers pos** command in EXEC mode.

**show controllers pos** *interface-path-id* [**all** | **framer** {**internal** | **register** | **statistics**} | **internal**] [**begin line** | **exclude line** | **file filename** | **include line**]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | (Optional) Displays information for all POS interface controllers.                                                                                                                                                                                                              |
| <b>framer</b>            | (Optional) Displays all POS framer information.                                                                                                                                                                                                                                 |
| <b>internal</b>          | (Optional) Displays all POS internal information.                                                                                                                                                                                                                               |
| <b>register</b>          | (Optional) Displays the POS framer registers.                                                                                                                                                                                                                                   |
| <b>statistics</b>        | (Optional) Displays the POS framer cumulative counters.                                                                                                                                                                                                                         |
| <b>begin line</b>        | (Optional) Displays information beginning with the line that includes the regular expression given by the <i>line</i> argument.                                                                                                                                                 |
| <b>exclude line</b>      | (Optional) Displays information excluding all lines that contain regular expressions that match the <i>line</i> argument.                                                                                                                                                       |
| <b>file filename</b>     | (Optional) Saves the configuration to the designated file. For more information on which standard filenames are recognized, use the question mark (?) online help function.                                                                                                     |
| <b>include line</b>      | (Optional) Displays only those lines that contain the regular expression given by the <i>line</i> argument.                                                                                                                                                                     |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

# Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

The information displayed is generally useful for diagnostic tasks performed by technical support personnel only.

# Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

# Examples

The following is sample output from the **show controllers pos** command:

```
RP/0/0/CPU0:router# show controllers POS 0/3/0/2

Port Number      : 2
Interface        : POS0/3/0/2
Ifhandle         : 0x1380120
CRC              : 32
MTU              : 4474
Port Bandwidth Kbps : 2488320
Admin state      : Up
Driver Link state : Up
```

```
Bundle member    : No
Bundle MTU       : 4474
Bundle Adminstate : Up
```

The following is sample output from the **show controllers pos all** command:

```
RP/0/0/CPU0:router# show controllers POS 0/3/0/2 all

Port Number      : 2
Interface        : POS0/3/0/2
Ifhandle         : 0x1380120
CRC              : 32
MTU              : 4474
Port Bandwidth Kbps : 2488320
Admin state      : Up
```

Driver Link state : Up

Bundle member : No  
 Bundle MTU : 4474  
 Bundle Adminstate : Up

#### POS Driver Internal Cooked Stats Values for port 2

```
=====
Rx Statistics                               Tx Statistics
-----
Total Bytes:      1200                    Total Bytes:      0
Good Bytes:       1200                    Good Bytes:      0
Good Packets:     25                      Good Packets:     0
Aborts:           0                      Aborts:          0
FCS Errors:       0                      Min-len errors: 0
Runs:             0                      Max-len errors: 0
FIFO Overflows:   0                      FIFO Underruns: 0
Giants:           0
Drops:            0
```

#### Sky4402 asic #2 registers:

```
0x000 general_cntrl          0x00
0x002 sys_intf_cntrl_1      0x06
0x003 sys_intf_cntrl_2      0x00
0x004 JTAG3                 0x10
0x005 JTAG2                 0x10
0x006 JTAG1                 0x10
0x007 JTAG0                 0x2f
0x010 active_led            0x01
0x011 gpio_port_mode        0x01
0x012 gpio_port_fault       0x00
0x013 gpio_port_data        0x58
0x015 gpio_port_cntrl       0x3f
0x017 gpio_port_transition   0x00
0x019 gpio_port_intr_mask   0xff
0x01b gpio_port_intr        0x3f
0x01c master_intr_status    0x00
0x01d master_mask           0x00
0x020 interrupt_4           0x04
0x021 interrupt_3           0x00
0x022 interrupt_2           0x00
0x023 interrupt_1           0x00
0x024 status_4              0x04
0x025 status_3              0x00
0x026 status_2              0x0c
0x027 status_1              0x80
0x028 mask_4                0x07
0x029 mask_3                0x03
0x02a mask_2                0x1c
0x02b mask_1                0x8f
0x02d link_state_cntrl      0x80
0x041 diag                  0x00
0x042 stcks                 0x03
0x043 short_frame_cntrl     0x00
0x0c0 ror_ram_c2            0x16
0x0c1 ror_ram_g1            0x00
0x0c2 ror_ram_f2            0x00
0x0c3 ror_ram_h4            0x00
0x0c4 ror_ram_z3            0x00
0x0c5 ror_ram_z4            0x00
0x0c6 ror_ram_z5            0x00
0x0c7 ror_ram_db_c2         0x16
0x0c8 ror_ram_db_g1         0x00
0x142 tor_ram_c2            0x16
0x143 tor_ram_g1            0x00
0x144 tor_ram_f2            0x00
0x145 tor_ram_h4            0x00
```

## show controllers pos

```

0x146 tor_ram_z3          0x00
0x147 tor_ram_z4          0x00
0x148 tor_ram_z5          0x00
0x170 tor_ram_s1          0x00
0x171 tor_ram_e2          0x00
0x172 tor_ram_e1          0x00
0x173 tor_ram_f1          0x00
0x174 tor_ram_k1          0x00
0x175 tor_ram_k2          0x00
0x177 tor_ram_z2          0x00
0x180 rsp_cntrl_1         0x00
0x181 rsp_cntrl_2         0x02
0x184 rtop_f1_ovrhd       0x00
0x185 rtop_k1_ovrhd       0x00
0x186 rtop_k2_ovrhd       0x00
0x187 rtop_s1_ovrhd       0x00
0x188 rtop_e1_ovrhd       0x00
0x189 rtop_e2_ovrhd       0x00
0x18a rtop_deb_s1_ovrhd   0x00
0x18c rtop_b1_mismatch_cnt_u 0x00
0x18d rtop_b1_mismatch_cnt_l 0x00
0x190 rtop_b2_mismatch_cnt_u 0x00
0x191 rtop_b2_mismatch_cnt_l 0x00
0x194 rtop_rei_l_cnt_u    0x00
0x195 rtop_rei_l_cnt_l    0x00
0x198 rtop_ber_thresh_u   0x00
0x199 rtop_ber_thresh_l   0x00
0x19a rtop_ber_leak_u     0x00
0x19b rtop_ber_leak_l     0x00
0x19c rtop_ber_delay_u    0x00
0x19d rtop_ber_delay_l    0x00
0x1c0 rpop_signal_lbl_c2   0x16
0x1c2 rpop_valid_ptr_u     0x02
0x1c3 rpop_valid_ptr_l     0x0a
0x1c4 rpop_b3_mismatch_cnt_u 0x00
0x1c5 rpop_b3_mismatch_cnt_l 0x00
0x1c8 rpop_rei_p_cnt_u     0x00
0x1c9 rpop_rei_p_cnt_l     0x00
0x1cc rpop_ber_thresh_u    0x00
0x1cd rpop_ber_thresh_l    0x00
0x1ce rpop_ber_leak_u      0x00
0x1cf rpop_ber_leak_l      0x00
0x1d0 rpop_ber_delay_u     0x00
0x1d1 rpop_ber_delay_l     0x00
0x200 rpp_cntrl_1          0x11
0x201 rpp_cntrl_2          0x03
0x202 rpp_cntrl_3          0x3e
0x203 rpp_cntrl_4          0x00
0x204 rpp_cntrl_5          0x00
0x208 rpp_max_pkt_len_u    0x08
0x209 rpp_max_pkt_len_l    0xbd
0x20a rpp_min_pkt_len      0x04
0x244 tpp_inter_pkt_u      0x00
0x245 tpp_inter_pkt_l      0x00
0x246 tpp_idle_cell_hdr    0x00
0x247 tpp_idle_cell_filldata 0x00
0x248 tpp_cntrl            0x04
0x280 tpog_cntrl           0x20
0x2c0 ttog_cntrl           0x00
0x2c2 ttog_ovrhd_src_1     0x00
0x2c3 ttog_ovrhd_src_2     0x00
0x2c9 ttog_ovrhd_fill      0x00

```

Table 54: show controllers pos Field Descriptions

| Field                                  | Description                                                           |
|----------------------------------------|-----------------------------------------------------------------------|
| Cisco POS ASIC Register Dump (Receive) | Header for display of the contents of the receive ASIC1 register log. |



| Field                                              | Description                                                                                                        |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| asic mode                                          | Address in hex of the ASIC mode flag.                                                                              |
| error source                                       | Address in hex of the error source flag.                                                                           |
| error mask                                         | Address in hex of the error mask flag.                                                                             |
| error detail 1                                     | Address in hex of the error detail 1 flag.                                                                         |
| error detail 2                                     | Address in hex of the error detail 2 flag.                                                                         |
| rx offset                                          | Address in hex of the receive offset.                                                                              |
| Channel Modes                                      | Location in hex of the channel mode flag.                                                                          |
| Port 0:                                            | Port 0 (the first port) statistics display.                                                                        |
| Port 1:                                            | Port 1 (the second port) statistics display.                                                                       |
| Port 2:                                            | Port 2 (the third port) statistics display.                                                                        |
| Port 3:                                            | Port 3 (the fourth port) statistics display.                                                                       |
| Runt Threshold                                     | Limit in packets set for runs on the specified port.                                                               |
| Tx Delay                                           | Transmit delay that has been set for the specified port.                                                           |
| Cisco POS ASIC Register Dump (Transmit)            | Header for display of the contents of the transmit ASIC register log.                                              |
| POS Driver Internal Cooked Stats Values for port 0 | Statistics relating to the specified POS port (POS port 0).                                                        |
| Rx Statistics                                      | Receive statistics for the indicated POS port.                                                                     |
| Total Bytes                                        | Total number of bytes, including data and MAC encapsulation, received by the system.                               |
| Good Bytes                                         | Number of bytes received without errors.                                                                           |
| Good Packets                                       | Number of packets received without errors.                                                                         |
| Aborts                                             | Number of receive bytes that have been aborted                                                                     |
| FCS Errors                                         | Number of FCS2 errors that have been received.                                                                     |
| Runts                                              | Number of received packets that are discarded because they are smaller than the minimum packet size of the medium. |

| Field          | Description                                                                                                                                                                                                                                          |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FIFO Overflows | Number of received packets that exceeded the FIFO stack limit.                                                                                                                                                                                       |
| Giants         | Number of received packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                             |
| Drops          | Number of received packets that have been dropped from the system.                                                                                                                                                                                   |
| Tx Statistics  | Transmit statistics for the indicated POS port.                                                                                                                                                                                                      |
| Total Bytes    | Total number of bytes, including data and MAC encapsulation, sent by the system.                                                                                                                                                                     |
| Good Bytes     | Number of bytes sent without errors.                                                                                                                                                                                                                 |
| Good Packets   | Number of packets sent without errors.                                                                                                                                                                                                               |
| Aborts         | Number of sent bytes that have been aborted.                                                                                                                                                                                                         |
| Min-len errors | Minimum queue length violations.                                                                                                                                                                                                                     |
| Max-len errors | Maximum queue length violations.                                                                                                                                                                                                                     |
| FIFO Underruns | First-in, first-out, a buffering scheme where the first byte of data entering the buffer is the first byte retrieved by the CPU. FIFO underruns reports the number of times that the transmitter has been running faster than the router can handle. |

[1](#) [2](#)

<sup>1</sup> 1. application-specific integrated circuit

<sup>2</sup> 2. frame check sequence

# show controllers sonet

To display information about the operational status of SONET layers, use the **show controllers sonet** command in EXEC mode.

**show controllers sonet** *interface-path-id* {**all**|**framers**|**internal-state**}

## Syntax Description

|                          |                                                                                                                                                                                                                                                                              |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | Displays all information.                                                                                                                                                                                                                                                    |
| <b>framers</b>           | Displays framer information.                                                                                                                                                                                                                                                 |
| <b>internal-state</b>    | Displays internal SONET state.                                                                                                                                                                                                                                               |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.

- If specifying a virtual interface, the number range varies, depending on interface type.

Use the **show controllers sonet** command to display information about the operational status of SONET layers on a particular SONET port.

If the manageability PIE is not installed, you can use the **show controllers sonet** command to display the counters for the current 15 minutes only without history data. However, the SONET MIB is still available but is limited to the current bucket of data. History data is still available only when the manageability PIE is loaded. The **show controllers sonet** command is available at any time to display current data, and history data is stored in the line card rather in the history bucket.

## Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

## Examples

The following is sample output from the **show controllers sonet** command:

```
RP/0/0/CPU0:router# show controllers sonet 0/1/2/1

Port SONET0/1/2/1:

Status: Up

Loopback: None

SECTION
  LOF = 0          LOS   = 0          BIP(B1) = 0
LINE
  AIS = 0          RDI   = 1          FEBE = 0          BIP(B2) = 0
PATH
  AIS = 0          RDI   = 0          FEBE = 0          BIP(B3) = 0
  LOP = 0          NEWPTR = 0        PSE  = 0          NSE   = 0
  PLM = 0          TIM   = 0

Line delays trigger:      0 ms clear: 10000 ms
Path delays trigger:     0 ms clear: 10000 ms
Last clearing of "show controllers SONET" counters never

Detected Alarms: None
Asserted Alarms: None
Mask for Detected->Asserted: None
Detected Alerts: None
Reported Alerts: None
Mask for Detected->Reported: None
Alarm reporting enabled for: SLOS SLOF SF_BER PLOP
Alert reporting enabled for: B1-TCA B2-TCA B3-TCA

Framing: SONET
SPE Scrambling: Enabled
C2 State: Stable  C2_rx = 0x16 (22)  C2_tx = 0x16 (22) / Scrambling Derived
S1S0(tx): 0x0  S1S0(rx): 0x0 / Framing Derived

PATH TRACE BUFFER : STABLE
  Remote hostname : P1 CRS-8
  Remote interface: POS0/1/4/0
  Remote IP addr  : 0.0.0.0

APS
No APS Group Configured
Protect Channel 0  DISABLED
Rx(K1/K2) : 0x00/0x00
Tx(K1/K2) : 0x00/0x00
```

```

Remote Rx(K1/K2): 01/0   Remote Tx(K1/K2): 01/0

BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6  B3 = 10e-6

Optics type: OC48 SR/STM16 I-16
Clock source: internal (actual) internal (configured)
Rx S1: 0xf  Tx S1: 0x50

Optical Power Monitoring (accuracy: +/- 1dB)
Rx power = 0.3162 mW, -5.0 dBm
Tx power = 0.2883 mW, -5.4 dBm
Tx laser current bias = 17.2 mA

```

**Table 55: show controllers sonet Field Descriptions**

| Field    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port     | Slot number of the POS interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Status   | Displays whether the link associated with the specified port is up or down.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Loopback | Loopback identifier, if applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| LOF      | Section loss of frame is detected when a severely error-framing (SEF) defect on the incoming SONET signal persists for 3 milliseconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| LOS      | Section loss of signal is detected when an all-zeros pattern on the incoming SONET signal lasts 19(+3) microseconds or longer. This defect might also be reported if the received signal level drops below the specified threshold.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| BIP      | Bit interleaved parity error reported. <ul style="list-style-type: none"> <li>• For B1, the bit interleaved parity error report is calculated by comparing the BIP-8 code with the BIP-8 code extracted from the B1 byte of the following frame. Differences indicate that section-level bit errors have occurred.</li> <li>• For B2, the bit interleaved parity error report is calculated by comparing the BIP-8/24 code with the BIP-8 code extracted from the B2 byte of the following frame. Differences indicate that line-level bit errors have occurred.</li> <li>• For B3, the bit interleaved parity error report is calculated by comparing the BIP-8 code with the BIP-8 code extracted from the B3 byte of the following frame. Differences indicate that path-level bit errors have occurred.</li> </ul> |

| Field  | Description                                                                                                                                                                                                                                                                                                                                                                                |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AIS    | <p>Alarm indication signal.</p> <ul style="list-style-type: none"> <li>Line alarm indication signal is sent by the STE1 to alert the downstream LTE2 that a LOS or LOF defect has been detected on the incoming SONET section.</li> <li>Path alarm indication signal is sent by the LTE to alert the downstream PTE3 that it has detected a defect on its incoming line signal.</li> </ul> |
| RDI    | <p>Remote defect indication.</p> <ul style="list-style-type: none"> <li>Line remote defect indication is reported by the downstream LTE when it detects LOF4, LOS5, or AIS6.</li> <li>Path remote defect indication is reported by the downstream PTE when it detects a defect on the incoming signal.</li> </ul>                                                                          |
| FEBE   | <p>Far-end block errors.</p> <ul style="list-style-type: none"> <li>Line far-end block error (accumulated from the M0 or M1 byte) is reported when the downstream LTE detects BIP7 (B2) errors.</li> <li>Path far-end block error (accumulated from the G1 byte) is reported when the downstream PTE detects BIP (B3) errors.</li> </ul>                                                   |
| LOP    | Path loss of pointer is reported as a result of an invalid pointer (H1, H2) or an excess number of NDF8 enabled indications.                                                                                                                                                                                                                                                               |
| NEWPTR | Inexact count of the number of times the SONET framer has validated a new SONET pointer value (H1, H2).                                                                                                                                                                                                                                                                                    |
| PSE    | Inexact count of the number of times the SONET framer has detected a positive stuff event in the received pointer (H1, H2).                                                                                                                                                                                                                                                                |
| NSE    | Inexact count of the number of times the SONET framer has detected a negative stuff event in the received pointer (H1, H2).                                                                                                                                                                                                                                                                |
| PLM    | Payload label mismatch. A different payload-specific functionality than the provisioned functionality is reported. For example, 02 to E0, or FD to FE.                                                                                                                                                                                                                                     |

| Field                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TIM                                                | Trace identifier mismatch. Reported TIM defects that occur primarily as a result of provisioning errors; for example, incorrect cross-connections in the network.                                                                                                                                                                                                                                            |
| Line delays trigger                                | Line triggers delayed and cleared, in milliseconds.                                                                                                                                                                                                                                                                                                                                                          |
| Path delays trigger                                | Path triggers delayed and cleared, in milliseconds.                                                                                                                                                                                                                                                                                                                                                          |
| Last clearing of “show controllers SONET” counters | When the counters associated with the <b>show controllers sonet</b> command were last cleared.                                                                                                                                                                                                                                                                                                               |
| Detected/Asserted Alarms                           | Any alarms detected by the controller are displayed here. Alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> |
| Mask for Detected -> Asserted                      | Masked alarms for the asserted alarm. For example, when SLOS is asserted, all low-level alarms are masked and are listed in this section of the output.                                                                                                                                                                                                                                                      |
| Detected Alerts                                    | List of alerts that are detected.                                                                                                                                                                                                                                                                                                                                                                            |
| Reported Alerts                                    | List of reported alerts, such as B1-TCA B2-TCA B3-TCA, sent to the application layer.                                                                                                                                                                                                                                                                                                                        |
| Mask for Detected -> Reported                      | List of masked alerts for asserted alarms that are reported.                                                                                                                                                                                                                                                                                                                                                 |
| Alarm reporting enabled for                        | Types of alarms that generate an alarm message.                                                                                                                                                                                                                                                                                                                                                              |
| Alert reporting enabled for                        | Types of alarms that generate an alert message.                                                                                                                                                                                                                                                                                                                                                              |
| Framing                                            | Type of framing enabled on the controller.                                                                                                                                                                                                                                                                                                                                                                   |
| SPE Scrambling                                     | Status of synchronous payload envelope (SPE) scrambling: Enabled, Disabled.                                                                                                                                                                                                                                                                                                                                  |
| C2 State                                           | Value extracted from the SONET path signal label byte (C2).                                                                                                                                                                                                                                                                                                                                                  |

| Field                      | Description                                                                                                                                                                                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S1S0(tx)                   | Two S bits received in the last H1 byte.                                                                                                                                                       |
| PATH TRACE BUFFER          | SONET path trace buffer is used to communicate information regarding the remote hostname, interface name/number, and IP address. This use of the J1 (path trace) byte is proprietary to Cisco. |
| Remote hostname            | Name of the remote host.                                                                                                                                                                       |
| Remote interface           | Interface of the remote host.                                                                                                                                                                  |
| Remote IP addr             | IP address of the remote host.                                                                                                                                                                 |
| APS                        | Configuration status of the APS feature                                                                                                                                                        |
| APS Group                  | Indicates whether or not an APS group is configured.                                                                                                                                           |
| Protect Channel 0          | Indicates whether or not channel 0 is protected.                                                                                                                                               |
| Rx(K1/K2)/Tx(K1/K2)        | Contents of the received and transmitted K1 and K2 bytes at the local end in an APS configuration.                                                                                             |
| Remote Rx(K1/K2)/Tx(K1/K2) | Contents of the received and transmitted K1 and K2 bytes at the remote end in an APS configuration.                                                                                            |
| BER thresholds             | List of the bit error rate (BER) thresholds you configured with the <b>threshold</b> (SONET) command.                                                                                          |
| TCA thresholds             | List of threshold crossing alarms (TCA) you configured with the <b>threshold</b> (SONET) command.                                                                                              |
| Optics type                | Type of small form-factor pluggable (SFP) used in the associated port.                                                                                                                         |
| Tx laser current bias      | Measured laser bias current, in milliamps (mA). The valid range is 0 through 131 mA.                                                                                                           |
| Clock source               | Actual and configured clock source.                                                                                                                                                            |
| Optical Power Monitoring   | Power status of the SONET controller.                                                                                                                                                          |
| Tx laser current bias      | Current information, in milliamps (mA), in the transmit direction.                                                                                                                             |



[3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#)

The following is sample output from the **show controllers sonet** command with the **framers** option:

```
RP/0/0/CPU0:router# show controllers sonet 0/1/2/1 framers

Common Regs
reg[0]                Master Reset and Identity 0x01
reg[1]                Master Cfg 0000
reg[3]                Master Clock Monitors 0x37
reg[100]              Master Intr Status 1 0000
reg[101]              Master Intr Status Ch 0-7 0000
reg[102]              Master Intr Status Ch 8-15 0000
reg[1000]             Master Clock Source Cfg 0000
reg[1001]             Master DCC Interface Cfg 1 0x0f
reg[1002]             Master DCC Interface Cfg 2 0000
reg[1004]             APS Cfg and Status 0000
reg[1005]             APS FIFO Cfg and Status 0x0f
reg[1006]             APS Intr Status 1 0000
reg[1007]             APS Intr Status 2 0000
reg[1008]             APS Reset Ctrl 0000
reg[1010]             TUL3 Interface Cfg 0x80
reg[1011]             TUL3 Intr Status/Enable 1 0000
reg[1012]             TUL3 Intr Status/Enable 2 0000
reg[1013]             TUL3 ATM Level 3 FIFO Cfg 0x03
reg[1014]             TUL3 ATM Level 3 Signal Label 0x01
reg[1015]             TUL3 POS Level 3 FIFO Low Water Mark 0x15
reg[1016]             TUL3 POS Level 3 FIFO High Water Mark 0x17
reg[1017]             TUL3 POS Level 3 Signal Label 0000
reg[1018]             TUL3 burst 0x0f
--More--
```

The following is sample output from the **show controllers sonet** command with the **internal-state** keyword:

```
RP/0/0/CPU0:router# show controllers sonet 0/1/2/1 internal-state

Interface(layer)      admin_up  if_state
-----
SONET0/1/2/1          up       up
(SONET Section)       up       up
(SONET Line)          up       up
(SONET Path)          up       up
SonetPath0/1/2/1      up       up
  POS0/1/2/1          up       up
```

**Table 56: show controllers sonet Field Descriptions**

| Field             | Description                       |
|-------------------|-----------------------------------|
| Interface (layer) | Slot number of the POS interface. |

- 3 1. section terminating equipment
- 4 2. line terminating equipment
- 5 3. path terminating equipment
- 6 4. loss of frame
- 7 5. loss of synchronization
- 8 6. alarm indication signal
- 9 7. bit interleaved parity
- 10 8. new data flag
- 11

| Field    | Description                                                                  |
|----------|------------------------------------------------------------------------------|
| admin_up | Whether the interface and its associated layers are in the admin-up state.   |
| if_state | Whether the interface and its associated layers are in the up or down state. |

# show sonet-local trace frr

To display the alarms associated with Fast Re-Route (FRR) for all nodes or for a specific node, use the **show sonet-local trace frr** command in EXEC mode.

**show sonet-local trace frr location** *node-id*

## Syntax Description

|                                |                                                                                                                                              |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>location</b> <i>node-id</i> | Full path location of the node.<br><br>For more information about the syntax for the router, use the question mark (?) online help function. |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

Displays the FRR alarms for all nodes on the router.

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.9.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID       | Operations |
|---------------|------------|
| cisco-support | read       |

## Examples

The following example shows how to display the FRR alarms for a specific node:

```
RP/0/0/CPU0:router# show sonet-local trace frr location 0/1/0/0
```

The following example shows how to display the FRR alarms for all nodes on the router:

```
RP/0/0/CPU0:router# show sonet-local trace frr
```

show sonet-local trace frr

Related Commands

| Command                                             | Description                                                        |
|-----------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers. |

# shutdown (SONET)

To disable SONET controller processing, use the **shutdown** command in SONET/SDH configuration mode. To bring back up a SONET controller and enable SONET controller processing, use the **no form of this** command.

**shutdown**

**no shutdown**

**Syntax Description** This command has no keywords or arguments.

**Command Default** The SONET controller is up, and SONET controller processing is enabled.

**Command Modes** SONET/SDH configuration

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **shutdown** command to shut down a SONET controller and disable SONET controller processing. Use the **no shutdown** command to bring back up a SONET controller and enable SONET controller processing.

The SONET controller must be brought up for the proper operation of the Layer 2 interface. The Layer 2 interface has a separate **shutdown** command available, which does not operate on the SONET controller's administrative state.

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples** The following example shows how to bring down the SONET controller and disable SONET controller processing:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/2  
RP/0/0/CPU0:router(config-sonet)# shutdown
```

Related Commands

| Command                                                              | Description                                                        |
|----------------------------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers sonet</a> , <a href="#">on page 857</a> | Displays information about the operational status of SONET layers. |

# signalling

To configure the K1K2 overhead byte signaling protocol used for automatic protection switching (APS), use the **signalling** command in APS group configuration mode. To reset APS signaling to the default, use the **no** form of this command.

**signalling** {sonet| sdh}

**no signalling** {sonet| sdh}

## Syntax Description

|              |                                                        |
|--------------|--------------------------------------------------------|
| <b>sonet</b> | Sets signaling to SONET.                               |
| <b>sdh</b>   | Sets signaling to Synchronous Digital Hierarchy (SDH). |

## Command Default

SONET signaling is set by default.

## Command Modes

APS group configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

By default, APS uses the signaling mode matching the framing mode. The **signalling** command may be required, depending upon the transport equipment capabilities, only on “transition” links interconnecting SONET and SDH networks.

In a multirouter APS topology, the **signalling** command is allowed only on the protect router.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to reset the signaling protocol from the default SONET value to SDH:

```
RP/0/0/CPU0:router(config)# aps group 1
```

```
RP/0/0/CPU0:router(config-aps)# signalling sdh
```

The following example sets the signaling to SONET:

```
RP/0/0/CPU0:router(config)# aps group 1  
RP/0/0/CPU0:router(config-aps)# signalling sonet
```

### Related Commands

| Command                                         | Description                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode. |
| <a href="#">show aps group, on page 848</a>     | Displays information about the APS groups.                                                 |



# sts

To specify the Synchronous Transport Signal (STS) path and enter the STS controller configuration mode, use the **sts** command in SONET controller configuration mode.

**sts** *number*

## Syntax Description

|               |                                                             |
|---------------|-------------------------------------------------------------|
| <i>number</i> | STS path number. The range varies by the type of line card. |
|---------------|-------------------------------------------------------------|

## Command Default

No default behavior or values

## Command Modes

SONET controller configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.5.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to specify STS 1:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/0
RP/0/0/CPU0:router(config-sonet)# sts 1
RP/0/0/CPU0:router(config-stsPath)#
```

## Related Commands

| Command                          | Description                                                                                          |
|----------------------------------|------------------------------------------------------------------------------------------------------|
| <a href="#">au</a> , on page 790 | Specifies the administrative unit (AU) group number and enters the AU controller configuration mode. |

# timers (APS)

To change the time between hello packets and the time before the protect interface process declares a working interface router to be down, use the **timers** command in APS group configuration mode. To return to the default timers, use the **no** form of this command.

**timers** *hello-seconds hold-seconds*

**no timers**

| Syntax Description   |  |                                                                                                                                                                                    |
|----------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>hello-seconds</i> |  | Number of seconds to wait before sending a hello packet (hello timer). Range is from 1 through 255 seconds. Default is 1 second.                                                   |
| <i>hold-seconds</i>  |  | Number of seconds to wait to receive a response from a hello packet before the interface is declared down (hold timer). Range is from 1 through 255 seconds. Default is 3 seconds. |

| Command Default | <i>hello-seconds</i> : 1 |
|-----------------|--------------------------|
|                 | <i>hold-seconds</i> : 3  |

| Command Modes | APS group configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

| Usage Guidelines | <p>To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.</p> <p>Use the <b>timers</b> command to change the time between hello packets and the time before the protect interface process declares a working interface router to be down.</p> <p>The hello time, in seconds, represents the interval between the periodic message exchange between the Protect Group Protocol (PGP) peers. The hold time, in seconds, represents the interval starting with the first failed periodic message after which, if no successful exchange takes place, the PGP link is declared dead.</p> <p>If many multirouter APS groups are configured and the CPU load or the User Datagram Protocol (UDP) traffic associated with the PGP communication is considered too high, then the hello interval should be increased.</p> <p>Increasing the hold time is suggested if the PGP link is flapping. The possible causes include high route processor (RP) CPU load, high traffic, or high error rates on the links between the working and the protect routers.</p> |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

We recommend that you have a hold time at least three times longer than the hello time (allowing three or more consecutive failed periodic message exchange failures).

The **timers** command is typically used only on the protect router. After the PGP connection is established, the working router learns about the timer settings from the protect router and automatically adjusts accordingly, regardless of its own timer configuration.

The **timers** command is meaningful only in multirouter automatic protection switching (APS) topologies and is ignored otherwise.

#### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

#### Examples

The following example shows how to configure APS group 3 with the hello timer at 2 seconds and the hold timer at 6 seconds:

```
RP/0/0/CPU0:router(config)# aps group 3  
RP/0/0/CPU0:router(config-aps)# timers 2 6
```

#### Related Commands

| Command                                         | Description                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode. |
| <a href="#">show aps group, on page 848</a>     | Displays information about the APS groups.                                                 |

# threshold (SONET)

To set the bit error rate (BER) threshold values of the specified alarms for a SONET controller, use the **threshold** command in SONET/SDH configuration mode. To remove the setting of the threshold from the configuration file and restore the default condition, use the **no** form of this command.

**threshold** {b1-tca| b2-tca| sd-ber| sf-ber} *bit-error-rate*

**no threshold** {b1-tca| b2-tca| sd-ber| sf-ber} *bit-error-rate*

## Syntax Description

|                       |                                                                                              |
|-----------------------|----------------------------------------------------------------------------------------------|
| <b>b1-tca</b>         | Sets the B1 BER threshold crossing alarm (TCA). Range is from 3 through 9. Default is 10e-6. |
| <b>b2-tca</b>         | Sets the B2 BER threshold crossing alarm (TCA). Range is from 3 through 9. Default is 10e-6. |
| <b>sd-ber</b>         | Sets the signal degrade BER threshold. Range is from 3 through 9. Default is 10e-6.          |
| <b>sf-ber</b>         | Sets the signal failure BER threshold. Range is from 3 through 9. Default is 10e-3.          |
| <b>bit-error-rate</b> | BER from 3 to 9 (10 to the minus <i>x</i> ).                                                 |

## Command Default

**b1-tca:** 10e-6  
**b2-tca:** 10e-6  
**sd-ber:** 10e-6  
**sf-ber:** 10e-3

## Command Modes

SONET/SDH configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For B1, the bit interleaved parity (BIP) error report is calculated by comparing the BIP-8 code with the BIP-8 code that is extracted from the B1 byte of the following frame. Differences indicate that section-level bit errors have occurred.

For B2, the BIP error report is calculated by comparing the BIP-8/24 code with the BIP-8 code that is extracted from the B2 byte of the following frame. Differences indicate that line-level bit errors have occurred.

Signal failure BER and signal degrade BER are sourced from B2 BIP-8 error counts (as is B2-TCA). The **b1-tca** and **b2-tca** keywords print only a log message to the console (if reports for them are enabled).

To determine the BER thresholds configured on the controller, use the **show controllers sonet** command.

#### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

#### Examples

The following example shows how to configure thresholds on the SONET controller:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
RP/0/0/CPU0:router(config-sonet)# threshold sd-ber 8
RP/0/0/CPU0:router(config-sonet)# threshold sf-ber 4
RP/0/0/CPU0:router(config-sonet)# threshold b1-tca 4
```

#### Related Commands

| Command                                             | Description                                                                       |
|-----------------------------------------------------|-----------------------------------------------------------------------------------|
| <a href="#">report (SONET), on page 836</a>         | Permits selected SONET alarms to be logged to the console for a SONET controller. |
| <a href="#">show controllers sonet, on page 857</a> | Displays information about the operational status of SONET layers.                |

# threshold (SONET path)

To set the bit error rate (BER) threshold values of the specified alarms for a SONET path, use the **threshold** command in SONET/SDH path configuration mode. To remove the setting of the SONET path threshold from the configuration file and restore the default condition, use the **no** form of this command.

**threshold b3-tca** *bit-error-rate*

**no threshold b3-tca** *bit-error-rate*

## Syntax Description

|                       |                                                               |
|-----------------------|---------------------------------------------------------------|
| <b>b3-tca</b>         | Sets the B3 BER threshold crossing alarm (TCA). Default is 6. |
| <i>bit-error-rate</i> | BER from 3 to 9 (10 to the minus <i>x</i> ).                  |

## Command Default

**b3-tca:** 6

## Command Modes

SONET/SDH path configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For B3, the bit interleaved parity (BIP) error report is calculated by comparing the BIP-8 code with the BIP-8 code that is extracted from the B3 byte of the following frame. Differences indicate that path-level bit errors have occurred.

In addition to BIP errors detected at the local end in the receive direction, B3 error counts detected in the G1 byte (P-REI or P-FEBE) by the far-end SONET equipment are returned.

The **b3-tca** keyword prints only a log message to the console (if reports for them are enabled).

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

In the following example, the BER is set to 4:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/1  
RP/0/0/CPU0:router(config-sonet)# path  
RP/0/0/CPU0:router(config-sonet-path)# threshold b3-tca 4
```

## Related Commands

| Command                                                              | Description                                                                       |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <a href="#">report (SONET)</a> , <a href="#">on page 836</a>         | Permits selected SONET alarms to be logged to the console for a SONET controller. |
| <a href="#">show controllers sonet</a> , <a href="#">on page 857</a> | Displays information about the operational status of SONET layers.                |

# tug3

To specify the tributary unit group (TUG) number and enter the TUG3 controller configuration mode, use the **tug3** command in SONET controller configuration mode.

**tug3** *number*

## Syntax Description

|               |                                                                                                                                                                      |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i> | The tributary unit group (TUG) number. The ranges are: <ul style="list-style-type: none"><li>• AU4—The only value is 1.</li><li>• AU3—The range is 1 to 3.</li></ul> |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default is 1.

## Command Modes

SONET controller configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.5.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **tug3** command enables you to begin configuring the interface in the TUG3 controller configuration mode, where you can configure virtual containers (VCs) and DS3s:

STM1 -> AU4 -> TUG3 -> VC-3 -> DS3

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to specify tug3 1.

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/0
RP/0/0/CPU0:router(config-sonet)# au 1
RP/0/0/CPU0:router(config-auPath)# tug3 1
RP/0/0/CPU0:router(config-tug3Path)#
```



**Related Commands**

| Command                                          | Description                                                                                          |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <a href="#">au</a> , <a href="#">on page 790</a> | Specifies the administrative unit (AU) group number and enters the AU controller configuration mode. |

# uneq-shut (SONET path)

To enable automatic insertion of P-UNEQ code (0x00) in the sent SONET path overhead C2 byte, use the **uneq-shut** command in SONET/SDH path configuration mode. To disable this feature, use the **no** form of this command.

**uneq-shut**

**no uneq-shut**

**Syntax Description** This command has no keywords or arguments.

**Command Default** Automatic insertion is enabled.

**Command Modes** SONET/SDH path configuration

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **uneq-shut** command to disable automatic insertion of P-UNEQ code in the sent SONET path overhead C2 byte whenever the SONET path enters the administratively down state.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

**Examples** In the following example, automatic insertion of P-UNEQ code is disabled in the sent SONET path overhead C2 byte:

```
RP/0/0/CPU0:router(config)# controller sonet 0/2/0/2
RP/0/0/CPU0:router(config-sonet)# path
RP/0/0/CPU0:router(config-sonet-path)# uneq-shut
```

# unidirectional

To configure a protect interface for unidirectional mode, use the **unidirectional** command in APS group configuration mode. To restore the default setting, bidirectional mode, use the **no** form of this command.

**unidirectional**

**no unidirectional**

## Syntax Description

This command has no keywords or arguments.

## Command Default

Bidirectional mode is the default mode for the protect interface.

## Command Modes

APS group configuration

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **unidirectional** command to configure a protect interface for unidirectional mode. Use the **no** form of this command to restore the default setting.

The unidirectional or bidirectional automatic protection switching (APS) operation mode of the routers should be matched with the APS operation mode of the connected SONET equipment.



### Note

We recommend using bidirectional APS mode when it is supported by the interconnecting SONET equipment. When the protect interface is configured as unidirectional, the working and protect interfaces must cooperate to switch the transmit and receive SONET channel in a bidirectional fashion. Cooperation occurs automatically when the SONET network equipment is in bidirectional mode.

In a multirouter APS topology, the **unidirectional** command is allowed only on the protect router.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**unidirectional**

### Examples

The following example shows how to configure an APS group for unidirectional mode:

```
RP/0/0/CPU0:router(config)# aps group 1
RP/0/0/CPU0:router(config-aps)# unidirectional
```

### Related Commands

| Command                                         | Description                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------|
| <a href="#">aps group (global), on page 788</a> | Adds an automatic protection switching (APS) group and enter APS group configuration mode. |
| <a href="#">show aps, on page 844</a>           | Displays the operational status for all configured SONET APS groups.                       |

# width

To set the number of paths in a stream, use the **width** command in the STS or AU controller configuration mode.

**width** *number*

## Syntax Description

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i> | Number of STS streams that are concatenated. The possible values are: <ul style="list-style-type: none"><li>• 1—Indicating one STS stream</li><li>• 3—Indicating three STS streams (STS-3c)</li><li>• 12—Indicating concatenation of 12 STS streams (STS-12c)</li><li>• 48—Indicating concatenation of 48 STS streams (STS-48c)</li></ul> Widths 3, 12, and 48 are configured on STS paths at natural boundaries, which coincide with the following path numbers: <ul style="list-style-type: none"><li>• 1, 4, 7, 10, and so on, for STS-3c</li><li>• 1, 13, 25, and 37 for STS-12c</li><li>• 1 for STS-48c</li></ul> |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default is 1.

## Command Modes

SONET controller configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.5.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

width

### Examples

The following example shows how to specify a width of 3:

```
RP/0/0/CPU0:router(config)# controller sonet 0/1/0/0
RP/0/0/CPU0:router(config-sonet)# sts 1
RP/0/0/CPU0:router(config-stsPath)# width 3
```

### Related Commands

| Command                                   | Description                                                               |
|-------------------------------------------|---------------------------------------------------------------------------|
| <a href="#">mode (SONET), on page 824</a> | Sets the mode of an STS path, AU path, T3 controller, or TUG3 controller. |



## T3, E3, T1, E1 Controller Commands on the Cisco IOS XR Software

---

This module provides command line interface (CLI) commands for configuring T3/E3 and T1/E1 controllers on the Cisco XR 12000 Series Router.

- [bert e1, page 887](#)
- [bert e3, page 890](#)
- [bert error, page 892](#)
- [bert interval, page 894](#)
- [bert pattern, page 896](#)
- [bert t1, page 899](#)
- [bert t3, page 902](#)
- [cablelength, page 904](#)
- [cablelength long, page 906](#)
- [cablelength short, page 908](#)
- [channel-group, page 910](#)
- [clear controller t1, page 912](#)
- [clear controller t3, page 914](#)
- [clock source \(T1/E1\), page 916](#)
- [clock source \(T3/E3\), page 918](#)
- [controller e1, page 920](#)
- [controller e3, page 922](#)
- [controller t1, page 924](#)
- [controller t3, page 926](#)
- [delay clear \(T1/E1\), page 928](#)
- [delay clear \(T3/E3\), page 930](#)

- [delay trigger \(T1/E1\), page 932](#)
- [delay trigger \(T3/E3\), page 934](#)
- [description \(T1/E1\), page 936](#)
- [description \(T3/E3\), page 938](#)
- [down-when-looped \(T1/E1\), page 940](#)
- [down-when-looped \(T3/E3\), page 942](#)
- [dsu bandwidth, page 944](#)
- [dsu mode, page 946](#)
- [dsu remote, page 948](#)
- [fdl, page 950](#)
- [framing \(E1\), page 952](#)
- [framing \(E3\), page 954](#)
- [framing \(T1\), page 956](#)
- [framing \(T3\), page 958](#)
- [hw-module subslot cardtype, page 960](#)
- [linecode, page 962](#)
- [loopback \(T1/E1\), page 964](#)
- [loopback \(T3/E3\), page 966](#)
- [mdl, page 968](#)
- [mode, page 970](#)
- [national bits \(E1\), page 972](#)
- [national bits \(E3\), page 973](#)
- [show controllers e1, page 975](#)
- [show controllers e3, page 979](#)
- [show controllers t1, page 983](#)
- [show controllers t3, page 991](#)
- [shutdown \(T1/E1\), page 1000](#)
- [shutdown \(T3/E3\), page 1002](#)
- [speed \(DS0\), page 1004](#)
- [timeslots, page 1006](#)
- [yellow, page 1008](#)



# bert e1

To start or stop a configured bit error rate test (BERT) on an E1 controller or channel group, use the **bert e1** command in EXEC mode. To return to the default state, use the **no** form of this command.

**bert e1** *interface-path-id* [**channel-group** *channel-group-number*] [**error**] {**start**|**stop**}

## Syntax Description

|                                                     |                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i>                            | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>channel-group</b><br><i>channel-group-number</i> | (Optional) Channel group number. When an E1 data line is configured, channel group numbers can be values from 0 to 30.<br><br><b>Note</b> For any of the DS0 time slots within the time slot range provided for the channel group, use time slot -1 as the channel number.      |
| <b>error</b>                                        | (Optional) Injects errors into the running BERT stream.                                                                                                                                                                                                                         |
| <b>start</b>                                        | Starts the BERT on the E1 controller or channel.                                                                                                                                                                                                                                |
| <b>stop</b>                                         | Stops the BERT on the E1 controller or channel.                                                                                                                                                                                                                                 |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                        |
|---------------|-------------------------------------|
| Release 3.3.0 | This command was introduced.        |
| Release 3.6.0 | The <b>error</b> keyword was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:

- *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

**Note**

Before you can start a BERT on an E1 controller or channel group, you must configure a BERT pattern using the **bert pattern** command. If desired, you can also adjust the default setting (1 minute) of the BERT interval using the **bert interval** command. Both of these commands are available in E1 configuration mode and channel group configuration mode.

To view the BERT results, use the **show controllers e1** command in EXEC mode. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected
- Time remaining on the BERT
- Total bit errors
- Total bits received

BERT is data intrusive. Regular data cannot flow on a line while the test is in progress. The line is put in an alarm state when a BERT is in progress and restored to a normal state after a BERT has been terminated.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to start and stop a BERT on an E1 controller:

```
RP/0/0/CPU0:router# bert e1 0/3/0/0 start
RP/0/0/CPU0:router# bert e1 0/3/0/0 stop
```

The following example shows how to inject errors into the BERT stream on an E1 controller:

```
RP/0/0/CPU0:router# bert e1 0/3/0/0 error
```

**Related Commands**

| Command                                           | Description                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">bert interval</a> , on page 894       | Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line.         |
| <a href="#">bert pattern</a> , on page 896        | Enables a BERT pattern on a T3/E3 or T1/E1 line or an individual channel group.                  |
| <a href="#">show controllers e1</a> , on page 975 | Displays information about the E1 links and hardware and software drivers for the E1 controller. |

# bert e3

To start or stop a configured bit error rate test (BERT) on an E3 controller or channel group, use the **bert e3** command in EXEC mode. To return to the default state, use the **no** form of this command.

**bert e3** *interface-path-id* [**error**] {**start**|**stop**}

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>error</b>             | (Optional) Injects errors into the running BERT stream.                                                                                                                                                                                                                         |
| <b>start</b>             | Starts the BERT on the E3 controller or channel.                                                                                                                                                                                                                                |
| <b>stop</b>              | Stops the BERT on the E3 controller or channel.                                                                                                                                                                                                                                 |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.

- If specifying a virtual interface, the number range varies, depending on interface type.

**Note**

Before you can start a BERT on an E3 controller, you must configure a BERT pattern using the **bert pattern** command. If desired, you can also adjust the default setting (1 minute) of the BERT interval using the **bert interval** command. Both of these commands are available in E3 configuration mode.

To view the BERT results, use the **show controllers e3** command in EXEC mode. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected
- Time remaining on the BERT
- Total bit errors
- Total bits received

BERT is data intrusive. Regular data cannot flow on a line while the test is in progress. The line is put in an alarm state when a BERT is in progress and restored to a normal state after a BERT has been terminated.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to start and stop a BERT on an E3 controller:

```
RP/0/0/CPU0:router# bert e3 0/3/0/0/0 start
RP/0/0/CPU0:router# bert e3 0/3/0/0/0 stop
```

The following example shows how to inject errors into the BERT stream on an E3 controller:

```
RP/0/0/CPU0:router# bert e3 0/3/0/0 error
```

**Related Commands**

| Command                                           | Description                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">bert interval</a> , on page 894       | Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line.         |
| <a href="#">bert pattern</a> , on page 896        | Enables a BERT pattern on a T3/E3 or T1/E1 line or an individual channel group.                  |
| <a href="#">show controllers e3</a> , on page 979 | Displays information about the E3 links and hardware and software drivers for the E3 controller. |

# bert error

To insert errors into a BERT stream on a T3/E3 or T1/E1 line, use the **bert error** command in T3 or T1 configuration mode. To disable a BERT pattern, use the **no** form of this command.

```
bert error [ number ]
no bert error [ number ]
```

Syntax Description

|               |                                                                                                                     |
|---------------|---------------------------------------------------------------------------------------------------------------------|
| <i>number</i> | Specifies the number of BERT errors to introduce into the bit stream. The range is from 1 to 255. The default is 1. |
|---------------|---------------------------------------------------------------------------------------------------------------------|

Command Default

The default is 1.

Command Modes

- T3 configuration
- E3 configuration
- T1 configuration
- E1 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **bert error** command with the **bert pattern** command.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

Examples

The following example shows how to insert 10 errors into the BERT bit stream on the T3 controller in slot 0, subslot 3:

```
RP/0/0/CPU0:router(config)# controller t3 0/0/3/1/10
```

```
RP/0/0/CPU0:router(config-t3e3)# bert error 10
```

**Related Commands**

| Command                                           | Description                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">bert interval</a> , on page 894       | Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line.         |
| <a href="#">bert pattern</a> , on page 896        | Enables a BERT pattern on a T3/E3 or T1/E1 line or an individual channel group.                  |
| <a href="#">show controllers e1</a> , on page 975 | Displays information about the E1 links and hardware and software drivers for the E1 controller. |
| <a href="#">show controllers e3</a> , on page 979 | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t1</a> , on page 983 | Displays information about the T1 links and hardware and software drivers for the T1 controller. |
| <a href="#">show controllers t3</a> , on page 991 | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# bert interval

To specify the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line, use the **bert interval** command in the appropriate configuration mode. To revert to the default interval, use the **no** form of this command.

**bert interval** *time*  
**no bert interval** *time*

|                    |             |                                                                                                          |
|--------------------|-------------|----------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>time</i> | Duration (in minutes) of the BERT. The interval can be a value from 1 to 14400. The default is 1 minute. |
|--------------------|-------------|----------------------------------------------------------------------------------------------------------|

|                 |                           |
|-----------------|---------------------------|
| Command Default | A BERT runs for 1 minute. |
|-----------------|---------------------------|

|               |                                                                                                                           |
|---------------|---------------------------------------------------------------------------------------------------------------------------|
| Command Modes | T3 configuration<br>E3 configuration<br>T1 configuration<br>E1 configuration<br>Channel group configuration for T1 and E1 |
|---------------|---------------------------------------------------------------------------------------------------------------------------|

|                 |               |                              |
|-----------------|---------------|------------------------------|
| Command History | Release       | Modification                 |
|                 | Release 3.3.0 | This command was introduced. |

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.<br><br>Use the <b>bert interval</b> command with the <b>bert pattern</b> command. If the <b>bert interval</b> command is not used, then the BERT runs for a default of 1 minute. |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|         |           |             |
|---------|-----------|-------------|
| Task ID | Task ID   | Operations  |
|         | sonet-sdh | read, write |



## Examples

The following example shows how to limit the BERT to 10 minutes on the T3 controller in slot 0, subslot 3:

```
RP/0/0/CPU0:router(config)# controller t3 0/0/3/1/10  
RP/0/0/CPU0:router(config-t3e3)# bert interval 10
```

## Related Commands

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">bert error, on page 892</a>          | Insert errors into a BERT stream on a T3/E3 or T1/E1 line.                                       |
| <a href="#">bert pattern, on page 896</a>        | Enables a BERT pattern on a T3/E3 or T1/E1 line or an individual channel group.                  |
| <a href="#">show controllers e1, on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

## bert pattern

To enable a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line or an individual channel group, use the **bert pattern** command in T3, E3, T1, E1, or channel group configuration mode. To disable a BERT pattern, use the **no** form of this command.

**bert pattern** {0s| 1in8| 1s| 2^11| 2^15| 2^20| 2^20-QRSS| 2^23| 2^9| 3in24| 55Daly| 55Octet| alt-0-1| ds0-1| ds0-2| ds0-3| ds0-4}

**no bert pattern** {0s| 1in8| 1s| 2^11| 2^15| 2^20| 2^20-QRSS| 2^23| 2^9| 3in24| 55Daly| 55Octet| alt-0-1| ds0-1| ds0-2| ds0-3| ds0-4}

### Syntax Description

|                  |                                                                                                                                                                                                                                                                              |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>0s</b>        | Invokes a repeating pattern of zeros (...000...).                                                                                                                                                                                                                            |
| <b>1in8</b>      | (T1 and E1 only) Invokes a repeating pattern of one (1) bit in eight (8).                                                                                                                                                                                                    |
| <b>1s</b>        | Invokes a repeating pattern of ones (...111...).                                                                                                                                                                                                                             |
| <b>2^11</b>      | (Channel group only) Invokes a pseudorandom O.151 test pattern that is 32,768 bits in length.                                                                                                                                                                                |
| <b>2^15</b>      | Invokes a pseudorandom O.151 test pattern that is 32,768 bits in length.                                                                                                                                                                                                     |
| <b>2^20</b>      | Invokes a pseudorandom O.153 test pattern that is 1,048,575 bits in length.                                                                                                                                                                                                  |
| <b>2^20-QRSS</b> | Invokes a pseudorandom quasi-random signal sequence (QRSS) 0.151 test pattern that is 1,048,575 bits in length.                                                                                                                                                              |
| <b>2^23</b>      | Invokes a pseudorandom O.151 test pattern that is 8,388,607 bits in length.                                                                                                                                                                                                  |
| <b>2^9</b>       | (Channel group only) Invokes a pseudorandom 0.153 test pattern of 511 bits in length.                                                                                                                                                                                        |
| <b>3in24</b>     | (T1 and E1 only) Invokes a repeating pattern in which three (3) bits in twenty-four (24) are set to one (1) and the others are set to zero (0).                                                                                                                              |
| <b>55Daly</b>    | (T1 and E1 only) Invokes a repeating pattern of fifty-five (55) 8-bit octets of data. This pattern introduces rapid transitions from long sequences of low-density octets to high-density octets, high-density octets to low-density octets, and rapid 1010 bit transitions. |
| <b>55Octet</b>   | (T1 and E1 only) Invokes a repeating pattern of fifty-five (55) 8-bit octets of data. This pattern has fifteen (15) consecutive zeros.                                                                                                                                       |
| <b>alt-0-1</b>   | Invokes a repeating pattern of alternating zeros and ones (...01010...).                                                                                                                                                                                                     |
| <b>ds0-1</b>     | (Channel group only) Invokes a repeating sequence of 100x FFh, followed by 100x 00h. This combination of minimum and maximum densities causes stressing of the signal recovery circuitry.                                                                                    |

|              |                                                                                                                                                                              |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ds0-2</b> | (Channel group only) Invokes a repeating sequence of 100x 7Eh, followed by 100x 00h. This combination provides minimum ones density stressing as well as Layer 2 flag bytes. |
| <b>ds0-3</b> | (Channel group only) Invokes a repeating sequence of 200x 4Ch. This combination represents the typical SDD traffic patterns.                                                 |
| <b>ds0-4</b> | (Channel group only) Invokes a repeating sequence of 200x 40h. This combination represents the typical DEC VT traffic.                                                       |

**Command Default**

BERT pattern test is disabled

**Command Modes**

T3 configuration  
 E3 configuration  
 T1 configuration  
 E1 configuration  
 Channel group configuration for T1 and E1

**Command History**

| Release       | Modification                                                                                                                                                                    |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Release 3.3.0 | This command was introduced.                                                                                                                                                    |
| Release 3.6.0 | The <b>1in8</b> , <b>2^11</b> , <b>2^9</b> , <b>3in24</b> , <b>55Daly</b> , <b>55Octet</b> , <b>ds0-1</b> , <b>ds0-2</b> , <b>ds0-3</b> , and <b>ds0-4</b> keywords were added. |
| Release 3.7.0 | The <b>none</b> keyword was removed.                                                                                                                                            |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

BERT is supported on each of the T3/E3 or T1/E1 links. It is done only over an unframed T3/E3 or T1/E1 signal and is run on only one port at a time. It is also supported on an individual channel group.

To begin a BERT, commit the configuration and use the **bert t1**, **bert e1**, **bert t3**, or **bert e3** command in EXEC mode.

To view the BERT results, use the **show controllers t1** or **show controllers t3** command in EXEC mode. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected

- Time remaining on the BERT
- Total bit errors
- Total bits received

BERT is data intrusive. Regular data cannot flow on a line while the test is in progress. The line is put in an alarm state when a BERT is in progress and restored to a normal state after a BERT has been terminated.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to enable the running of a BERT pattern of all zeros on the T3 controller in slot 0, subslot 3:

```
RP/0/0/CPU0:router(config)# controller t3 0/0/3/1/10
RP/0/0/CPU0:router(config-t3e3)# bert pattern 0s
```

## Related Commands

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">bert error, on page 892</a>          | Insert errors into a BERT stream on a T3/E3 or T1/E1 line.                                       |
| <a href="#">bert interval, on page 894</a>       | Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line.         |
| <a href="#">show controllers e1, on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# bert t1

To start or stop a configured bit error rate test (BERT) on a T1 controller or channel group, use the **bert t1** command in EXEC mode.

**bert t1** *interface-path-id* [**channel-group** *channel-group-number*] [**error**] {**start**|**stop**}

## Syntax Description

|                                                     |                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i>                            | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>channel-group</b><br><i>channel-group-number</i> | <b>Note</b> (Optional) Channel group number. When a T1 data line is configured, channel group numbers can be values from 0 to 23.                                                                                                                                            |
| <b>error</b>                                        | (Optional) Injects errors into the running BERT stream.                                                                                                                                                                                                                      |
| <b>start</b>                                        | Starts the BERT on the T1 controller or channel.                                                                                                                                                                                                                             |
| <b>stop</b>                                         | Stops the BERT on the T1 controller or channel.                                                                                                                                                                                                                              |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                        |
|---------------|-------------------------------------|
| Release 3.3.0 | This command was introduced.        |
| Release 3.6.0 | The <b>error</b> keyword was added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.

- *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

**Note**

Before you can start a BERT on a T1 controller or channel group, you must configure a BERT pattern using the **bert pattern** command. If desired, you can also adjust the default setting (1 minute) of the BERT interval using the **bert interval** command. Both of these commands are available in T1 configuration mode and channel group configuration mode.

To view the BERT results, use the **show controllers t1** command in EXEC mode. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected
- Time remaining on the BERT
- Total bit errors
- Total bits received

BERT is data intrusive. Regular data cannot flow on a line while the test is in progress. The line is put in an alarm state when a BERT is in progress and restored to a normal state after a BERT has been terminated.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to start and stop a BERT on a T1 controller:

```
RP/0/0/CPU0:router# bert t1 0/3/0/0/0 start
RP/0/0/CPU0:router# bert t1 0/3/0/0/0 stop
```

The following example shows how to inject errors into the BERT stream on an T1 controller:

```
RP/0/0/CPU0:router# bert t1 0/3/0/0 error
```

**Related Commands**

| Command                                     | Description                                                                              |
|---------------------------------------------|------------------------------------------------------------------------------------------|
| <a href="#">bert interval</a> , on page 894 | Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line. |

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">bert pattern, on page 896</a>        | Enables a BERT pattern on a T3/E3 or T1/E1 line or an individual channel group.                  |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

# bert t3

To start or stop a configured bit error rate test (BERT) on a T3 controller or channel group, use the **bert t3** command in EXEC mode.

**bert t3** *interface-path-id* [**error**] {**start**| **stop**}

Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>error</b>             | (Optional) Injects errors into the running BERT stream.                                                                                                                                                                                                                         |
| <b>start</b>             | Starts the BERT on the T3 controller or channel.                                                                                                                                                                                                                                |
| <b>stop</b>              | Stops the BERT on the T3 controller or channel.                                                                                                                                                                                                                                 |

Command Default

No default behavior or values

Command Modes

EXEC

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.



- If specifying a virtual interface, the number range varies, depending on interface type.

**Note**

Before you can start a BERT on a T3 controller, you must configure a BERT pattern using the **bert pattern** command. If desired, you can also adjust the default setting (1 minute) of the BERT interval using the **bert interval** command. Both of these commands are available in T3 configuration mode.

To view the BERT results, use the **show controllers t3** command in EXEC mode. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected
- Time remaining on the BERT
- Total bit errors
- Total bits received

BERT is data intrusive. Regular data cannot flow on a line while the test is in progress. The line is put in an alarm state when a BERT is in progress and restored to a normal state after a BERT has been terminated.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to start and stop a BERT on a T3 controller:

```
RP/0/0/CPU0:router# bert t3 0/3/0/0 start
RP/0/0/CPU0:router# bert t3 0/3/0/0 stop
```

The following example shows how to inject errors into the BERT stream on a T3 controller:

```
RP/0/0/CPU0:router# bert t3 0/3/0/0 error
```

**Related Commands**

| Command                                           | Description                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">bert interval</a> , on page 894       | Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line.         |
| <a href="#">bert pattern</a> , on page 896        | Enables a BERT pattern on a T3/E3 or T1/E1 line or an individual channel group.                  |
| <a href="#">show controllers t3</a> , on page 991 | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# cablelength

To specify the distance of the cable from the routers to the network equipment, use the **cablelength** command in T3 or E3 configuration mode. To restore the default cable length, use the **no** form of this command.

**cablelength** *feet*

**no cablelength**

## Syntax Description

*feet*                      Number of feet in the range from 0 to 450. The default is 224 feet.

## Command Default

The default is 224 feet.

## Command Modes

T3 configuration

E3 configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

You can specify a cable length from 0 to 450 feet; however, the hardware recognizes only two ranges: 0 to 49 and 50 to 450. For example, entering 35 feet uses the 0 to 49 range. If you later change the cable length to 40 feet, there is no change because 40 is still within the 0 to 49 range. However, if you change the cable length to 50, the 50 to 450 range is used. The actual number you enter is stored in the configuration file.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to set the cable length for the router to 300 feet:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/0/0
RP/0/0/CPU0:router(config-t3)# cablelength 300
```

**Related Commands**

| Command                                                         | Description                                                                                                                                               |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">cablelength long</a> , <a href="#">on page 906</a>  | Increase the pulse of a signal at the receiver and to decrease the pulse from the transmitter using pulse equalization and line build-out for a T1 cable. |
| <a href="#">cablelength short</a> , <a href="#">on page 908</a> | Sets a cable length of 655 feet or shorter for a DS1 link.                                                                                                |

# cablelength long

To increase the pulse of a signal at the receiver and to decrease the pulse from the transmitter using pulse equalization and line build-out for a T1 cable, use the **cablelength long** command in T1 configuration mode. To return the pulse equalization and line build-out values to their default settings, use the **no** form of this command.

**cablelength long** *db-gain-value db-loss-value*

**no cablelength long** *db-gain-value db-loss-value*

## Syntax Description

|                      |                                                                                                                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>db-gain-value</i> | Number of decibels (dB) by which the receiver signal is increased. Use one of the following values: <ul style="list-style-type: none"><li>gain26</li><li>gain36</li></ul> The default is gain26.                    |
| <i>db-loss-value</i> | Number of decibels by which the transmit signal is decreased. Use one of the following values: <ul style="list-style-type: none"><li>0db</li><li>-7.5db</li><li>-15db</li><li>-22.5db</li></ul> The default is 0db. |

## Command Default

*db-gain-value*: gain26  
*db-loss-value*: 0db

## Command Modes

T1 configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **cablelength long** command to configure DS1 links (meaning, to build CSU/DSU links) when the cable length is longer than 655 feet.

A pulse equalizer regenerates a signal that has been attenuated and filtered by a cable loss. Pulse equalization does not produce a simple gain, but it filters the signal to compensate for complex cable loss. A gain26 receiver gain compensates for a long cable length equivalent to 26 dB of loss, whereas a gain36 compensates for 36 dB of loss.

The lengthening or *building out* of a line is used to control far-end crosstalk. Line build-out attenuates the stronger signal from the customer installation transmitter so that the transmitting and receiving signals have similar amplitudes. A signal difference of less than 7.5 dB is ideal. Line build-out does not produce simple flat loss (also known as resistive flat loss). Instead, it simulates a cable loss of 7.5 dB, 15 dB, or 22.5 dB so that the resulting signal is handled properly by the receiving equalizer at the other end.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to increase the receiver gain by 36 decibels and decrease the transmitting pulse by 15 decibels:

```
RP/0/0/CPU0:router(config)#controller t1 0/4/2/0/1
RP/0/0/CPU0:router(config-t1)#cablelength long gain36 -15db
```

**Related Commands**

| Command                                         | Description                                                                    |
|-------------------------------------------------|--------------------------------------------------------------------------------|
| <a href="#">cablelength</a> , on page 904       | Specifies the distance of the cable from the routers to the network equipment. |
| <a href="#">cablelength short</a> , on page 908 | Sets a cable length of 655 feet or shorter for a DS1 link.                     |

# cablelength short

To set a cable length of 655 feet or shorter for a DS1 link, use the **cablelength short** command in T1 configuration mode. To delete the cablelength short value, use the **no** form of this command.

**cablelength short** *length*  
**no cablelength short** *length*

Syntax Description

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>length</i> | Specifies a cable length. Use one of the following values: <ul style="list-style-type: none"><li>• 133ft—Specifies a cable length from 0 to 133 feet.</li><li>• 266ft—Specifies a cable length from 134 to 266 feet.</li><li>• 399ft—Specifies a cable length from 267 to 399 feet.</li><li>• 533ft—Specifies a cable length from 400 to 533 feet.</li><li>• 655ft—Specifies a cable length from 534 to 655 feet.</li></ul> The default is 533 feet. |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Command Default

The default cable length is 533 feet.

Command Modes

T1 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **cablelength short** command to configure DSX-1 links when the cable length is 655 feet or less. This command is supported on T1 controllers only.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to set the cable length for the DS1 link to 655 feet:

```
RP/0/0/CPU0:router(config)# controller t1 0/4/2/0/1
RP/0/0/CPU0:router(config-t3)# cablelength short 655ft
```

## Related Commands

| Command                                                        | Description                                                                                                                                               |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">cablelength</a> , <a href="#">on page 904</a>      | Specifies the distance of the cable from the routers to the network equipment.                                                                            |
| <a href="#">cablelength long</a> , <a href="#">on page 906</a> | Increase the pulse of a signal at the receiver and to decrease the pulse from the transmitter using pulse equalization and line build-out for a T1 cable. |

# channel-group

To configure a DS0 channel group and enter channel group configuration mode, use the **channel-group** command in T1 or E1 configuration mode. To unassign a channel group, use the **no** form of this command.

```
channel-group channel-group-number
no channel-group channel-group-number
```

Syntax Description

|                             |             |                                                                                                             |
|-----------------------------|-------------|-------------------------------------------------------------------------------------------------------------|
| <i>channel-group-number</i> | <b>Note</b> | Channel group number. When a T1 controller is configured, channel group numbers can be values from 0 to 23. |
|-----------------------------|-------------|-------------------------------------------------------------------------------------------------------------|

Command Default

No default behavior or values

Command Modes

T1 configuration  
E1 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **channel-group** command is available only on channelized SPAs.

Use the **channel-group** command in configurations in which the router must communicate with a T1 or an E1 fractional data line. The channel group number may be arbitrarily assigned and must be unique for the controller. An associated serial interface is created with each defined channel group.

Before the channel group configuration is valid, you must define the associated DS0 time slots using the **timeslots** command.

Use the **no channel group** command to delete a channel group.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |



## Examples

The following example shows how to enter channel group configuration mode for channel group number 5 and change the speed of the underlying DS0s in the channel group to 56 kbps:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1)# channel-group 5
RP/0/0/CPU0:router(config-t1-channel_group)# speed 56
```

The following example shows how to associate DS0 time slots 1, 6, 8, 9, and 10 to channel group 5:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1)# channel-group 5
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 1:6:8-10
```

## Related Commands

| Command                                   | Description                                                                                            |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <a href="#">bert pattern, on page 896</a> | Enables a BERT pattern on a T3/E3 or T1/E1 line or an individual channel group.                        |
| <a href="#">framing (E1), on page 952</a> | Selects the frame type for an E1 data line.                                                            |
| <a href="#">framing (T1), on page 956</a> | Selects the frame type for a T1 data line.                                                             |
| <a href="#">mode, on page 970</a>         | Sets the mode of the T3/E3 or T1/E1 controller.                                                        |
| <a href="#">speed (DS0), on page 1004</a> | Specifies the speed of the underlying DS0s in a channel group.                                         |
| <a href="#">timeslots, on page 1006</a>   | Associates one or more DS0 time slots to a channel group and create an associated serial subinterface. |

# clear controller t1

To clear T1 controller data, use the **clear controller t1** command in EXEC configuration mode.

**clear controller t1** *interface-path-id*

|                    |                                                                                                                                                                                                                                   |                                          |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Syntax Description | <i>interface-path-id</i>                                                                                                                                                                                                          | Physical interface or virtual interface. |
|                    | <b>Note</b> Use the <b>show controllers</b> command to see a list of all controllers currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |                                          |

|                 |                               |
|-----------------|-------------------------------|
| Command Default | No default behavior or values |
|-----------------|-------------------------------|

|               |      |
|---------------|------|
| Command Modes | EXEC |
|---------------|------|

|                 |               |                              |
|-----------------|---------------|------------------------------|
| Command History | Release       | Modification                 |
|                 | Release 3.3.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When specifying a channelized T1 controller, use the following guidelines for the *interface-path-id*:

- The naming notation is *rack/slot/module/port/T3Num/T1num*.
- The slash between values is required as part of the notation.
- The following list describes the components of the notation:
  - *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *T3num*—T3 controller number.
  - *T1num*—T1 controller number.

- If specifying a virtual interface, the number range varies, depending on interface type.
- When specifying a virtual tributary group, the naming notation is *rack/slot/module/port/vtg/vt*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *vtg*—Virtual tributary group.
  - *vt*—Virtual tributary instance.

To view the status of the controllers, use the **show controllers t1** command.

#### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| dwdm      | read, write |
| interface | read, write |
| sonet-sdh | read, write |

#### Examples

The following example shows how to clear controller data for the channelized T1 controller 1 that is located in chassis 0, for a SIP installed in slot 1 with a SPA in subslot 0, and port 0 with T3 controller 1, and channelized T1 controller 1:

```
RP/0/0/CPU0:router# clear controller t1 0/1/0/0/1/1
```

#### Related Commands

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">controller t1, on page 924</a>       |                                                                                                  |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

# clear controller t3

To clear T3 controller data, use the **clear controller t3** command in EXEC configuration mode.

**clear controller t3** *interface-path-id*

**Syntax Description**

|                          |                                                                                                                                                                                                                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show controllers</b> command to see a list of all controllers currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Command Default**

No default behavior or values

**Command Modes**

EXEC

**Command History**

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- When specifying a T3 controller, the naming notation is *rack/slot/module/port/T3num*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card or SIP.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *T3num*—T3 controller number.

To view the status of the controllers, use the **show controllers t3** command.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| dwdm      | read, write |
| interface | read, write |
| sonet-sdh | read, write |

**Examples**

The following example shows how to clear controller data for T3 controller 1 that is located in chassis 0, for a SIP installed in slot 6 with a SPA in subslot 2, and port 0 with T3 controller 1:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/2/0/1
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">controller t3, on page 926</a>       | Configures a T3 controller and enters T3 configuration mode.                                     |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# clock source (T1/E1)

To set clocking for individual T1 or E1 links, use the **clock source** command in T1 or E1 configuration mode. To return to the default, use the **no** form of this command.

```
clock source {internal| line}
no clock source
```

Syntax Description

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| internal | Specifies that the clock is generated from the internal clock of the T1 or E1 controller. The default is internal.<br><br><b>Note</b> When configuring clocking on a serial link, you need to configure one end to be <b>internal</b> and the other end to be <b>line</b> . If you configure <b>internal</b> clocking on both ends of a connection, framing slips occur. If you configure <b>line</b> clocking on both ends of a connection, the line does not come up. |
| line     | Specifies that the clock on this controller derives its clocking from the external source to which the controller is connected, which is generally the telephone company central office (CO).                                                                                                                                                                                                                                                                           |

Command Default

The default clock source is internal.

Command Modes

T1 configuration  
E1 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to set the clocking on the T1 controller in slot 6, subslot 0 to internal:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/1/1  
RP/0/0/CPU0:router(config-t1e1)# clock source internal
```

## Related Commands

| Command                                    | Description                                                   |
|--------------------------------------------|---------------------------------------------------------------|
| <a href="#">controller e1, on page 920</a> | Configures an E1 controller and enters E1 configuration mode. |
| <a href="#">controller t1, on page 924</a> |                                                               |

# clock source (T3/E3)

To set clocking for individual T3 or E3 links, use the **clock source** command in T3 or E3 configuration mode. To return to the default, use the **no** form of this command.

```
clock source {internal| line}
no clock source
```

Syntax Description

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| internal | Specifies that the clock is generated from the internal clock of the T3 or E3 controller. The default is internal.<br><br><b>Note</b> When configuring clocking on a serial link, you need to configure one end to be <b>internal</b> and the other end to be <b>line</b> . If you configure <b>internal</b> clocking on both ends of a connection, framing slips occur. If you configure <b>line</b> clocking on both ends of a connection, the line does not come up. |
| line     | Specifies that the clock on this controller derives its clocking from the external source to which the controller is connected, which is generally the telephone company central office (CO).                                                                                                                                                                                                                                                                           |

Command Default

The default clock source is internal.

Command Modes

T3 configuration  
E3 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you do not specify the **clock source** command, the default clock source is used.

Configure the **clock source line** command if your telephone company or the remote data service unit provides the master clock of the T3 or E3 connection.

Configure the **clock source internal** command if your router provides the master clock of the T3 or E3 connection.



**Note**

For a back-to-back connection between two T3 or E3 network modules, one controller must be configured for internal clocking while the other controller must be configured for line clocking.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to set the clocking to line on the T3 controller 1 that is located in chassis 0, on a SIP installed in slot 6 with a SPA in subslot 0, on port 0 with T3 controller 1:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/0/0/1  
RP/0/0/CPU0:router(config-t3)# clock source line
```

**Related Commands**

| Command                                    | Description                                                   |
|--------------------------------------------|---------------------------------------------------------------|
| <a href="#">controller e3, on page 922</a> | Configures an E3 controller and enters E3 configuration mode. |
| <a href="#">controller t3, on page 926</a> | Configures a T3 controller and enters T3 configuration mode.  |

# controller e1

To configure an E1 controller and enter E1 configuration mode, use the **controller e1** command in global configuration mode. To return to the default state, use the **no** form of this command.

```
controller e1 interface-path-id
no controller e1 interface-path-id
```

Syntax Description

|                   |                                                                                                                          |
|-------------------|--------------------------------------------------------------------------------------------------------------------------|
| interface-path-id | Physical interface or virtual interface.                                                                                 |
|                   | <b>Note</b> Use the <b>show controllers</b> command to see a list of all controllers currently configured on the router. |
|                   | For more information about the syntax for the router, use the question mark (?) online help function.                    |

Command Default

No default behavior or values

Command Modes

Global configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

The **controller e1** command is used in configurations in which the router is intended to communicate with an E1 fractional data line. The **controller e1** command is available only on channelized interfaces.

Use the **mode** command in T3 configuration mode to specify the mode for the port. The default mode for 2-Port and 4-Port Channelized T3 SPAs is T1.

**Note**

If you do not use the **mode** command to define the port to be E1, you cannot configure the E1 controller.

To view the status of the controllers, use the **show controllers e1** command.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

**Examples**

The following example shows how to enter E1 configuration mode for a controller:

```
RP/0/0/CPU0:router(config)# controller e1 0/1/0/0
RP/0/0/CPU0:router(config-e1)#
```

**Related Commands**

| Command                                                           | Description                                                                                      |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">mode</a> , <a href="#">on page 970</a>                | Sets the mode of the T3/E3 or T1/E1 controller.                                                  |
| <a href="#">show controllers e1</a> , <a href="#">on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |

# controller e3

To configure an E3 controller and enter E3 configuration mode, use the **controller e3** command in global configuration mode. To return to the default state, use the **no** form of this command.

```
controller e3 interface-path-id
no controller e3 interface-path-id
```

Syntax Description

|                                                                                                                          |                                          |
|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| interface-path-id                                                                                                        | Physical interface or virtual interface. |
| <b>Note</b> Use the <b>show controllers</b> command to see a list of all controllers currently configured on the router. |                                          |
| For more information about the syntax for the router, use the question mark (?) online help function.                    |                                          |

Command Default

No default behavior or values

Command Modes

Global configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

The **controller e3** command applies only to the 2-Port and 4-Port Clear Channel T3/E3 SPAs. Use the **card type** command to define the controller type to be E3.

To view the status of the controllers, use the **show controllers e3** command.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

**Examples**

The following example shows how to enter E3 configuration mode for a controller in slot 6, on the SPA in subslot 2, on E3 controller 0:

```
RP/0/0/CPU0:router(config)# controller e3 0/6/2/0  
RP/0/0/CPU0:router(config-e3)#
```

**Related Commands**

| Command                                                 | Description                                                                                      |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">hw-module subslot cardtype, on page 960</a> | Sets the ports on a SPA in T3, E3, T1, or E1 mode.                                               |
| <a href="#">show controllers e3, on page 979</a>        | Displays information about the E3 links and hardware and software drivers for the E3 controller. |

# controller t1

To configure a T1 controller and enter T1 configuration mode, use the **controller t1** command in global configuration mode. To return to the default state, use the **no** form of this command.

```
controller t1 interface-path-id
no controller t1 interface-path-id
```

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show controllers</b> command to see a list of all controllers currently configured on the router.<br><br>For more information about the syntax for the router, use the question mark (?) online help function. |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When specifying a channelized T1 controller, use the following guidelines for the *interface-path-id*:

- The naming notation is *rack/slot/module/port/T3Num/T1num*.
- The slash between values is required as part of the notation.
- The following list describes the components of the notation:
  - *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *T3num*—T3 controller number.

- *Tlnum*—T1 controller number.
- If specifying a virtual interface, the number range varies, depending on interface type.
- When specifying a virtual tributary group, the naming notation is *rack/slot/module/port/vtg/vt*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *vtg*—Virtual tributary group.
  - *vt*—Virtual tributary instance.

The **controller t1** command is used in configurations in which the router is intended to communicate with a T1 fractional data line. The **controller t1** command is available only on channelized SPAs.

Use the **mode** command in T3 configuration mode to specify the mode for each T3 port. The default mode for 2-Port and 4-Port Channelized T3 SPAs is T1.

To view the status of the controllers, use the **show controllers t1** command.

If the T1 framing type is super frame (SF), you should consider disabling yellow alarm detection as the yellow alarm can be incorrectly detected with SF framing.

Serial interface may flap and eventually, go down if yellow alarm detection is not disabled on its T1 controller configured with SF framing.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

## Examples

The following example shows how to enter T1 configuration mode for a controller:

```
RP/0/0/CPU0:router(config)# controller t1 0/1/0/0/1
RP/0/0/CPU0:router(config-t1)#
```

## Related Commands

| Command                                           | Description                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">mode</a> , on page 970                | Sets the mode of the T3/E3 or T1/E1 controller.                                                  |
| <a href="#">show controllers t1</a> , on page 983 | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

# controller t3

To configure a T3 controller and enter T3 configuration mode, use the **controller t3** command in global configuration mode. To return to the default state, use the **no** form of this command.

```
controller t3 interface-path-id
no controller t3 interface-path-id
```

Syntax Description

|                                                                                                                          |                                          |
|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| interface-path-id                                                                                                        | Physical interface or virtual interface. |
| <b>Note</b> Use the <b>show controllers</b> command to see a list of all controllers currently configured on the router. |                                          |
| For more information about the syntax for the router, use the question mark (?) online help function.                    |                                          |

Command Default

No default behavior or values

Command Modes

Global configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- When specifying a T3 controller, the naming notation is *rack/slot/module/port/T3num*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card or SIP.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *T3num*—T3 controller number.



- If specifying a virtual interface, the number range varies, depending on interface type.

For the 2-Port and 4-Port Clear Channel T3/E3 SPAs, use the **card type** command to define the controller type to be T3.

To view the status of the controllers, use the **show controllers t3** command.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| interface | read, write |

**Examples**

The following example shows how to enter T3 configuration mode for T3 controller 1 that is located in chassis 0, for a SIP installed in slot 6 with a SPA in subslot 2, and port 0 with T3 controller 1:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/2/0/1
RP/0/0/CPU0:router(config-t3)#
```

**Related Commands**

| Command                                                  | Description                                                                                      |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">hw-module subslot cardtype</a> , on page 960 | Sets the ports on a SPA in T3, E3, T1, or E1 mode.                                               |
| <a href="#">show controllers t3</a> , on page 991        | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# delay clear (T1/E1)

To configure the amount of time before a T1 or E1 path delay trigger alarm is cleared, use the **delay clear** command in T1 or E1 configuration mode. To return the command to its default setting, use the **no** form of this command.

**delay clear** *value*

**no delay clear** *value*

|                    |              |                                                                                                                                         |
|--------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>value</i> | Value, in milliseconds, before a T1 path delay trigger alarm is cleared. The range is from 0 through 180000. The default is 10 seconds. |
|--------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|

|                 |                            |
|-----------------|----------------------------|
| Command Default | The default is 10 seconds. |
|-----------------|----------------------------|

|               |                                      |
|---------------|--------------------------------------|
| Command Modes | T1 configuration<br>E1 configuration |
|---------------|--------------------------------------|

| Command History | <table><tr><th>Release</th><th>Modification</th></tr><tr><td>Release 3.8.0</td><td>This command was introduced.</td></tr></table> | Release | Modification | Release 3.8.0 | This command was introduced. |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------|---------|--------------|---------------|------------------------------|
| Release         | Modification                                                                                                                      |         |              |               |                              |
| Release 3.8.0   | This command was introduced.                                                                                                      |         |              |               |                              |

|                  |                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Task ID   | <table><tr><th>Task ID</th><th>Operations</th></tr><tr><td>sonet-sdh</td><td>read, write</td></tr></table> | Task ID | Operations | sonet-sdh | read, write |
|-----------|------------------------------------------------------------------------------------------------------------|---------|------------|-----------|-------------|
| Task ID   | Operations                                                                                                 |         |            |           |             |
| sonet-sdh | read, write                                                                                                |         |            |           |             |

|          |                                                                                                                                                                                                                                         |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Examples | <p>The following example shows how to specify that T1 path delay trigger alarms should be cleared after 9000 seconds:</p> <pre>RP/0/0/CPU0:router(config)# controller t1 0/4/2/0/1 RP/0/0/CPU0:router(config-t1)#delay clear 9000</pre> |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Related Commands**

| Command                                             | Description                                                  |
|-----------------------------------------------------|--------------------------------------------------------------|
| <a href="#">delay trigger (T1/E1)</a> , on page 932 | Configures a time value for the T1 or E1 path delay trigger. |

## delay clear (T3/E3)

To configure the amount of time before a T3 or E3 path delay trigger alarm is cleared, use the **delay clear** command in T3 or E3 configuration mode. To return the command to its default setting, use the **no** form of this command.

**delay clear** *value*

**no delay clear** *value*

### Syntax Description

|              |                                                                                                                                               |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <i>value</i> | Value, in milliseconds, before a T3 or E3 path delay trigger alarm is cleared. The range is from 0 through 180000. The default is 10 seconds. |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------|

### Command Default

The default is 10 seconds.

### Command Modes

T3 configuration  
E3 configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.8.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows how to specify that T3 path delay trigger alarms should be cleared after 9000 seconds:

```
RP/0/0/CPU0:router(config)# controller t3 0/4/2/0/1
RP/0/0/CPU0:router(config-t3)# delay clear 9000
```

**Related Commands**

| Command                                             | Description                                                  |
|-----------------------------------------------------|--------------------------------------------------------------|
| <a href="#">delay trigger (T3/E3)</a> , on page 934 | Configures a time value for the T3 or E3 path delay trigger. |

# delay trigger (T1/E1)

To configure a time value for the T1 or E1 path delay trigger, use the **delay trigger** command in T1 or E1 configuration mode. To return the command to its default setting, use the **no** form of this command.

**delay trigger** *value*  
**no delay trigger**

|                    |              |                                                                                                                       |
|--------------------|--------------|-----------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>value</i> | Sets the T1 path delay trigger value, in milliseconds. The range is from 0 through 60000. The default is 2.5 seconds. |
|--------------------|--------------|-----------------------------------------------------------------------------------------------------------------------|

|                 |                             |
|-----------------|-----------------------------|
| Command Default | The default is 2.5 seconds. |
|-----------------|-----------------------------|

|               |                                      |
|---------------|--------------------------------------|
| Command Modes | T1 configuration<br>E1 configuration |
|---------------|--------------------------------------|

|                 |               |                              |
|-----------------|---------------|------------------------------|
| Command History | Release       | Modification                 |
|                 | Release 3.8.0 | This command was introduced. |

|                  |                                                                                                                                                                                                                                                                                                                              |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.<br><br>If the timer for the T1 or E1 path delay trigger expires, an alarm is declared. |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|         |           |             |
|---------|-----------|-------------|
| Task ID | Task ID   | Operations  |
|         | sonet-sdh | read, write |

|          |                                                                                        |
|----------|----------------------------------------------------------------------------------------|
| Examples | The following example shows how to set the T1 path delay trigger to 8000 milliseconds: |
|----------|----------------------------------------------------------------------------------------|

```
RP/0/0/CPU0:router(config)# controller t1 0/4/2/0/1/1
RP/0/0/CPU0:router(config-t1)# delay trigger 8000
```

**Related Commands**

| Command                                          | Description                                                                          |
|--------------------------------------------------|--------------------------------------------------------------------------------------|
| <a href="#">delay clear (T1/E1), on page 928</a> | Configures the amount of time before a T1 or E1 path delay trigger alarm is cleared. |

# delay trigger (T3/E3)

To configure a time value for the T3 or E3 path delay trigger, use the **delay trigger** command in T3 or E3 configuration mode. To return the command to its default setting, use the **no** form of this command.

**delay trigger** *value*  
**no delay trigger**

Syntax Description

|              |                                                                                                                             |
|--------------|-----------------------------------------------------------------------------------------------------------------------------|
| <i>value</i> | Sets the T3 or E3 path delay trigger value, in milliseconds. The range is from 0 through 60000. The default is 2.5 seconds. |
|--------------|-----------------------------------------------------------------------------------------------------------------------------|

Command Default

The default is 2.5 seconds.

Command Modes

T3 configuration  
E3 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.8.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the timer for the T3 or E3 path delay trigger expires, an alarm is declared.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

Examples

The following example shows how to set the T3 path delay trigger to 8000 milliseconds:

```
RP/0/0/CPU0:router(config)# controller t3 0/4/2/0/1
RP/0/0/CPU0:router(config-t3)# delay trigger 8000
```



**Related Commands**

| Command                                          | Description                                                                          |
|--------------------------------------------------|--------------------------------------------------------------------------------------|
| <a href="#">delay clear (T3/E3), on page 930</a> | Configures the amount of time before a T3 or E3 path delay trigger alarm is cleared. |

# description (T1/E1)

To configure a description for a T1 or E1 controller, use the **description** command in T1 or E1 configuration mode. To delete a T1 or E1 controller description, use the **no** form of this command.

**description** *text*  
**no description** [ *text* ]

|                    |                                                                 |
|--------------------|-----------------------------------------------------------------|
| Syntax Description | <i>text</i> A text string comprised of alphanumeric characters. |
|--------------------|-----------------------------------------------------------------|

|                 |                               |
|-----------------|-------------------------------|
| Command Default | No description is configured. |
|-----------------|-------------------------------|

|               |                                      |
|---------------|--------------------------------------|
| Command Modes | T1 configuration<br>E1 configuration |
|---------------|--------------------------------------|

| Command History | <table><tr><th>Release</th><th>Modification</th></tr><tr><td>Release 3.7.0</td><td>This command was introduced.</td></tr></table> | Release | Modification | Release 3.7.0 | This command was introduced. |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------|---------|--------------|---------------|------------------------------|
| Release         | Modification                                                                                                                      |         |              |               |                              |
| Release 3.7.0   | This command was introduced.                                                                                                      |         |              |               |                              |

|                  |                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Task ID   | <table><tr><th>Task ID</th><th>Operations</th></tr><tr><td>sonet-sdh</td><td>read, write</td></tr><tr><td>interface</td><td>read, write</td></tr></table> | Task ID | Operations | sonet-sdh | read, write | interface | read, write |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------|-----------|-------------|-----------|-------------|
| Task ID   | Operations                                                                                                                                                |         |            |           |             |           |             |
| sonet-sdh | read, write                                                                                                                                               |         |            |           |             |           |             |
| interface | read, write                                                                                                                                               |         |            |           |             |           |             |

**Examples** The following example shows how to configure a description for a T1 controller:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/2/0
RP/0/0/CPU0:router(config-t1)# description This is a sample description for T1 controller 0/6/2/0
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e1, on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

## description (T3/E3)

To configure a description for a T3 or E3 controller, use the **description** command in T3 or E3 configuration mode. To delete a T3 or E3 controller description, use the **no** form of this command.

**description** *text*

**no description** [ *text* ]

### Syntax Description

|             |                                                     |
|-------------|-----------------------------------------------------|
| <i>text</i> | A text string comprised of alphanumeric characters. |
|-------------|-----------------------------------------------------|

### Command Default

No description is configured.

### Command Modes

T3 configuration  
E3 configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.7.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |
| interface | read, write |

### Examples

The following example shows how to configure a description for a T3 controller:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/2/0
RP/0/0/CPU0:router(config-t3)# description This is a sample description for T3 controller
0/6/2/0
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# down-when-looped (T1/E1)

To configure a T1 or E1 controller to inform the system that it is down when loopback is detected, use the **down-when-looped** command in T1 or E1 configuration mode.

**down-when-looped**

**Syntax Description** This command has no keywords or arguments.

**Command Default** By default, a T1 or E1 controller does not inform the system that it is down when loopback is detected.

**Command Modes** T1 configuration  
E1 configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.6.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command does not have a **no** form.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |
|         | interface | read, write |

**Examples** The following example shows how to configure a T1 controller to inform the system that the associated line is down if a loopback is detected:

```
RP/0/0/CPU0:router(config)# controller t1 0/4/2/0/1
RP/0/0/CPU0:router(config-t1)# down-when-looped
```

down-when-looped is a traffic-affecting operation if any loopback is present

**Related Commands**

| Command                                       | Description                                                          |
|-----------------------------------------------|----------------------------------------------------------------------|
| <a href="#">loopback (T1/E1), on page 964</a> | Loops individual T1 or E1 channels on the channelized T3 controller. |

# down-when-looped (T3/E3)

To configure a T3 or E3 controller to inform the system that it is down when loopback is detected, use the **down-when-looped** command in T3 or E3 configuration mode.

**down-when-looped**

**Syntax Description** This command has no keywords or arguments.

**Command Default** By default, a T3 or E3 controller does not inform the system that it is down when loopback is detected.

**Command Modes** T3 configuration  
E3 configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.6.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

This command does not have a **no** form.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |
|         | interface | read, write |

**Examples** The following example shows how to configure a T3 controller to inform the system that the associated line is down if a loopback is detected:

```
RP/0/0/CPU0:router(config)# controller t3 0/4/2/0
RP/0/0/CPU0:router(config-t3)# down-when-looped
```

down-when-looped is a traffic-affecting operation if any loopback is present



**Related Commands**

| Command                                       | Description                                                           |
|-----------------------------------------------|-----------------------------------------------------------------------|
| <a href="#">loopback (T3/E3), on page 966</a> | Loops the entire T3 or E3 line on the T3 controller or E3 controller. |

## dsu bandwidth

To specify the maximum allowable bandwidth used by a T3 or an E3 controller, use the **dsu bandwidth** command in T3 or E3 configuration mode. To return to the default state, use the **no** form of this command.

**dsu bandwidth kbps**

**no dsu bandwidth**

### Syntax Description

|             |                                                                                                    |
|-------------|----------------------------------------------------------------------------------------------------|
| <i>kbps</i> | Maximum bandwidth, in kilobits per second (kbps). Range is from 75 to 44210. The default is 44210. |
|-------------|----------------------------------------------------------------------------------------------------|

### Command Default

The default bandwidth is 44210.

### Command Modes

T3 configuration

E3 configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The local interface configuration must match the remote interface configuration. For example, if you reduce the maximum bandwidth to 16,000 on the local port, you must also do the same on the remote port.

The **dsu bandwidth** command reduces the bandwidth by padding the E3 and T3 frame.

To verify the data service unit (DSU) bandwidth configured on the interface, use the **show controllers t3** or **show controllers e3** command in EXEC mode.

When G.751 framing is used on E3 links, DSU bandwidth can be used to select a payload subrate from 34,010 kbps down to 22 kbps. Before framing bypass can be used, a DSU bandwidth of 34,010 kbps must be configured.

Although software allows the user to configure a continuous range of bandwidths in subrate modes, vendors support bandwidths only in quantums (for example, in a ADC Kentrox T3 link, bandwidth must be in multiples of 500 kbps). Therefore, the software sets the user-configured bandwidth to the closest vendor-supported bandwidth. Use the **show controllers t3** or **show controllers e3** command to display the actual bandwidth that is configured.

The following table shows DSU modes and vendor-supported bandwidths.

**Table 57: DSU Modes and Vendor-supported Bandwidths**

| Mode                   | Bandwidth (in kbps)                | Bandwidth Multiples (in kbps) |
|------------------------|------------------------------------|-------------------------------|
| Digital Link or Cisco  | 358–34010 for E3300–44210 for T3   | 358 300.746                   |
| ADC Kentrox T3/E3 IDSU | 1000–34010 for E31500–44210 for T3 | 500 500                       |
| Larscom Access T45     | 3100–44210 kbps                    | 3158                          |
| Adtran T3SU 300        | 75–44210 kbps                      | 75.186                        |
| Verilink HDM 2182      | 1500–44210 kbps                    | 1579                          |

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to set the maximum allowable DSU bandwidth to 16,000 kbps on a SIP in slot 6, on the SPA in subslot 2, for port 0, and T3 controller 1:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/2/0/1
RP/0/0/CPU0:router(config-t3)# dsu bandwidth 16000
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# dsu mode

To specify the interoperability mode used by a T3 or an E3 controller, use the **dsu mode** command in T3 or E3 configuration mode. To return to the default state, use the **no** form of this command.

**dsu mode mode**

**no dsu mode**

## Syntax Description

|             |                                                                                                                                                                                                                                                                        |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>mode</i> | DSU mode. Valid values are as follows: <ul style="list-style-type: none"><li>• (T3 only) <b>adtran</b></li><li>• cisco</li><li>• digital-link</li><li>• kentrox</li><li>• (T3 only) <b>larscom</b></li><li>• (T3 only) <b>verilink</b></li></ul> The default is cisco. |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Default

The default is cisco.

## Command Modes

T3 configuration  
E3 configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Refer to [Table 57: DSU Modes and Vendor-supported Bandwidths, on page 945](#) for more information regarding the modes.

The local interface configuration must match the remote interface configuration. For example, if you define the data service unit (DSU) interoperability mode as **digital-link** on the local port, you must also do the same on the remote port.

You must know what type of DSU is connected to the remote port to determine if it interoperates with a T3 or an E3 controller. The **dsu mode** command enables and improves interoperability with other DSUs.

To verify the DSU mode configured on the interface, use the **show controllers t3** command in EXEC mode.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to set the DSU mode to **digital-link** for T3 controller 1 located in chassis 0, on a SIP in slot 6 and SPA in subslot 2, and port 0 with T3 controller 1:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/2/0/1
RP/0/0/CPU0:router(config-t3)# dsu mode digital-link
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# dsu remote

To control the bandwidth usage with the remote port, use the **dsu remote** command in T3 or E3 configuration mode. To return to the default state, use the **no** form of this command.

```
dsu remote {disable| fullrate}
no dsu remote
```

Syntax Description

|          |                                                                          |
|----------|--------------------------------------------------------------------------|
| disable  | Denies incoming remote requests to reset the bandwidth to the full rate. |
| fullrate | Requests that the remote port set its bandwidth to full rate.            |

Command Default

Remote accept is the default.

Command Modes

T3 configuration  
E3 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

To verify the DSU remote settings configured on the interface, use the **show controllers t3** or **show controllers e3** command in EXEC mode.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

Examples

The following example shows how to specify that the connected remote port set its bandwidth to full rate:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/2/0
RP/0/0/CPU0:router(config-t3)# dsu remote fullrate
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

fdl

To enable or disable the transmission of performance reports through Facility Data Link (FDL) for a T1 channel on the channelized T3 interface, use the **fdl** command in T1 configuration mode. To return to the default state of performance reporting, use the **no** form of this command.

```
fdl {ansi| att} {enable| disable}
no fdl {ansi| att} {enable| disable}
```

|                    |         |                                                                                     |
|--------------------|---------|-------------------------------------------------------------------------------------|
| Syntax Description | ansi    | Specifies the transmission of ANSI T1.403 once-per-second performance reports.      |
|                    | att     | Specifies the transmission of AT&T TR54016 once-per-second performance reports.     |
|                    | enable  | Enables transmission of the specified performance reports.                          |
|                    | disable | Disables transmission of the specified performance reports. The default is disable. |

|                 |                                                                                                |
|-----------------|------------------------------------------------------------------------------------------------|
| Command Default | The transmission of ANSI T1.403 and AT&T TR54016 performance reports through FDL are disabled. |
|-----------------|------------------------------------------------------------------------------------------------|

|               |                  |
|---------------|------------------|
| Command Modes | T1 configuration |
|---------------|------------------|

|                 |               |                              |
|-----------------|---------------|------------------------------|
| Command History | Release       | Modification                 |
|                 | Release 3.3.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **fdl** command applies only to T1 lines and can be used only if the T1 framing type is Extended Super Frame (ESF).

To display the performance report information, use the **show controllers t1** command.

|         |           |             |
|---------|-----------|-------------|
| Task ID | Task ID   | Operations  |
|         | sonet-sdh | read, write |



## Examples

The following example shows how to enable ANSI T1.403 performance reports for T1 channel 10:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/1/10  
RP/0/0/CPU0:router(config-t1e1)# fdl ansi enable
```

## Related Commands

| Command                                                           | Description                                                                                      |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers t1</a> , <a href="#">on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

# framing (E1)

To select the frame type for an E1 data line, use the **framing** command in E1 configuration mode. To disable E1 framing, use the **no** form of this command.

```
framing {crc4| no-crc4| unframed}
no framing {crc4| no-crc4| unframed}
```

Syntax Description

|          |                                                                                  |
|----------|----------------------------------------------------------------------------------|
| crc4     | Specifies framing with CRC-4 error-monitoring capabilities. The default is crc4. |
| no-crc4  | Specifies framing without CRC-4 error-monitoring capabilities.                   |
| unframed | Specifies unframed E1.                                                           |

Command Default

The default is **crc4**.

Command Modes

E1 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **framing** command in configurations in which the router or access server is intended to communicate with E1 fractional data lines. The service provider determines the framing type required for your E1 circuit.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

Examples

The following example shows how to select E1 framing without CRC-4 error-monitoring capabilities:

```
RP/0/0/CPU0:router(config)# controller e1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1e1)# framing no-crc4
```

**Related Commands**

| Command                                           | Description                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e1</a> , on page 975 | Displays information about the E1 links and hardware and software drivers for the E1 controller. |

# framing (E3)

To select the frame type for E3 data lines, use the **framing** command in E3 configuration mode. To disable E3 framing, use the **no** form of this command.

```
framing {g751| g832}
no framing {g751| g832}
```

## Syntax Description

|      |                                                                                    |
|------|------------------------------------------------------------------------------------|
| g751 | Specifies that G.751 framing is used as the E3 framing type. The default is G.751. |
| g832 | Specifies that G.832 framing is used as the E3 framing type.                       |

## Command Default

The default is G.751.

## Command Modes

E3 configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you do not use the **framing** command, the default is used by the E3 controllers to automatically determine the framing type received from the far-end equipment. You can also set the framing for each T1/E1 channel by using the **framing** command in T1 or E1 configuration mode.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to select G751 as the E3 frame type:

```
RP/0/0/CPU0:router(config)# controller e3 0/6/0/0
RP/0/0/CPU0:router(config-e3)# framing g751
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |

# framing (T1)

To select the frame type for a T1 data line, use the **framing** command in T1 configuration mode. To disable T1 framing, use the **no** form of this command.

```
framing {esf| sf}
no framing {esf| sf}
```

|                    |     |                                                                                  |
|--------------------|-----|----------------------------------------------------------------------------------|
| Syntax Description | esf | Specifies extended super frame as the T1 frame type. The default is <b>esf</b> . |
|                    | sf  | Specifies super frame as the T1 frame type.                                      |

|                 |                             |
|-----------------|-----------------------------|
| Command Default | The default is <b>esf</b> . |
|-----------------|-----------------------------|

|               |                  |
|---------------|------------------|
| Command Modes | T1 configuration |
|---------------|------------------|

|                 |               |                              |
|-----------------|---------------|------------------------------|
| Command History | Release       | Modification                 |
|                 | Release 3.3.0 | This command was introduced. |

|                  |                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|                  | Use the <b>framing</b> command in configurations in which the router or access server is intended to communicate with T1 fractional data lines. The service provider determines the framing type required for your T1 /E1 circuit.    |

|         |           |             |
|---------|-----------|-------------|
| Task ID | Task ID   | Operations  |
|         | sonet-sdh | read, write |

|          |                                                                             |
|----------|-----------------------------------------------------------------------------|
| Examples | The following example shows how to select super frame as the T1 frame type: |
|----------|-----------------------------------------------------------------------------|

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1)# framing sf
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

# framing (T3)

To select the frame type for T3 data lines, use the **framing** command in T3 configuration mode. To disable T3 framing, use the **no** form of this command.

```
framing {auto-detect | c-bit| m23}
no framing {auto-detect | c-bit| m23}
```

Syntax Description

|             |                                                                                                  |
|-------------|--------------------------------------------------------------------------------------------------|
| auto-detect | Specifies that application identification channel signal framing is used as the T3 framing type. |
| c-bit       | Specifies that C-bit framing is used as the T3 framing type. The default is <b>c-bit</b> .       |
| m23         | Specifies that M23 framing is used as the T3 framing type.                                       |

Command Default

The default is **c-bit**.

Command Modes

T3 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If you do not use the **framing** command, the default is used by the T3 controllers to automatically determine the framing type received from the far-end equipment. You can also set the framing for each T1 or E1 channel by using the **framing** command in T1 or E1 configuration mode.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

Examples

The following example shows how to select M23 as the T3 frame type:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/0/0/1
```



```
RP/0/0/CPU0:router(config-t3)# framing m23
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# hw-module subslot cardtype

To set the ports on a SPA in T3, E3, T1, or E1 mode, use the **hw-module subslot cardtype** command in global configuration mode. To deselect the card type, use the **no** form of this command.

```
hw-module subslot subslot-id cardtype {e1| e3| t1| t3}
no hw-module subslot subslot-id cardtype {e1| e3| t1| t3}
```

## Syntax Description

|            |                                                                                                                 |
|------------|-----------------------------------------------------------------------------------------------------------------|
| subslot-id | Subslot to be power cycled. The <i>subslot-id</i> argument is entered in the <i>rack/slot/subslot</i> notation. |
| e1         | E1 fractional data line.                                                                                        |
| t1         | T1 fractional data line. The default for the 8-Port Channelized T1/E1 SPA is T1.                                |

## Command Default

The default for the 2-Port and 4-Port Clear Channel T3/E3 SPAs is T3.  
The default for the 8-Port Channelized T1/E1 SPA is T1.

## Command Modes

Global configuration

## Command History

| Release       | Modification                                     |
|---------------|--------------------------------------------------|
| Release 3.3.0 | This command was introduced.                     |
| Release 3.6.0 | The <b>t1</b> and <b>e1</b> keywords were added. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **hw-module subslot cardtype** command applies only to the following SPAs:

- 2-Port and 4-Port Clear Channel T3/E3 SPAs
- 8-Port Channelized T1/E1 SPA

By default, the 2-Port and 4-Port Clear Channel T3/E3 SPAs boot in T3 mode , while the 8-Port Channelized T1/E1 SPA boots in T1 mode. Use the **hw-module subslot cardtype** command to change the setting to E3 for the 2-Port and 4-Port Clear Channel T3/E3 SPAs and to E1 for the 8-Port Channelized T1/E1 SPA.

If there are nondefault configurations on the card interfaces, you must delete them before you can change the card type. Use the **no controller { e1 | e3 | t1 | t3 }** and **no interface serial** commands to delete any T3, E3, T1, E1, or serial configurations.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| root-lr | read, write |

**Examples**

The following example shows how to configure all ports of a 2-Port or 4-Port Clear Channel T3/E3 SPA located in slot 5, subslot 2 to E3 mode:

```
RP/0/0/CPU0:router(config)# hw-module subslot 0/5/2 cardtype e3
```

The following example shows how to configure all ports of an 8-Port Channelized T1/E1 SPA located in slot 2, subslot 1 to E1 mode:

```
RP/0/0/CPU0:router(config)# hw-module subslot 0/2/1 cardtype e1
```

**Related Commands**

| Command                                       | Description                                                                            |
|-----------------------------------------------|----------------------------------------------------------------------------------------|
| <a href="#">controller e1, on page 920</a>    | Configures an E1 controller and enters E1 configuration mode.                          |
| <a href="#">controller e3, on page 922</a>    | Configures an E3 controller and enters E3 configuration mode.                          |
| <a href="#">controller t1, on page 924</a>    |                                                                                        |
| <a href="#">controller t3, on page 926</a>    | Configures a T3 controller and enters T3 configuration mode.                           |
| <a href="#">interface serial, on page 733</a> | Configures a serial interface and enters interface or subinterface configuration mode. |

# linecode

To select the line-code type for T1 or E1 lines, use the **linecode** command in T1 or E1 configuration mode. To return the line to the default line-code type, use the **no** form of this command.

**linecode** {ami| b8zs| hdb3}

**no linecode** {ami| b8zs| hdb3}

## Syntax Description

|             |                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------|
| <b>ami</b>  | Specifies alternate mark inversion (AMI) as the line-code type. This value is the default for E1 lines. |
| <b>b8zs</b> | (T1 only) Specifies B8ZS as the line-code type. This value is the default for T1 lines.                 |
| <b>hdb3</b> | (E1 only) Specifies high-density bipolar 3 (HDB3) as the line-code type.                                |

## Command Default

T1 lines: the default is B8ZS.

E1 lines: the default is AMI.

## Command Modes

T1 configuration

E1 configuration

## Command History

|               |                              |
|---------------|------------------------------|
| Release 3.6.0 | This command was introduced. |
|---------------|------------------------------|

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use this command in configurations where the router must communicate with T1 or E1 fractional data lines. The T1 or E1 service provider determines which line-code type is required for your T1 or E1 circuit.

## Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to select AMI as the T1 line-code type:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/1/1
```

```
RP/0/0/CPU0:router(config-t1)# linecode ami
```

The following example shows how to select HDB3 as the E1 line-code type:

```
RP/0/0/CPU0:router(config)# controller e1 0/4/1/1  
RP/0/0/CPU0:router(config-e1)# linecode hdb3
```

#### Related Commands

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e1, on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

## loopback (T1/E1)

To loop individual T1 or E1 channels on the channelized T3 controller, use the **loopback** command in T1 or E1 configuration mode. To remove the loop, use the **no** form of this command.

```
loopback {local| network {line| payload}| remote {line {fdl {ansi| bellcore}| inband}| payload fdl ansi}}
no loopback {local| network {line| payload}| remote {line {fdl {ansi| bellcore}| inband}| payload fdl
ansi}}
```

### Syntax Description

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>local</b>                    | Loops the router output data back toward the router at the T1 framer and sends an alarm indication signal (AIS) signal out toward the network.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>network {line   payload}</b> | <p>T1 loopback with encapsulation HDLC:</p> <p>Loops the data back toward the network before the T1 framer and automatically sets a local loopback at the High-Level Data Link Control (HDLC) controllers (line), or loops the payload data back toward the network at the T1 framer and automatically sets a local loopback at the HDLC controllers (payload).</p> <p>T1 loopback with encapsulation PPP:</p> <p>Loops the data back toward the network before the T1 framer and automatically sets a local loopback at the PPP serial interface (line), or loops the payload data back toward the network at the T1 framer and automatically sets a local loopback at the PPP serial interface (payload).</p> |
| <b>remote line fdl</b>          | (T1 only) Sends a repeating, 16-bit Extended Superframe (ESF) data link code word (00001110 11111111 for FDL ANSI and 00010010 11111111 for FDL Bellcore) to the remote end, requesting that it enter into a network line loopback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>remote line inband</b>       | (T1 only) Sends a repeating, 5-bit inband pattern (00001) to the remote end requesting that it enter into a network line loopback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>remote payload fdl</b>       | (T1 only) Sends a repeating, 16-bit ESF data link code word (00010100 11111111) to the remote end, requesting that it enter into a network payload loopback. Enables the remote payload FDL ANSI bit loopback on the T1 channel.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>ansi</b>                     | (T1 only) Enables the remote line Facility Data Link (FDL) ANSI bit loopback on the T1 channel, based on the ANSI T1.403 specification.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>bellcore</b>                 | (T1 only) Enables the remote SmartJack loopback on the T1 channel, based on the TR-TSY-000312 specification.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### Command Default

No loops are configured.

### Command Modes

T1 configuration

## E1 configuration

**Command History**

Release 3.3.0

This command was introduced.

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **loopback** command for troubleshooting purposes. To verify that a loopback is configured on the interface, use the **show controllers t1** or **show controllers e1** command in EXEC mode.

For E1 lines, only the **local** and **network** options are valid. For T1 lines, all listed options are valid.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to configure the T1 for a local loopback:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1)# loopback local
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">framing (E1), on page 952</a>        | Selects the frame type for an E1 data line.                                                      |
| <a href="#">framing (T1), on page 956</a>        | Selects the frame type for a T1 data line.                                                       |
| <a href="#">show controllers e1, on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

# loopback (T3/E3)

To loop the entire T3 or E3 line (all 28 T1 channels or all 21 E1 channels) on the T3 controller or E3 controller, use the **loopback** command in T3 or E3 configuration mode. To remove the loop, use the **no** form of this command.

```
loopback {local| {network| remote {line| payload}}}  
no loopback
```

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| local                    | Loops the data back toward the router and sends an alarm indication signal (AIS) out toward the network.                                                                                                                                                                              |
| network {line   payload} | Sets the loopback toward the network before going through the framer ( <b>line</b> ) or after going through the framer ( <b>payload</b> ).                                                                                                                                            |
| remote {line   payload}  | Sends a far-end alarm control (FEAC) request to the remote end requesting that it enter into a network line loopback. FEAC requests (and therefore remote loopbacks) are possible only when the T3 is configured for C-bit framing. The M23 format does not support remote loopbacks. |

## Command Default

No loops are configured on the T3 line.

## Command Modes

T3 configuration  
E3 configuration

## Command History

|               |                              |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |
|---------------|------------------------------|

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **loopback** command for troubleshooting purposes. To verify that a loopback is configured on the interface, use the **show controllers t3** or **show controllers e3** command in EXEC mode. Note that remote loopback is valid only in C-bit parity mode.

You can also loopback each T1 or E1 channel by using the **loopback** command in T1 or E1 configuration mode.



**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to configure the T3 for a local loopback:

```
RP/0/0/CPU0:router(config)# controller t3 0/3/0/0  
RP/0/0/CPU0:router(config-t3)# loopback local
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">framing (E1), on page 952</a>        | Selects the frame type for an E1 data line.                                                      |
| <a href="#">framing (T1), on page 956</a>        | Selects the frame type for a T1 data line.                                                       |
| <a href="#">loopback (T1/E1), on page 964</a>    | Loops individual T1 or E1 channels on the channelized T3 controller.                             |
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# mdl

To configure the Maintenance Data Link (MDL) message defined in the ANSI T1.107a-1990 specification, use the **mdl** command in T3 configuration mode. To remove the message, use the **no** form of this command.

```
{mdl string {eic| fi| fic| gen-number| lic| port-number| unit} string| transmit {idle-signal| path| test-signal}
{disable| enable}}
```

```
{no mdl string {eic| fi| fic| gen-number| lic| port-number| unit} string| transmit {idle-signal| path|
test-signal} {disable| enable}}
```

## Syntax Description

|                                         |                                                                                                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>string eic</b> <i>string</i>         | Specifies the Equipment Identification Code; can be up to 10 characters.                               |
| <b>string fi</b> <i>string</i>          | Specifies the Facility Identification Code sent in the MDL Path message; can be up to 38 characters.   |
| <b>string fic</b> <i>string</i>         | Specifies the Frame Identification Code; can be up to 10 characters.                                   |
| <b>string gen-number</b> <i>string</i>  | Specifies the Generator number string sent in the MDL Test Signal message; can be up to 38 characters. |
| <b>string lic</b> <i>string</i>         | Specifies the Location Identification Code; can be up to 11 characters.                                |
| <b>string port-number</b> <i>string</i> | Specifies the Port number string sent in the MDL Idle Signal message; can be up to 10 characters.      |
| <b>string unit</b> <i>string</i>        | Specifies the Unit Identification Code; can be up to 6 characters.                                     |
| <b>transmit idle-signal</b>             | Specifies the transmission of the MDL Idle Signal message.                                             |
| <b>transmit path</b>                    | Specifies the transmission of the MDL Path message.                                                    |
| <b>transmit test-signal</b>             | Specifies the transmission of the MDL Test Signal message.                                             |
| <b>disable   enable</b>                 | Disables or enables transmission of the specified message.                                             |

## Command Default

No MDL message is configured.

## Command Modes

T3 configuration

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Use the **show controllers t3** command to display MDL information (received strings). MDL information is displayed only when framing is set to C-bit.

**Note**

MDL is supported only when the DS3 framing is C-bit parity.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows the **mdl** commands on a T3 controller in slot 1, subslot 2, port 0:

```
RP/0/0/CPU0:router(config)# controller t3 0/1/2/0
RP/0/0/CPU0:router(config-t3)# clock source line
RP/0/0/CPU0:router(config-t3)# mdl string eic ID
RP/0/0/CPU0:router(config-t3)# mdl string fic Building B
RP/0/0/CPU0:router(config-t3)# mdl string unit ABC
RP/0/0/CPU0:router(config-t3)# mdl string fi Facility Z
RP/0/0/CPU0:router(config-t3)# mdl string port-number Port 7
RP/0/0/CPU0:router(config-t3)# mdl transmit path enable
RP/0/0/CPU0:router(config-t3)# mdl transmit idle-signal enable
```

**Related Commands**

| Command                                           | Description                                                                                      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers t3</a> , on page 991 | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

# mode

To set the mode of the T3/E3 or T1/E1 controller, use the **mode** command in T3, E3, T1, or E1 configuration mode. To disable the controller mode, use the **no** form of this command.

```
mode {atm| e1| serial| t1}
no mode {atm| e1| serial| t1}
```

Syntax Description

|        |                                                                                                                                                       |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| atm    | Specifies the mode of the port to be a clear channel transporting ATM.                                                                                |
| e1     | (T3 and E3 only) Specifies the mode of the port to be channelized E1.                                                                                 |
| serial | (T3 and E3 only) Specifies the mode of the port to be clear channel serial. The default for the 2-Port and 4-Port Clear Channel T3/E3 SPAs is serial. |
| t1     | (T3 and E3 only) Specifies the mode of the port to be channelized T1.                                                                                 |

Command Default

The default for the 2-Port and 4-Port Clear Channel T3/E3 SPAs is serial.  
There is no default for the 2-Port and 4-Port Channelized T3 SPAs.

Command Modes

- T3 configuration
- E3 configuration
- T1 configuration
- E1 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

You can change the mode of a controller only when there are no subinterfaces defined for the controller. For example, if you previously defined channelized T1 subinterfaces on a T3 interface and now you want to change this to E1 subinterfaces or a clear channel interface, you must first clear the subinterfaces. To do this, use the **no controller t1** command for all defined T1/E1 subinterfaces. If you have defined serial parameters, you also need to use the **no interface serial** command.

For channelized SPAs, you must use the **mode** command before you can configure any channelized controllers.

**Task ID**

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

**Examples**

The following example shows how to change the mode of a T3 port to channelized T1:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/0/0  
RP/0/0/CPU0:router(config-t3)# mode t1
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e1, on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

## national bits (E1)

To specify the national reserved bits for an E1 port, use the **national bits** command in E1 configuration mode. To revert to the default national bits, use the **no** form of this command.

**national bits** *bits*

**no national bits** *bits*

### Syntax Description

*bits* Bit pattern. Values can be from 0 to 31. The default is 0.

### Command Default

The default is 0, which corresponds to 0x1f.

### Command Modes

E1 configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows how to specify the national bits for the E1 controller:

```
RP/0/0/CPU0:router(config)# controller e1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1e1)# national bits 3
```

### Related Commands

| Command                                                           | Description                                                                                      |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e1</a> , <a href="#">on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |

## national bits (E3)

To enable or disable the national reserved bit pattern on an E3 port, use the **national bits** command in E3 configuration mode. To revert to the default value, use the **no** form of this command.

**national bits** {disable| enable}

**no national bits** {disable| enable}

### Syntax Description

|                |                                                                               |
|----------------|-------------------------------------------------------------------------------|
| <b>disable</b> | Disables national reserved bits for an E3 port.                               |
| <b>enable</b>  | Enables national reserved bits for an E3 port. The default is <b>enable</b> . |

### Command Default

The default is **enable**.

### Command Modes

E3 configuration

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows how to enable the national bits for an E3 controller:

```
RP/0/0/CPU0:router(config)# controller e3 0/6/2/0  
RP/0/0/CPU0:router(config-e3)# national bits enable
```

Related Commands

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |



# show controllers e1

To display information about the E1 links and hardware and software drivers for the E1 controller, use the **show controllers e1** command in EXEC mode.

**show controllers e1** *interface-path-id* [**all**|**bert**|**brief**|**internal-state**|**tabular**]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | Displays all information for the controllers.                                                                                                                                                                                                                                   |
| <b>bert</b>              | Displays internal E1 bit error rate test results.                                                                                                                                                                                                                               |
| <b>brief</b>             | Displays summary information for the E1 controller.                                                                                                                                                                                                                             |
| <b>internal-state</b>    | Displays internal E1 state information.                                                                                                                                                                                                                                         |
| <b>tabular</b>           | Displays E1 controller information in tabular format.                                                                                                                                                                                                                           |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.

- *module*: Module number. A physical layer interface module (PLIM) is always 0.
- *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

Examples

The following example shows sample output from the **show controllers e1** command for a single E1 channel:

```
RP/0/0/CPU0:router# show controllers e1 0/1/0/0

E1 0/1/0/0 is down
timeslots:
Receiver has no alarms.
Framing is E1 CRC, Clock Source is internal
Data in current interval (0 seconds elapsed):
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
  0 Near-end path failures, 0 Far-end path failures, 0 SEF/AIS Secs
```

Table 58: show controllers e1 Field Descriptions

| Field                  | Description                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E1 0/1/0/0 is down     | E1 channel is not operating. The channel state can be up, down, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped).                                                                                                                                                                                                                                                |
| timeslots              | DS0 time slots assigned to the E1 channel.                                                                                                                                                                                                                                                                                                                                                                       |
| Receiver has no alarms | Any alarms detected by the E1 controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"><li>• Transmitter is sending remote alarm.</li><li>• Transmitter is sending AIS.</li><li>• Receiver has loss of signal.</li><li>• Receiver is getting AIS.</li><li>• Receiver has loss of frame.</li><li>• Receiver has remote alarm.</li><li>• Receiver has no alarms.</li></ul> |

| Field                  | Description                                                                                                                                                                                                                                                      |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Framing                | Framing type on the channelized controller.                                                                                                                                                                                                                      |
| Clock Source           | Clock source controller. Values are internal and line.                                                                                                                                                                                                           |
| Line Code Violations   | Line Code Violations (LCVs) is a count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) that occur over the accumulation period. An EXZ increments the LCV by one regardless of the length of the zero string.                                       |
| P-bit Coding Violation | For all DS3 applications, a P-bit coding violation (PCV) error event is a P-bit parity error event. A P-bit parity error event is the occurrence of a received P-bit code on the DS3 M-frame that is not identical to the corresponding locally calculated code. |
| Slip Secs              | Controlled slip second (CSS) is a 1-second interval that contains one or more controlled slips.                                                                                                                                                                  |
| Fr Loss Secs           | Frame loss seconds (SELS) is the number of seconds for which an out-of-frame error is detected.                                                                                                                                                                  |
| Line Err Secs          | Line errored seconds (LES) is a second in which one or more line code violation errors are detected.                                                                                                                                                             |
| Degraded Mins          | Degraded minute (DM) is a minute in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3. For more information, see RFC 1406, <i>Definitions of Managed Objects for DS1 and E1 Interface Types</i> .                                             |
| Errored Secs           | Errored seconds (ES) is a second with one or more path coding violations, one or more out-of-frame defects, or one or more controlled slip events or a detected AIS defect.                                                                                      |
| Bursty Err Secs        | Bursty errored seconds (BES) is a second with fewer than 320 and more than one path coding violation error events, no severely errored frame defects, and no detected incoming AIS defects. Controlled slips are not included in this parameter.                 |
| Severely Err Secs      | Severely errored seconds (SES) is a second with 320 or more path code violation errors events, one or more out-of-frame defects, or a detected AIS defect.                                                                                                       |
| Unavailable Secs       | Number of seconds during which the interface was not available in this interval, referred to as UAS.                                                                                                                                                             |

show controllers e1

| Field                  | Description                                                                                                                                                                                                                                                                                                                                                         |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stuffed Secs           | Stuffed seconds (SS) is a second in which one more bit stuffings take place. This happens when the Pulse Density Enforcer detects a potential violation in the output stream and inserts a 1 to prevent it. Such bit stuffings corrupt user data and indicate that the network is configured incorrectly. This counter can be used to help diagnose this situation. |
| Near-end path failures | Path failure (PFC)                                                                                                                                                                                                                                                                                                                                                  |
| Far-end path failures  | (PFCFE)                                                                                                                                                                                                                                                                                                                                                             |
| SEF/AIS Secs           | (SAS)                                                                                                                                                                                                                                                                                                                                                               |

Related Commands

| Command                                    | Description                                                   |
|--------------------------------------------|---------------------------------------------------------------|
| <a href="#">controller e1, on page 920</a> | Configures an E1 controller and enters E1 configuration mode. |

# show controllers e3

To display information about the E3 links and hardware and software drivers for the E3 controller, use the **show controllers e3** command in EXEC mode.

**show controllers e3** *interface-path-id* [**all**|**bert**|**brief**|**internal-state**|**tabular**]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | Displays all information for the controllers.                                                                                                                                                                                                                                   |
| <b>bert</b>              | Displays internal E3 bit error rate test results.                                                                                                                                                                                                                               |
| <b>brief</b>             | Displays summary information for the E3 controller.                                                                                                                                                                                                                             |
| <b>internal-state</b>    | Displays internal E3 state information.                                                                                                                                                                                                                                         |
| <b>tabular</b>           | Displays E3 controller information in tabular format.                                                                                                                                                                                                                           |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.

- *module*: Module number. A physical layer interface module (PLIM) is always 0.
- *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

**Task ID**

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

**Examples**

The following example shows sample output from the **show controllers e3** command for a single E3 port:

```
RP/0/0/CPU0:router# show controllers e3 0/2/0/0

E3 0/2/0/0 is down
Transmitter is sending RAI.
Receiver has loss of frame.
Framing is G.751, Line Code is B3ZS, Clock Source is Internal
Subrate is enabled. Mode: Cisco(default), Bandwidth: 34010 kbps
Remote accept is enabled
Remote fullrate has no request outstanding
Data in current interval (360 seconds elapsed):
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  360 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
```

The following example shows sample output from the **show controllers e3** command using the **tabular** keyword, for a single E3 port:

```
RP/0/0/CPU0:router# show controllers e3 0/2/0/0 tabular

E3 0/2/0/0 is down
Transmitter is sending RAI.
Receiver has loss of frame.
Framing is G.751, Line Code is B3ZS, Clock Source is Internal
Subrate is enabled. Mode: Cisco(default), Bandwidth: 34010 kbps
Remote accept is enabled
Remote fullrate has no request outstanding
INTERVAL      LCV   PCV   CCV   PES   PSES  SEFS   UAS   LES   CES   CSES
07:49-07:56    0     0     0     0     0     0    380    0     0     0
Data in current interval (380 seconds elapsed):
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  380 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
```

**Table 59: show controllers e3 Field Descriptions**

| Field                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transmitter is sending RAI                 | Any alarms detected by the controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> |
| Framing                                    | Framing type on the controller. Values are G.751 and G.832.                                                                                                                                                                                                                                                                                                                                                           |
| Line Code                                  | Line coding format on the controller.                                                                                                                                                                                                                                                                                                                                                                                 |
| Clock Source                               | Clock source on the channelized controller. Values are internal and line.                                                                                                                                                                                                                                                                                                                                             |
| Data in current interval (seconds elapsed) | Shows the current accumulation period, which rolls into the 24-hour accumulation every 15 minutes. The accumulation period is from 1 to 900 seconds. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer.                                                                                                                                                                               |
| Line Code Violations                       | Line Code Violations (LCVs) is a count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) that occur over the accumulation period. An EXZ increments the LCV by one regardless of the length of the zero string.                                                                                                                                                                                            |
| P-bit Coding Violation                     | For all DS3 applications, a P-bit coding violation (PCV) error event is a P-bit parity error event. A P-bit parity error event is the occurrence of a received P-bit code on the DS3 M-frame that is not identical to the corresponding locally calculated code.                                                                                                                                                      |
| C-bit Coding Violation                     | For C-bit parity and SYNTRAN DS3 applications, the C-bit coding violation (CCV) is the count of coding violations reported by the C-bits. For C-bit parity, it is the count of CP-bit parity errors that occur during the accumulation interval. For SYNTRAN, it is a count of CRC-9 errors that occur during the accumulation interval.                                                                              |

| Field                       | Description                                                                                                                                                                                               |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P-bit Err Secs              | P-bit errored seconds (PES) is a second with one or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge does not increment when unavailable seconds are counted.          |
| P-bit Severely Err Secs     | P-bit severely errored seconds (PSES) is a second with 44 or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge does not increment when unavailable seconds are counted. |
| Severely Err Framing Secs   | Severely errored framing seconds (SEFS) is a second with one or more out-of-frame defects or a detected incoming AIS.                                                                                     |
| Unavailable Secs            | The number of unavailable seconds (UAS) is calculated by counting the number of seconds for which the interface is unavailable. For more information, see RFC 1407, <i>DS3 MIB Variables</i> .            |
| Line Errored Secs           | Line errored seconds (LES) is a second in which one or more code violations or one or more LOS defects occurred.                                                                                          |
| C-bit Errored Secs          | C-bit errored seconds (CES) is a second with one or more C-bit code violations (CCV), one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.  |
| C-bit Severely Errored Secs | C-bit severely errored seconds (CSES) is a second with 44 or more CCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.                |
| Total Data (last 24 hours)  | Shows the last 15-minute accumulation period.                                                                                                                                                             |

**Related Commands**

| Command                                     | Description                                                   |
|---------------------------------------------|---------------------------------------------------------------|
| <a href="#">controller e3</a> , on page 922 | Configures an E3 controller and enters E3 configuration mode. |



# show controllers t1

To display information about the T1 links and hardware and software drivers for the T1 controller, use the **show controllers t1** command in EXEC mode.

**show controllers t1** *interface-path-id* [**all**| **bert**| **brief**| **internal-state**| **remote** {**performance brief**| **tabular**}| **tabular**]

## Syntax Description

|                                                             |                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i>                                    | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>                                                  | Displays all information for the controllers.                                                                                                                                                                                                                                |
| <b>bert</b>                                                 | Displays internal T1 bit error rate test results.                                                                                                                                                                                                                            |
| <b>brief</b>                                                | Displays summary information for the T1 controller.                                                                                                                                                                                                                          |
| <b>internal-state</b>                                       | Displays internal T1 state information.                                                                                                                                                                                                                                      |
| <b>remote</b> { <b>performance brief</b>   <b>tabular</b> } | Displays remote performance information in a brief summary or table format.                                                                                                                                                                                                  |
| <b>tabular</b>                                              | Displays T1 controller information in table format.                                                                                                                                                                                                                          |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

When specifying a channelized T1 controller, use the following guidelines for the *interface-path-id*:

- The naming notation is *rack/slot/module/port/T3Num/T1num*.

- The slash between values is required as part of the notation.
- The following list describes the components of the notation:
  - *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *T3num*—T3 controller number.
  - *T1num*—T1 controller number.
- If specifying a virtual interface, the number range varies, depending on interface type.
- When specifying a virtual tributary group, the naming notation is *rack/slot/module/port/vtg/vt*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *vtg*—Virtual tributary group.
  - *vt*—Virtual tributary instance.

Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

Examples

The following example shows sample output from the **show controllers t1** command with the **brief** keyword for a single T1 channel:

```
RP/0/0/CPU0:router# show controllers t1 0/4/2/0/1 brief

T1 0/4/2/0/1 is up
mode: ATM
timeslots: 1-24
FDL per AT&T 54016 spec.
Receiver has no alarms.
Framing is ESF, Line Code is B8ZS, Clock Source is internal
Alarm Soaking Interval:
    Alarm Declaring= 2500 msec
    Alarm clearing = 10000 msec

Bert Test on controller port : T1 0/4/2/0/1
BERT test result (not running)
```

```

Test Pattern : Not Configured, Status : not running, Sync Detected : 0
Interval : 1 minute(s), Time Remain : 0 (ms)
Bit Errors (since BERT started): 0 bits,
Bits Received (since BERT started): 0 Kbits
Bit Errors (since last sync): 0 bits
Bits Received (since last sync): 0 Kbits

```

**Table 60: show controllers t1 brief Field Descriptions**

| Field                          | Description                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T1 0/4/2/0/1 is up             | T1 channel is operating. The channel state can be up, down, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped).                                                                                                                                                                                                                                                            |
| mode                           | Mode of the T1 controller, which can be ATM.                                                                                                                                                                                                                                                                                                                                                                             |
| timeslots                      | DS0 time slots assigned to the T1 channel.                                                                                                                                                                                                                                                                                                                                                                               |
| FDL per <i>spec-name</i> spec. | Performance monitoring is through Facility Data Link based on ANSI T1.403 specification or AT&T standard specification number 54016.                                                                                                                                                                                                                                                                                     |
| Receiver has no alarms.        | Any alarms detected by the T1 controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> |
| Framing                        | Framing type on the channelized controller. Values are ESF and SF.                                                                                                                                                                                                                                                                                                                                                       |
| Line Code                      | Line coding format on the channelized controller. Values are AMI or B8ZS.                                                                                                                                                                                                                                                                                                                                                |
| Clock Source                   | Clock source on the T1 channel. Values are internal and line.                                                                                                                                                                                                                                                                                                                                                            |

| Field                              | Description                                                                                                                                                                                                                                                                            |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Soaking Interval             | Values of the following alarm soaking intervals: <ul style="list-style-type: none"> <li>• Alarm declarings: amount of time, in milliseconds, after which an alarm is declared.</li> <li>• Alarm clearing: amount of time, in milliseconds, after which an alarm is cleared.</li> </ul> |
| Bert Test on controller port       | Indicates controller port on which BERT test can be run.                                                                                                                                                                                                                               |
| BERT test result                   | Indicates the current state of the test. Can be one of the following: <ul style="list-style-type: none"> <li>• running— BER test is still in progress.</li> <li>• done—BER test is complete.</li> <li>• not running—BER test is not running on the controller.</li> </ul>              |
| Test Pattern                       | Indicates the test pattern you selected for the test.                                                                                                                                                                                                                                  |
| Status                             | Indicates the current synchronization state (sync).                                                                                                                                                                                                                                    |
| Sync Detected                      | Indicates the number of times synchronization has been detected during this test.                                                                                                                                                                                                      |
| Interval                           | Indicates the length of the test.                                                                                                                                                                                                                                                      |
| Time Remain                        | Indicates the time remaining for the test to run. <p><b>Note</b> If you terminate a BER test, you receive a message similar to the following: Time Remain : 2 minute(s) (unable to complete) "(Unable to complete)" signifies that you interrupted the test.</p>                       |
| Bit Errors (since BERT started)    | Bit errors that have been detected since the test started.                                                                                                                                                                                                                             |
| Bits Received (since BERT started) | Total number of test bits that have been received since the test started.                                                                                                                                                                                                              |
| Bit Errors (since last sync)       | Bit errors that have been detected since the synchronization started.                                                                                                                                                                                                                  |
| Bits Received (since last sync)    | Total number of test bits that have been received since the synchronization started.                                                                                                                                                                                                   |

The following example shows sample output from the **show controllers t1** command for a single T1 channel:

```
RP/0/0/CPU0:router# show controllers t1 0/4/2/0/1

T1 0/4/2/0/1 is up
mode: ATM
timeslots: 1-24
FDL per AT&T 54016 spec.
Receiver has no alarms.
Framing is ESF, Line Code is B8ZS, Clock Source is internal
Data in current interval (38 seconds elapsed):
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
  0 Near-end path failures, 0 Far-end path failures, 0 SEF/AIS Secs
Data in Interval 1:
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
  0 Near-end path failures, 0 Far-end path failures, 0 SEF/AIS Secs
Data in Interval 2:
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
  0 Near-end path failures, 0 Far-end path failures, 0 SEF/AIS Secs
.
.
.
```

The following example shows sample output from the **show controllers t1** command with the **tabular** keyword for a single T1 channel:

```
RP/0/0/CPU0:router# show controllers t1 0/4/2/0/1 tabular

T1 0/4/2/0/1 is up
mode: ATM
timeslots: 1-24
FDL per AT&T 54016 spec.
Receiver has no alarms.
Framing is ESF, Line Code is B8ZS, Clock Source is internal

```

| INTERVAL    | LCV | PCV | CSS | SEFS | LES | DM | ES | BES | SES | UAS | SSS |
|-------------|-----|-----|-----|------|-----|----|----|-----|-----|-----|-----|
| 08:30-08:35 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 08:15-08:30 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 08:00-08:15 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 07:45-08:00 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 07:30-07:45 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 07:15-07:30 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 07:00-07:15 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 06:45-07:00 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 06:30-06:45 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 06:15-06:30 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 06:00-06:15 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 05:45-06:00 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 05:30-05:45 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |
| 05:15-05:30 | 0   | 0   | 0   | 0    | 0   | 0  | 0  | 0   | 0   | 0   | 0   |

```

.
.
.
```

**Table 61: show controllers t1 and show controllers t1 tabular Field Descriptions**

| Field                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T1 0/4/2/0/1 is up                         | T1 channel is operating. The channel state can be up, down, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped).                                                                                                                                                                                                                                                            |
| mode                                       | Mode of the T1 controller, which can be ATM.                                                                                                                                                                                                                                                                                                                                                                             |
| timeslots                                  | DS0 time slots assigned to the T1 channel.                                                                                                                                                                                                                                                                                                                                                                               |
| FDL per <i>spec-name</i> spec.             | Performance monitoring is through Facility Data Link based on ANSI T1.403 specification or AT&T standard specification number 54016.                                                                                                                                                                                                                                                                                     |
| Receiver has no alarms.                    | Any alarms detected by the T1 controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> |
| Framing                                    | Framing type on the channelized controller. Values are ESF and SF.                                                                                                                                                                                                                                                                                                                                                       |
| Line Code                                  | Line coding format on the channelized controller. Values are AMI or B8ZS.                                                                                                                                                                                                                                                                                                                                                |
| Clock Source                               | Clock source on the T1 channel. Values are internal and line.                                                                                                                                                                                                                                                                                                                                                            |
| Data in current interval (seconds elapsed) | Shows the current accumulation period, which rolls into the 24-hour accumulation every 15 minutes. The accumulation period is from 1 to 900 seconds. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer.                                                                                                                                                                                  |
| Line Code Violations                       | Line Code Violations (LCVs) is a count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) that occur over the accumulation period. An EXZ increments the LCV by one regardless of the length of the zero string.                                                                                                                                                                                               |

| Field                  | Description                                                                                                                                                                                                                                                                                                                                                          |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slip Secs              | Controlled slip second (CSS) is a 1-second interval that contains one or more controlled slips.                                                                                                                                                                                                                                                                      |
| Fr Loss Secs           | Frame loss seconds (SELS) is the number of seconds for which an out-of-frame error is detected.                                                                                                                                                                                                                                                                      |
| Line Err Secs          | Line errored seconds (LES) is a second in which one or more line code violation errors are detected.                                                                                                                                                                                                                                                                 |
| Degraded Mins          | Degraded minute (DM) is a minute in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3. For more information, see RFC 1406, <i>Definitions of Managed Objects for DS1 and E1 Interface Types</i> .                                                                                                                                                 |
| Errored Secs           | Errored seconds (ES) is a second with one or more path coding violations, one or more out-of-frame defects, or one or more controlled slip events or a detected AIS defect.                                                                                                                                                                                          |
| Bursty Err Secs        | Bursty errored seconds (BES) is a second with fewer than 320 and more than one path coding violation error events, no severely errored frame defects, and no detected incoming AIS defects. Controlled slips are not included in this parameter.                                                                                                                     |
| Severely Err Secs      | Severely errored seconds (SES) is a second with 320 or more path code violation errors events, one or more out-of-frame defects, or a detected AIS defect.                                                                                                                                                                                                           |
| Unavailable Secs       | Number of seconds during which the interface was not available in this interval, referred to as UAS.                                                                                                                                                                                                                                                                 |
| Stuffed Secs           | Stuffed seconds (SSS) is a second in which one more bit stuffings take place. This happens when the Pulse Density Enforcer detects a potential violation in the output stream and inserts a 1 to prevent it. Such bit stuffings corrupt user data and indicate that the network is configured incorrectly. This counter can be used to help diagnose this situation. |
| Near-end path failures | Total number of near-end path failures.                                                                                                                                                                                                                                                                                                                              |
| Far-end path failures  | Total number of far-end path failures.                                                                                                                                                                                                                                                                                                                               |
| SEF/AIS Secs           | Total number of Severely Errored Framing (SEF) and Alarm Indication Signal (AIS) errors.                                                                                                                                                                                                                                                                             |

show controllers t1

Related Commands

| Command                                     | Description |
|---------------------------------------------|-------------|
| <a href="#">controller t1</a> , on page 924 |             |



# show controllers t3

To display information about the T3 links and hardware and software drivers for the T3 controller, use the **show controllers t3** command in EXEC mode.

**show controllers t3** *interface-path-id* [**all**|**bert**|**brief**|**internal-state**|**tabular**]

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-path-id</i> | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>all</b>               | Displays all information for the controllers.                                                                                                                                                                                                                                   |
| <b>bert</b>              | Displays internal T3 bit error rate test results.                                                                                                                                                                                                                               |
| <b>brief</b>             | Displays summary information for the controller.                                                                                                                                                                                                                                |
| <b>internal-state</b>    | Displays internal T3 state information.                                                                                                                                                                                                                                         |
| <b>tabular</b>           | Displays T3 controller information in tabular format.                                                                                                                                                                                                                           |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release       | Modification                                          |
|---------------|-------------------------------------------------------|
| Release 3.3.0 | This command was introduced.                          |
| Release 3.5.0 | The command output was updated to display new fields. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- When specifying a T3 controller, the naming notation is *rack/slot/module/port/T3num*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:

- *rack*—Chassis number of the rack.
  - *slot*—Physical slot number of the line card or SIP.
  - *module*—Module number or subslot (for a SPA). A physical layer interface module (PLIM) is always 0.
  - *port*—Physical port number of the interface.
  - *T3num*—T3 controller number.
- If specifying a virtual interface, the number range varies, depending on interface type.

Task ID

| Task ID   | Operations |
|-----------|------------|
| interface | read       |

Examples

The following example shows sample output from the **show controllers t3** command using the **brief** keyword for a single T3 port:

```
RP/0/0/CPU0:router# show controllers t3 0/4/2/0/1 brief

T3 0/4/2/0 is up
No alarms detected.
mode: serial
MDL transmission is disabled
  EIC: , LIC: , FIC: , UNIT:
  Path FI:
  Idle Signal PORT NO:
  Test Signal GEN NO:
FEAC code received: No code is being received
Framing is C-BIT Parity, Line Code is B3ZS, Clock Source is Internal
Alarm Soaking Interval:
  Alarm Declaring= 2500 msec
  Alarm clearing = 10000 msec
BERT test result (not running)
  Test Pattern : Not Configured, Status : not running, Sync Detected : 0
  Interval : 1 minute(s), Time Remain : 0 (ms)
  Bit Errors (since BERT started): 0 bits,
  Bits Received (since BERT started): 0 Kbits
  Bit Errors (since last sync): 0 bits
  Bits Received (since last sync): 0 Kbits
```

Table 62: show controllers t3 brief Field Descriptions

| Field              | Description                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T3 0/4/2/0/1 is up | T3 channel is operating. The channel state can be up, down, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped). |

| Field               | Description                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No alarms detected  | Any alarms detected by the controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> |
| mode                | Mode of the T3 controller, which can be ATM, serial, or T1serial or T1 .                                                                                                                                                                                                                                                                                                                                              |
| MDL transmission    | Status of the Maintenance Data Link (either enabled or disabled) and the values of the MDL message fields.                                                                                                                                                                                                                                                                                                            |
| EIC                 | Equipment Identification Code.                                                                                                                                                                                                                                                                                                                                                                                        |
| LIC                 | Location Identification Code.                                                                                                                                                                                                                                                                                                                                                                                         |
| FIC                 | Frame Identification Code.                                                                                                                                                                                                                                                                                                                                                                                            |
| UNIT                | Unit Identification Code.                                                                                                                                                                                                                                                                                                                                                                                             |
| Path FI             | Path facility identifier.                                                                                                                                                                                                                                                                                                                                                                                             |
| Idle Signal PORT_NO | Identifies the port that initiates the idle signal message.                                                                                                                                                                                                                                                                                                                                                           |
| Test Signal GEN_NO  | Generator number to send in test signal messages.                                                                                                                                                                                                                                                                                                                                                                     |

| Field                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FEAC code received     | <p>Whether or not a far-end alarm code request is being received. Possible values are as follows:</p> <ul style="list-style-type: none"> <li>• DS3 Eqpt. Failure (SA)</li> <li>• DS3 LOS/HBER</li> <li>• DS3 Out-of-Frame</li> <li>• DS3 AIS Received</li> <li>• DS3 IDLE Received</li> <li>• DS3 Eqpt. Failure (NSA)</li> <li>• Common Eqpt. Failure (NSA)</li> <li>• Multiple DS1 LOS/HBER</li> <li>• DS1 Eqpt. Failure</li> <li>• Single DS1 LOS/HBER</li> <li>• DS1 Eqpt. Failure (NSA)</li> <li>• No code is being received</li> </ul> |
| Framing                | Framing type on the channelized controller. Values are auto-detect, M23, and C-Bit.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Line Code              | Line coding format on the channelized controller. Values are AMI and B8ZS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Clock Source           | Clock source on the channelized controller. Values are internal and line.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Alarm Soaking Interval | <p>Values of the following alarm soaking intervals:</p> <ul style="list-style-type: none"> <li>• Alarm declarings: amount of time, in milliseconds, after which an alarm is declared.</li> <li>• Alarm clearing: amount of time, in milliseconds, after which an alarm is cleared.</li> </ul>                                                                                                                                                                                                                                               |
| BERT test result       | <p>Indicates the current state of the test. Can be one of the following:</p> <ul style="list-style-type: none"> <li>• running—BER test is still in progress.</li> <li>• done—BER test is complete.</li> <li>• not running—BER test is not running on the controller.</li> </ul>                                                                                                                                                                                                                                                             |
| Test Pattern           | Indicates the test pattern you selected for the test.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Field                              | Description                                                                                                                                                                                                                                                      |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status                             | Indicates the current synchronization state (sync).                                                                                                                                                                                                              |
| Sync Detected                      | Indicates the number of times synchronization has been detected during this test.                                                                                                                                                                                |
| Interval                           | Indicates the length of the test.                                                                                                                                                                                                                                |
| Time Remain                        | Indicates the time remaining for the test to run.<br><br><b>Note</b> If you terminate a BER test, you receive a message similar to the following: Time Remain : 2 minute(s) (unable to complete) "(Unable to complete)" signifies that you interrupted the test. |
| Bit Errors (since BERT started)    | Bit errors that have been detected since the test started.                                                                                                                                                                                                       |
| Bits Received (since BERT started) | Total number of test bits that have been received since the test started.                                                                                                                                                                                        |
| Bit Errors (since last sync)       | Bit errors that have been detected since the synchronization started.                                                                                                                                                                                            |
| Bits Received (since last sync)    | Total number of test bits that have been received since the synchronization started.                                                                                                                                                                             |

The following example shows sample output from the **show controllers t3** command using the **tabular** keyword, for a single T3 port:

```
RP/0/0/CPU0:router# show controllers 0/4/2/0/1 tabular
```

```
T3 0/4/2/0/1 is up
INTERVAL      LCV   PCV   CCV   PES   PSER  SEFS   UAS   LES   CES   CSES
09:00-09:02   0     0     0     0     0     0     0     0     0     0
08:45-09:00   0     0     0     0     0     0     0     0     0     0
08:30-08:45   0     0     0     0     0     0     0     0     0     0
08:15-08:30   0     0     0     0     0     0     0     0     0     0
08:00-08:15   0     0     0     0     0     0     0     0     0     0
07:45-08:00   0     0     0     0     0     0     0     0     0     0
07:30-07:45   0     0     0     0     0     0     0     0     0     0
.
.
.
```

The following example shows sample output from the **show controllers t3** command for a single T3 port:

```
RP/0/0/CPU0:router# show controllers t3 0/4/2/0/1
```

```
T3 0/4/2/0/1 is up
No alarms detected.
mode: serial
MDL transmission is disabled
EIC: , LIC: , FIC: , UNIT:
Path FI:
```

```

Idle Signal PORT NO:
Test Signal GEN_NO:
FEAC code received: No code is being received
Framing is C-BIT Parity, Line Code is B3ZS, Clock Source is Internal
Data in current interval (695 seconds elapsed):
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  0 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 1:
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  0 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 2:
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  0 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 3:
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  0 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
.
.
.

```

**Table 63: show controllers t3 and show controllers t3 tabular Field Descriptions**

| Field              | Description                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T3 0/4/2/0/1 is up | T3 channel is operating. The channel state can be up, down, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped).                                                                                                                                                                                                                                                         |
| No alarms detected | Any alarms detected by the controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> |
| mode               | Mode of the T3 controller, which can be ATM, serial, T1, or E1 serial or T1 ATM or serial .                                                                                                                                                                                                                                                                                                                           |

| Field               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MDL transmission    | Status of the Maintenance Data Link (either enabled or disabled) and the values of the MDL message fields.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| EIC                 | Equipment Identification code.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| LIC                 | Location Identification code.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| FIC                 | Frame Identification code.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| UNIT                | Unit Identification code.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Path FI             | Path facility identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Idle Signal PORT_NO | Identifies the port that initiates the idle signal message.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Test Signal GEN_NO  | Generator number to send in test signal messages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| FEAC code received  | Whether or not a far-end alarm code request is being received. Possible values are as follows: <ul style="list-style-type: none"> <li>• DS3 Eqpt. Failure (SA)</li> <li>• DS3 LOS/HBER</li> <li>• DS3 Out-of-Frame</li> <li>• DS3 AIS Received</li> <li>• DS3 IDLE Received</li> <li>• DS3 Eqpt. Failure (NSA)</li> <li>• Common Eqpt. Failure (NSA)</li> <li>• Multiple DS1 LOS/HBER</li> <li>• DS1 Eqpt. Failure</li> <li>• Single DS1 LOS/HBER</li> <li>• DS1 Eqpt. Failure (NSA)</li> <li>• No code is being received</li> </ul> |
| Framing             | Framing type on the channelized controller. Values are M23 and C-Bit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Line Code           | Line coding format on the channelized controller. Values are AMI and B8ZS.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Clock Source        | Clock source on the channelized controller. Values are internal and line.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Field                                      | Description                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data in current interval (seconds elapsed) | Shows the current accumulation period, which rolls into the 24-hour accumulation every 15 minutes. The accumulation period is from 1 to 900 seconds. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer.                                                                                                  |
| Line Code Violations                       | Line Code Violations (LCVs) is a count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) that occur over the accumulation period. An EXZ increments the LCV by one regardless of the length of the zero string.                                                                                                               |
| P-bit Coding Violation                     | For all DS3 applications, a P-bit coding violation (PCV) error event is a P-bit parity error event. A P-bit parity error event is the occurrence of a received P-bit code on the DS3 M-frame that is not identical to the corresponding locally calculated code.                                                                         |
| C-bit Coding Violation                     | For C-bit parity and SYNTRAN DS3 applications, the C-bit coding violation (CCV) is the count of coding violations reported by the C-bits. For C-bit parity, it is the count of CP-bit parity errors that occur during the accumulation interval. For SYNTRAN, it is a count of CRC-9 errors that occur during the accumulation interval. |
| P-bit Err Secs                             | P-bit errored seconds (PES) is a second with one or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge does not increment when unavailable seconds are counted.                                                                                                                                         |
| P-bit Severely Err Secs                    | P-bit severely errored seconds (PSES) is a second with 44 or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge does not increment when unavailable seconds are counted.                                                                                                                                |
| Severely Err Framing Secs                  | Severely errored framing seconds (SEFS) is a second with one or more out-of-frame defects or a detected incoming AIS.                                                                                                                                                                                                                    |
| Unavailable Secs                           | The number of unavailable seconds (UAS) is calculated by counting the number of seconds for which the interface is unavailable. For more information, see RFC 1407, <i>DS3 MIB Variables</i> .                                                                                                                                           |
| Line Errored Secs                          | Line errored seconds (LES) is a second in which one or more code violations or one or more LOS defects occurred.                                                                                                                                                                                                                         |



| Field                       | Description                                                                                                                                                                                              |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C-bit Errored Secs          | C-bit errored seconds (CES) is a second with one or more C-bit code violations (CCV), one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted. |
| C-bit Severely Errored Secs | C-bit severely errored seconds (CSES) is a second with 44 or more CCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.               |

**Related Commands**

| Command                                     | Description                                                  |
|---------------------------------------------|--------------------------------------------------------------|
| <a href="#">controller t3</a> , on page 926 | Configures a T3 controller and enters T3 configuration mode. |

# shutdown (T1/E1)

To disable the T1 or E1 controller, use the **shutdown** command in T1 or E1 configuration mode. To restart a disabled T1 or E1 controller, use the **no** form of this command.

**shutdown**  
**no shutdown**

**Syntax Description** This command has no keywords or arguments.

**Command Default** No default behavior or values

**Command Modes** T1 configuration  
E1 configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.3.0 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Shutting down the T1 or E1 controller disables all functions on the interface and sends an AIS alarm to the network. The **shutdown** command marks the interface as unavailable. To check if the controller is disabled, use the **show controllers t1** or **show controllers e1** command.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

**Examples** The following example shows how to bring up a controller that was previously shut down:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1e1)# no shutdown
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e1, on page 975</a> | Displays information about the E1 links and hardware and software drivers for the E1 controller. |
| <a href="#">show controllers t1, on page 983</a> | Displays information about the T1 links and hardware and software drivers for the T1 controller. |

## shutdown (T3/E3)

To disable a T3 or E3 controller, use the **shutdown** command in T3 or E3 configuration mode. To restart a disabled T3 or E3 controller, use the **no** form of this command.

**shutdown**

**no shutdown**

**Syntax Description** This command has no keywords or arguments.

**Command Default** No default behavior or values

**Command Modes** T3 configuration  
E3 configuration

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.3.0 | This command was introduced. |

**Usage Guidelines** To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Shutting down the T3 or E3 controller disables all functions on the interface and sends an AIS alarm to the network. The **shutdown** command marks the interface as unavailable. To check if the controller is disabled, use the **show controllers t3** or **show controllers e3** command.

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

**Examples** The following example shows how to bring up a controller that was previously shut down:

```
RP/0/0/CPU0:router(config)# controller t3 0/6/0/0
RP/0/0/CPU0:router(config-t3)# no shutdown
```

**Related Commands**

| Command                                          | Description                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">show controllers e3, on page 979</a> | Displays information about the E3 links and hardware and software drivers for the E3 controller. |
| <a href="#">show controllers t3, on page 991</a> | Displays information about the T3 links and hardware and software drivers for the T3 controller. |

## speed (DS0)

To specify the speed of the underlying DS0s in a channel group, use the **speed** command in channel group configuration mode. To revert to the default speed, use the **no** form of this command.

**speed** *kbps*

**no speed** *kbps*

### Syntax Description

|             |                                                                                                                 |
|-------------|-----------------------------------------------------------------------------------------------------------------|
| <i>kbps</i> | Speed of the underlying DS0s in kilobits per second (kbps). Valid values are 56 and 64. The default is 64 kbps. |
|-------------|-----------------------------------------------------------------------------------------------------------------|

### Command Default

The default speed is 64 kbps.

### Command Modes

Channel group configuration for T1

### Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

### Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Before the channel group configuration is valid, you must define the associated DS0 time slots using the **timeslots** command.

### Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

### Examples

The following example shows how to define the speed for the underlying DS0 to be 56 kbps:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1el)# channel-group 5
RP/0/0/CPU0:router(config-t1el-channel_group)# speed 56
```

**Related Commands**

| Command                                    | Description                                                                                            |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <a href="#">timeslots, on page 1006</a>    | Associates one or more DS0 time slots to a channel group and create an associated serial subinterface. |
| <a href="#">channel-group, on page 910</a> | Configures a DS0 channel group and enters channel group configuration mode.                            |

# timeslots

To associate one or more DS0 time slots to a channel group and create an associated serial subinterface, use the **timeslots** command in channel group configuration mode. To unassign the DS0 time slots and delete the associated serial interface, use the **no** form of this command.

**timeslots** *range*  
**no timeslots**

|                    |              |
|--------------------|--------------|
| Syntax Description | <i>range</i> |
|--------------------|--------------|

|                 |                               |
|-----------------|-------------------------------|
| Command Default | No default behavior or values |
|-----------------|-------------------------------|

|               |                                           |
|---------------|-------------------------------------------|
| Command Modes | Channel group configuration for T1 and E1 |
|---------------|-------------------------------------------|

| Command History | Release       | Modification                 |
|-----------------|---------------|------------------------------|
|                 | Release 3.3.0 | This command was introduced. |

|                  |                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance. |
|                  | The time slot range must match the DS0 time slots assigned to the channel group. The service provider defines the DS0 time slots that compose a channel group.                                                                        |
|                  | Before the channel group configuration is valid, you must define the associated DS0 time slots using the <b>timeslots</b> command.                                                                                                    |

| Task ID | Task ID   | Operations  |
|---------|-----------|-------------|
|         | sonet-sdh | read, write |

|          |                                                                                                   |
|----------|---------------------------------------------------------------------------------------------------|
| Examples | The following example shows how to associate DS0 time slots 1, 6, 8, 9 and 10 to channel group 5: |
|----------|---------------------------------------------------------------------------------------------------|

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/10
RP/0/0/CPU0:router(config-t1e1)# channel-group 5
RP/0/0/CPU0:router(config-t1e1-channel_group)# timeslots 1:6:8-10
```



**Related Commands**

| Command                                    | Description                                                                 |
|--------------------------------------------|-----------------------------------------------------------------------------|
| <a href="#">framing (E1), on page 952</a>  | Selects the frame type for an E1 data line.                                 |
| <a href="#">framing (T1), on page 956</a>  | Selects the frame type for a T1 data line.                                  |
| <a href="#">speed (DS0), on page 1004</a>  | Specifies the speed of the underlying DS0s in a channel group.              |
| <a href="#">channel-group, on page 910</a> | Configures a DS0 channel group and enters channel group configuration mode. |

# yellow

To enable detection and generation of T1 yellow alarms, use the **yellow** command in T1 configuration mode. To disable detection and generation of T1 yellow alarms, use the **no** form of this command.

```
yellow {detection| generation} {disable| enable}
no yellow {detection| generation} {disable| enable}
```

Syntax Description

|            |                                                                             |
|------------|-----------------------------------------------------------------------------|
| detection  | Detects yellow alarms.                                                      |
| generation | Generates yellow alarms.                                                    |
| disable    | Disables detection or generation of T1 yellow alarms.                       |
| enable     | Enables detection or generation of T1 yellow alarms. The default is enable. |

Command Default

Yellow alarms are detected and generated on the T1 channel.

Command Modes

T1 configuration

Command History

| Release       | Modification                 |
|---------------|------------------------------|
| Release 3.3.0 | This command was introduced. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

If the T1 framing type is super frame (SF), you should consider disabling yellow alarm detection as the yellow alarm can be incorrectly detected with SF framing.

Serial interface may flap and eventually, go down if yellow alarm detection is not disabled on its T1 controller configured with SF framing.

The default state of the **yellow** command is enabled. If you disable yellow alarm detection and want to reenable it, you can use the **no** form of the command. Alternatively, you can use the **enable** keyword.

The **yellow** command is only applicable to T1 lines.

Task ID

| Task ID   | Operations  |
|-----------|-------------|
| sonet-sdh | read, write |

## Examples

The following example shows how to disable yellow alarm generation:

```
RP/0/0/CPU0:router(config)# controller t1 0/6/0/0/10  
RP/0/0/CPU0:router(config-t1e1)# yellow generation disable
```

yellow



## 802.1Q VLAN Subinterface Commands on the Cisco IOS XR Software

---

This module provides command line interface (CLI) commands for configuring 802.1Q VLANs on the Cisco XR 12000 Series Router.

- [dot1q native vlan, page 1012](#)
- [dot1q vlan, page 1014](#)
- [interface \(VLAN\), page 1016](#)
- [show vlan interface, page 1018](#)
- [show vlan tags, page 1020](#)
- [show vlan trunks, page 1022](#)

# dot1q native vlan

To assign the native VLAN ID of a physical interface trunking 802.1Q VLAN traffic, use the **dot1q native vlan** command in interface configuration mode. To remove the VLAN ID assignment, use the **no** form of this command.

```
dot1q native vlan vlan-id
no dot1q native vlan vlan-id
```

|                    |                |                                                                                  |
|--------------------|----------------|----------------------------------------------------------------------------------|
| Syntax Description | <i>vlan-id</i> | Trunk interface ID. Range is from 1 to 4094 inclusive (0 and 4095 are reserved). |
|--------------------|----------------|----------------------------------------------------------------------------------|

|                 |                               |
|-----------------|-------------------------------|
| Command Default | No default behavior or values |
|-----------------|-------------------------------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

| Command History | Release     | Modification                      |
|-----------------|-------------|-----------------------------------|
|                 | Release 3.2 | This command was first supported. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **dot1q native vlan** command defines the default, or native VLAN, associated with a 802.1Q trunk interface. The native VLAN of a trunk interface is the VLAN to which all untagged VLAN packets are logically assigned.



**Note**

The native VLAN cannot be configured on a subinterface of the trunk interface. The native VLAN must be configured with the same value at both ends of the link, or traffic can be lost or sent to the wrong VLAN.

| Task ID | Task ID | Operations  |
|---------|---------|-------------|
|         | vlan    | read, write |

## Examples

The following example shows how to configure the native VLAN of a TenGigE0/2/0/4 trunk interface as 1. Packets received on this interface that are untagged, or that have an 802.1Q tag with VLAN ID 1, are received on the main interface. Packets sent from the main interface are transmitted without an 802.1Q tag.

```
RP/0/0/CPU0:router(config)# interface TenGigE 0/2/0/4
RP/0/0/CPU0:router(config-if)# dot1q native vlan 1
```

## Related Commands

| Command                                                   | Description                                                                                                 |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <a href="#">dot1q vlan</a> , <a href="#">on page 1014</a> | Assigns a VLAN ID to a subinterface (or modifies the VLAN ID that is currently assigned to a subinterface). |

# dot1q vlan

To assign a VLAN ID to a subinterface (or to modify the VLAN ID that is currently assigned to a subinterface), use the **dot1q vlan** command in subinterface configuration mode. To remove the VLAN ID assigned to a subinterface, use the **no** form of this command.

```
dot1q vlan vlan-id [vlan-id2] any
no dot1q vlan vlan-id
```

|                    |                 |                                                                                                                                                         |
|--------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>vlan-id</i>  | ID of the subinterface. Range is from 1 to 4094 (0 and 4095 are reserved).                                                                              |
|                    | <i>vlan-id2</i> | (Optional) Identifies the host VLAN of a Q-in-Q VLAN pair. Replace <i>vlan-id2</i> with a number that specifies the host VLAN. Range is from 1 to 4094. |
|                    | <b>any</b>      | (Optional) Identifies the host VLAN of a Q-in any VLAN pair.                                                                                            |

**Command Default** No default behavior or values

**Command Modes** Subinterface configuration

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | Release 3.2 | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The VLAN ID specifies where 802.1Q tagged packets are sent and received on a specified subinterface. An 802.1Q VLAN subinterface must have a configured VLAN ID to send and receive traffic; without a VLAN ID, the subinterface remains in the down state. All VLAN IDs must be unique among all subinterfaces configured on the same physical interface. To change a VLAN ID, the new VLAN must not already be in use on the same physical interface. To exchange VLAN IDs, you must remove the configuration information and reconfigure the ID for each device.



**Note** The subinterface does not pass traffic without an assigned VLAN ID.



**Task ID**

| Task ID | Operations  |
|---------|-------------|
| vlan    | read, write |

**Examples**

The following example shows how to configure the VLAN ID and IP address on a subinterface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface TenGigE 0/2/0/4.1
RP/0/0/CPU0:router(config-subif)# dot1q vlan 10
RP/0/0/CPU0:router(config-subif)# ipv4 addr 10.0.0.1/24
```

The following example shows how to configure the VLAN IDs for both VLANs in a single Q-in-Q attachment circuit (AC). In this case, incoming traffic must match both of the VLAN IDs before it is accepted by the subinterface:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface TenGigE 0/2/0/4.1
RP/0/0/CPU0:router(config-subif)# dot1q vlan 10 20
```

The following example shows how to configure the VLAN IDs for a Q-in-any AC. In this case, all incoming traffic must have two VLAN tags, where the outer VLAN ID matches the configured value, while the inner VLAN ID can be any value.

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# interface TenGigE 0/2/0/4.1 l2transport
RP/0/0/CPU0:router(config-subif)# dot1q vlan 10 any
```

**Related Commands**

| Command                                           | Description                                                                             |
|---------------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">dot1q native vlan, on page 1012</a>   | Assigns the native VLAN ID of a physical interface trunking 802.1Q VLAN traffic.        |
| <a href="#">show interfaces, on page 549</a>      | Displays statistics for all interfaces configured on the router or for a specific node. |
| <a href="#">show vlan interface, on page 1018</a> | Displays summarized information about VLAN subinterfaces.                               |
| <a href="#">show vlan tags, on page 1020</a>      | Displays VLAN tagging allocation information.                                           |

# interface (VLAN)

To create a VLAN subinterface, use the **interface** command in global configuration mode. To delete a subinterface, use the **no** form of this command.

```
interface type interface-path-id.subinterface [l2transport]
no interface type interface-path-id.subinterface [l2transport]
```

|                    |                                |                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | type                           | Type of Ethernet interface on which you want to create a VLAN. Enter <b>GigabitEthernet</b> , <b>TenGigE</b> , <b>FastEthernet</b> , or <b>Bundle-Ether</b> .                                                                                                                                                                            |
|                    | interface-path-id.subinterface | Physical interface or virtual interface followed by the subinterface path ID. Naming notation is <i>interface-path-id.subinterface</i> . The period in front of the subinterface value is required as part of the notation.<br><br>For more information about the syntax for the router, use the question mark (?) online help function. |
|                    | l2transport                    | Enables Layer 2 transport port mode on the specified VLAN interface and enters Layer 2 transport configuration mode. The l2transport keyword creates the Vlan interface in L2 mode so that it can be used for L2VPNs and local switching.                                                                                                |

|                 |                               |
|-----------------|-------------------------------|
| Command Default | No default behavior or values |
|-----------------|-------------------------------|

|               |                      |
|---------------|----------------------|
| Command Modes | Global configuration |
|---------------|----------------------|

| Command History | Release     | Modification                      |
|-----------------|-------------|-----------------------------------|
|                 | Release 3.2 | This command was first supported. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

- For the *interface-path-id* argument, use the following guidelines:
- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
    - *rack*: Chassis number of the rack.
    - *slot*: Physical slot number of the line card.

- *module*: Module number. A physical layer interface module (PLIM) is always 0.
- *port*: Physical port number of the interface.
- If specifying an Ethernet bundle interface, the range is from 1 through 65535.

For the *subinterface* argument, the range is from 0 through 4095.

To configure a large number of subinterfaces, we recommend entering all configuration data before you commit the **interface** command.

To change an interface from Layer 2 to Layer 3 mode and back, you must delete the interface first and then re-configure it in the appropriate mode.

**Note**

A subinterface does not pass traffic without an assigned VLAN ID.

**Task ID**

| Task ID | Operations  |
|---------|-------------|
| vlan    | read, write |

**Examples**

The following example shows how to configure a VLAN subinterface on a 10-Gigabit Ethernet interface:

```
RP/0/0/CPU0:router(config)# interface TenGigE 0/0/0/1.2
RP/0/0/CPU0:router(config-subif)# dot1q vlan 1
RP/0/0/CPU0:router(config-subif)# ipv4 address 50.0.0.1/24
```

The following example shows how to create a VLAN subinterface with Layer 2 transport port mode enabled, and enter Layer 2 transport configuration mode under that VLAN:

```
RP/0/0/CPU0:router(config)# interface GigabitEthernet 0/4/0/1.1
RP/0/0/CPU0:router(config-if-l2)#
```

**Related Commands**

| Command                                         | Description                                                                                                 |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <a href="#">dot1q native vlan, on page 1012</a> | Assigns the native VLAN ID of a physical interface trunking 802.1Q VLAN traffic.                            |
| <a href="#">dot1q vlan, on page 1014</a>        | Assigns a VLAN ID to a subinterface (or modifies the VLAN ID that is currently assigned to a subinterface). |

# show vlan interface

To display summarized information about VLAN subinterfaces, use the **show vlan interface** command in EXEC mode.

**show vlan interface** [*type interface-path-id.subinterface*] **location** *instance*]

Syntax Description

|                                       |                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>                           | (Optional) Type of Ethernet interface whose VLAN information you want to display. Enter <b>GigabitEthernet</b> , <b>TenGigE</b> , <b>FastEthernet</b> , or <b>Bundle-Ether</b> .                                                                                                                                                         |
| <i>interface-path-id.subinterface</i> | Physical interface or virtual interface followed by the subinterface path ID. Naming notation is <i>interface-path-id.subinterface</i> . The period in front of the subinterface value is required as part of the notation.<br><br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>location</b> <i>instance</i>       | (Optional) Displays VLAN subinterfaces on a particular port. The <i>instance</i> argument is entered in the <i>rack/slot/module/port</i> notation.                                                                                                                                                                                       |

Command Default

No default behavior or values

Command Modes

EXEC

Command History

| Release     | Modification                      |
|-------------|-----------------------------------|
| Release 3.2 | This command was first supported. |

Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.

- If specifying an Ethernet bundle interface, the range is from 1 through 65535.

For the *subinterface* argument, the range is from 0 through 4095.

Enter the **show vlan interface** command without including any of the optional parameters to display summarized information about all VLANs configured on the router.

**Task ID**

| Task ID | Operations |
|---------|------------|
| vlan    | read       |

**Table 64: show vlan interface Field Descriptions**

| Field         | Description                                                                                                                                                                      |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| interface     | VLAN subinterface.                                                                                                                                                               |
| encapsulation | Encapsulation of the VLAN subinterface. Currently, this is always 802.1Q.                                                                                                        |
| Outer VLAN    | VLAN ID currently assigned to the subinterface. Range is from 1 to 4094 (or blank if no VLAN ID has been assigned).                                                              |
| 2nd VLAN      | VLAN ID currently assigned to the second subinterface in a pair. Range is from 1 to 4094 (or blank if no VLAN ID has been assigned). For Q-in-any VLANs, this field shows “Any.” |
| Service       | Service currently assigned to the VLAN. Possible services are L2 and L3.                                                                                                         |
| MTU           | Maximum transmission unit (MTU) value configured for the specified VLAN, in bytes.                                                                                               |
| LineP state   | Displays the line protocol state of the VLAN interface. Possible states: up, down, admin-down. The line protocol state reflects whether a VLAN ID is configured or not.          |

**Related Commands**

| Command                                         | Description                                                                             |
|-------------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">show interfaces</a> , on page 549   | Displays statistics for all interfaces configured on the router or for a specific node. |
| <a href="#">show vlan trunks</a> , on page 1022 | Displays information about VLAN trunks.                                                 |

# show vlan tags

To display VLAN tagging allocation information, use the **show vlan tags** command in EXEC mode.

**show vlan tags** [*type interface-path-id*] **location** *node-id*]

|                    |                                |                                                                                                                                                                                                                                                                                                         |
|--------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>type</i>                    | Displays VLAN tagging information for a specific bundle type.<br><br><b>Note</b> Use the <b>show interfaces</b> command with the <b>Bundle-Ether</b> , <b>FastEthernet</b> , <b>GigabitEthernet</b> or <b>TenGigE</b> keyword to see a list of all Ethernet bundles currently configured on the router. |
|                    | <i>interface-path-id</i>       | Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function.                         |
|                    | <b>location</b> <i>node-id</i> | Displays VLAN tagging information for a specific node. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.                                                                                                                                                                  |

|                 |                                                                                                                                                       |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Command Default | Enter the command without any of the optional keywords or arguments to display tagging allocation information for all VLANS configured on the router. |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|

|               |      |
|---------------|------|
| Command Modes | EXEC |
|---------------|------|

|                 |                |                              |
|-----------------|----------------|------------------------------|
| Command History | <b>Release</b> | <b>Modification</b>          |
|                 | Release 3.2    | This command was introduced. |

**Usage Guidelines**

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:

- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - rack*: Chassis number of the rack.
  - slot*: Physical slot number of the line card.
  - module*: Module number. A physical layer interface module (PLIM) is always 0.

◦ *port*: Physical port number of the interface.

- If specifying an Ethernet bundle interface, the range is from 1 through 65535.

## Task ID

| Task ID | Operations |
|---------|------------|
| vlan    | read       |

## Examples

The following example shows how to display VLAN tagging allocation information for a router:

```
RP/0/0/CPU0:router(config-subif)# show vlan tagsl2protocol cdp drop
```

| Interface   | Outer VLAN | 2nd VLAN | Service | MTU  | LineP State |
|-------------|------------|----------|---------|------|-------------|
| Gi0/1/5/0.1 | 10         |          | L3      | 1518 | up          |
| Gi0/1/5/0.2 | 20         |          | L3      | 1518 | up          |
| Gi0/1/5/0.3 | 30         |          | L3      | 1518 | up          |

**Table 65: show vlan tags Field Descriptions**

| Field       | Description                                                                                                                        |
|-------------|------------------------------------------------------------------------------------------------------------------------------------|
| Outer Vlan  | The first (outermost) 802.1Q VLAN ID. This field is empty if no VLAN ID is configured. An asterisk (*) indicate the native VLAN.   |
| 2nd Vlan    | The second 802.1Q VLAN ID. This field reports “any” for a Q-in-Any service. If no VLAN ID is configured, then this field is empty. |
| Service     | Service currently assigned to the subinterface. Can be Layer 2 (L2) or Layer 3 (L3).                                               |
| MTU         | Maximum transmission unit (MTU) value configured for the specified VLAN, in bytes.                                                 |
| LineP state | Displays the state of the VLAN interface. Possible states: up, down, admin-down.                                                   |

## Related Commands

| Command                                            | Description                                                                                                 |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <a href="#">dot1q vlan</a> , on page 1014          | Assigns a VLAN ID to a subinterface (or modifies the VLAN ID that is currently assigned to a subinterface). |
| <a href="#">show vlan interface</a> , on page 1018 | Displays summarized information about VLAN subinterfaces.                                                   |
| <a href="#">show vlan trunks</a> , on page 1022    | Displays information about VLAN trunks.                                                                     |

# show vlan trunks

To display information about VLAN trunks, use the **show vlan trunks** command in EXEC mode.

**show vlan trunks** [**brief**] [**location** *node-id*] [*type interface-path-id*] [**summary**]

## Syntax Description

|                                |                                                                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>                    | (Optional) Type of Ethernet interface whose VLAN trunk information you want to display. Possible Ethernet types are <b>GigabitEthernet</b> , <b>TenGigE</b> , <b>FastEthernet</b> , or <b>Bundle-Ether</b> .                                                                               |
| <i>interface-path-id</i>       | (Optional) Physical interface or virtual interface.<br><br><b>Note</b> Use the <b>show interfaces</b> command to see a list of all interfaces currently configured on the router.<br>For more information about the syntax for the router, use the question mark (?) online help function. |
| <b>brief</b>                   | (Optional) Displays a short summary output.                                                                                                                                                                                                                                                |
| <b>summary</b>                 | (Optional) Displays a summarize output.<br><br><b>Note</b> The <b>summary</b> option can be specified only if the trunk interface is not specified.                                                                                                                                        |
| <b>location</b> <i>node-id</i> | (Optional) Displays VLAN trunk information for a specific node. The <i>node-id</i> is expressed in the <i>rack/slot/module</i> notation.<br><br><b>Note</b> For more information about the syntax for the router, use the question mark (?) online help function.                          |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| Release 3.2 | This command was introduced. |

## Usage Guidelines

To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

For the *interface-path-id* argument, use the following guidelines:



- If specifying a physical interface, the naming notation is *rack/slot/module/port*. The slash between values is required as part of the notation. An explanation of each component of the naming notation is as follows:
  - *rack*: Chassis number of the rack.
  - *slot*: Physical slot number of the line card.
  - *module*: Module number. A physical layer interface module (PLIM) is always 0.
  - *port*: Physical port number of the interface.
- If specifying a virtual interface, the number range varies, depending on interface type.

The **show vlan trunks** command provides summary information about VLAN trunk interfaces. It is used to determine the number of configured subinterfaces and verify the state of the subinterfaces.

## Task ID

| Task ID | Operations |
|---------|------------|
| vlan    | read       |

## Examples

The following is sample output from the **show vlan trunks** command:

```
RP/0/0/CPU0:router# show vlan trunks

GigabitEthernet0/4/0/0 is up
  Outer VLAN tag format is Dot1Q (0x8100)
  L3 Encapsulations: Ether, 802.1Q
    Sub-interfaces: 2
      2 are up
    Single tag sub-interfaces: 2
  No native VLAN Id
  L2 Encapsulations: 802.1Q
    VLAN ACs: 1
      1 are up
    Single tag ACs: 1
```

**Table 66: show vlan trunks summary Field Descriptions**

| Field                 | Description                                                                                                                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outer VLAN tag format | <p>The first (outermost) 802.1Q VLAN Id.</p> <ul style="list-style-type: none"> <li>• This field is empty if no VLAN ID is configured.</li> <li>• An asterisk (*) indicates that a native VLAN is configured.</li> </ul> |

| Field                      | Description                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| L3 Encapsulations          | <p>VLAN encapsulations currently used for terminated Layer 3 traffic. Possible Layer 3 encapsulations are as follows:</p> <ul style="list-style-type: none"> <li>• Nat – A Native VLAN is configured.</li> <li>• Q – One or more sub-interfaces are configured with either 0 or 1 802.1Q VLAN tags.</li> <li>• 2Q – One or more sub-interfaces have been configured with two 802.1Q VLAN tags.</li> </ul>            |
| Sub-interfaces             | <p>The number of subinterfaces configured on the main Ethernet interface, and the current state of those subinterfaces. Possible states are up, down, and admin-down.</p> <p><b>Note</b> The number of Down and Admin-down subinterfaces is only reported only if that number is greater than 0.</p>                                                                                                                 |
| Single tag sub-interfaces: | <p>Number of sub-interfaces configured with a single 802.1Q tag.</p> <p><b>Note</b> The number of sub-interfaces is displayed only if that number is greater than 0.</p>                                                                                                                                                                                                                                             |
| No native VLAN Id          | <p>Indicate that a native VLAN ID is not configured on this interface.</p>                                                                                                                                                                                                                                                                                                                                           |
| L2 Encapsulations:         | <p>VLAN encapsulations currently used for terminated L2 traffic. Possible Layer 2 encapsulations are as follows:</p> <ul style="list-style-type: none"> <li>• Q – One or more single 802.1Q tag ACs are configured.</li> <li>• 2Q – One or more double 802.1Q tag ACs have been configured.</li> <li>• Qany – One or more double 802.1Q tag ACs have been configured that have a wildcard “any” innertag.</li> </ul> |
| VLAN ACs                   | <p>Number of ACs currently configured under the specified interface.</p>                                                                                                                                                                                                                                                                                                                                             |
| Single tag ACs             | <p><b>Note</b> The number of sub-interfaces sub-interfaces configured with a single 802.1Q tag is displayed only if that number is greater than 0.</p>                                                                                                                                                                                                                                                               |

**Related Commands**

| Command                                         | Description                                                                             |
|-------------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">show interfaces</a> , on page 549   | Displays statistics for all interfaces configured on the router or for a specific node. |
| <a href="#">interface (VLAN)</a> , on page 1016 | Creates a VLAN subinterface.                                                            |

 **show vlan trunks**



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