



Cisco IOS XR MPLS Command Reference for the Cisco CRS Router, Release 4.2.x

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Preface

The *Cisco IOS XR MPLS Command Reference for the Cisco CRS-1 Router* preface contains these sections:

- [Changes to This Document](#), page xiii
- [Obtaining Documentation and Submitting a Service Request](#), page xiii

Changes to This Document

[Changes to This Document](#) lists the technical changes made to this document since it was first printed.

Table 1: Changes to This Document

Revision	Date	Change Summary
OL-26060-03	September 2012	Republished with documentation updates for Cisco IOS XR Release 4.2.3 features.
OL-26060-02	June 2012	Republished for Cisco IOS XR Release 4.2.1.
OL-26060-01	December 2011	Initial release of this document.

Obtaining Documentation and Submitting a Service Request

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MPLS Label Distribution Protocol Commands

This module describes the commands used to configure Label Distribution Protocol (LDP) in a Multiprotocol Label Switching (MPLS) network.

LDP provides a standard methodology for hop-by-hop (or dynamic label) distribution in an MPLS network by assigning labels to routes that have been chosen by the underlying Interior Gateway Protocol (IGP) routing protocols. The resulting labeled paths, called *label switch paths* (LSPs), forward labeled traffic across an MPLS backbone.

LDP also provides the means for label switching routers (LSRs) to request, distribute, and release label prefix binding information to peer routers in a network. LDP enables LSRs to discover potential peers and establish LDP sessions with those peers to exchange label binding information.

For detailed information about MPLS concepts, configuration tasks, and examples, see *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router*.

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backoff

To configure the parameters for the Label Distribution Protocol (LDP) backoff mechanism, use the **backoff** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

backoff *initial maximum*

no backoff

Syntax Description

<i>initial</i>	Initial backoff delay, in seconds. Range is 5 to 50331.
<i>maximum</i>	Maximum backoff delay, in seconds. Range is 5 to 50331.

Command Default

initial : 15

maximum : 120

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 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.

The LDP backoff mechanism prevents two incompatibly configured label switch routers from engaging in an unthrottled sequence of session setup failures. If a session setup attempt fails (due to incompatibility), each Label Switching Router (LSR) delays the next attempt, increasing the delay exponentially with each successive failure until the maximum backoff delay is reached.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure the initial backoff delay to 30 seconds and the maximum backoff delay to 240 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# backoff 30 240
```

Related Commands

Command	Description
show mpls ldp backoff , on page 66	Displays information about the configured session setup backoff parameters and LDP peers.
show mpls ldp parameters , on page 98	Displays current LDP parameter settings.

clear mpls ldp msg-counters neighbor

To clear the Label Distribution Protocol (LDP) message counters, use the **clear mpls ldp msg-counters neighbor** command in EXEC mode.

clear mpls ldp msg-counters neighbor {*ip-address* | **all**}

Syntax Description

<i>ip-address</i>	LSR or LDP ID of the neighbor.
all	Clears LDP message counters for all neighbors.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 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.

Use the **clear mpls ldp msg-counters neighbor** command to clear the statistics on message counters for a specific neighbor (IP address) or for all neighbors. These message counters count the number of LDP protocol messages sent to and received from LDP neighbors.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to clear message counters for neighbor 10.20.20.20:

```
RP/0/RP0/CPU0:router# clear mpls ldp msg-counters neighbor 10.20.20.20
```

 `clear mpls ldp msg-counters neighbor`**Related Commands**

Command	Description
show mpls ldp statistics msg-counters , on page 101	Displays statistics about the type and count of the messages sent and received from neighbors.

clear mpls ldp neighbor

To force Label Distribution Protocol (LDP) session restart, use the **clear mpls ldp neighbor** command in EXEC mode.

clear mpls ldp neighbor [*ip-address*]

Syntax Description

<i>ip-address</i>	(Optional) Neighbor IP address or LDP ID.

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.

Use the **clear mpls ldp neighbor** command to restart a single LDP session or all LDP sessions (without restarting the LDP process itself).

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to force an unconditional LDP session restart:

```
RP/0/RP0/CPU0:router# clear mpls ldp neighbor 10.20.20.20
```

Related Commands

Command	Description
show mpls ldp neighbor , on page 92	Displays information about LDP neighbors.

clear mpls ldp forwarding

To clear (or reset) the MPLS Label Distribution Protocol (LDP) forwarding rewrites, use the **clear mpls ldp forwarding** command in EXEC mode.

clear mpls ldp forwarding [*IP -address*]

Syntax Description

IP-address

(Optional) IPv4 address, specified in four-part, dotted-decimal notation.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 4.0.1	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.

This command resets LDP installed forwarding state for all prefixes or a given prefix. It is useful when installed LDP forwarding state needs to be reprogrammed in LSD and MPLS forwarding.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

This is a sample output from the **clear mpls ldp forwarding** command:

```
RP/0/RP0/CPU0:router# clear mpls ldp forwarding
```

Related Commands

Command	Description
show mpls ldp forwarding	Displays the LDP forwarding state installed in MPLS forwarding.
show mpls forwarding	Displays the contents of the MPLS Label Forwarding Information Base (LFIB).
graceful-restart (MPLS LDP), on page 23	Configures the LDP graceful restart feature.
show mpls ldp bindings, on page 68	Displays the contents of LDP LIB.

default-route

To enable Multiprotocol Label Switching (MPLS) switching for IP default route by allocating and advertising non-null label, use the **default-route** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

default-route

no default-route

Syntax Description

This command has no arguments or keywords.

Command Default

Allocates null (implicit or explicit) local label for IP default route prefix 0.0.0.0/0.

Command Modes

MPLS LDP 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 the IP default route 0.0.0.0/0 is configured on an egress router, it is advertised through Interior Gateway Protocol (IGP) to other routers to enable default IP forwarding. When MPLS LDP is configured and establishing label switch paths (LSPs) for other prefixes, you can emulate default forwarding and switching for MPLS in the same way as IP forwarding. To do so, allocate a non-null local label and advertise this label to its peers.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to enable default MPLS switching for default prefix:

```
RP/0/RP0/CPU0:router(config-ldp) # default-route
```


Related Commands

Command	Description
show mpls ldp bindings, on page 68	Displays LDP label bindings.
show mpls ldp forwarding, on page 79	Displays LDP installed forwarding state.

discovery hello

To configure the interval between transmission of consecutive Label Distribution Protocol (LDP) discovery hello messages and the holdtime for a discovered LDP neighbor, use the **discovery hello** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

discovery hello {**holdtime** *seconds* | **interval** *seconds*}

no discovery hello {**holdtime** | **interval**}

Syntax Description

holdtime	Sets the time, in seconds, a discovered LDP neighbor is remembered without receipt of an LDP hello message from the neighbor. Default is 15.
interval	Sets the time, in seconds, between consecutive hello messages. Default is 5.
<i>seconds</i>	Time value, in seconds. Range is 1 to 65535 (65535 means infinite).

Command Default

holdtime: 15

interval: 5

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 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	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure the link hello holdtime to 30 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# discovery hello holdtime 30
```

The following example shows how to configure the link hello interval to 10 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# discovery hello interval 10
```

Related Commands

Command	Description
discovery targeted-hello, on page 15	Configures targeted-hello messages.

discovery instance-tlv disable

To disable transmit and receive processing for Type-Length-Value (TLV), use the **discovery instance-tlv disable** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

discovery instance-tlv disable

no discovery instance-tlv disable

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP 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
	mpls-ldp	read, write

Examples The following example shows how to disable transmit and receive processing for TLV:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# discovery instance-tlv disable
```

Related Commands	Command	Description
	discovery targeted-hello , on page 15	Configures targeted-hello messages.

discovery targeted-hello

To configure the interval between transmission of consecutive Label Distribution Protocol (LDP) discovery targeted-hello messages, the hold time for a discovered targeted LDP neighbor, and to accept targeted hello from peers, use the **discovery targeted-hello** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

discovery targeted-hello {**accept** | [**from** *acl*]} **holdtime** *seconds* | **interval** *seconds*}

no discovery targeted-hello {**accept** | **holdtime** | **interval**}

Syntax Description

accept	Accepts targeted hellos from any source.
from <i>acl</i>	(Optional) Accepts targeted hellos from LDP peers as permitted by the access-list.
holdtime	Configures the time a discovered LDP neighbor is remembered without receipt of an LDP hello message from a neighbor.
interval	Displays time between consecutive hello messages.
<i>seconds</i>	Time value, in seconds. Range is 1 to 65535.

Command Default

accept : Targeted hello messages are not accepted from any source (neighbor).

holdtime : 90

interval : 10

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	Support was added for the from <i>acl</i> keyword and argument under the accept 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.

LDP supports IPv4 standard access lists only.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure the targeted-hello holdtime to 45 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# discovery targeted-hello holdtime 45
```

The following example shows how to configure the targeted-hello interval to 5 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# discovery targeted-hello interval 5
```

The following example shows how to configure acceptance of targeted hellos from all peers:

```
RP/0/RP0/CPU0:router(config-ldp)# discovery targeted-hello accept
```

The following example shows how to configure acceptance of targeted hello from peers 10.1.1.1 and 10.2.2.2 only:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list peer_acl_10
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.1.1.1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.2.2.2
RP/0/RP0/CPU0:router(config-ldp)# discovery targeted-hello accept from peer_acl_10
```

Related Commands

Command	Description
show mpls ldp discovery, on page 74	Displays LDP discovery information.
show mpls ldp parameters, on page 98	Displays LDP parameters information.

discovery transport-address

To provide an alternative address for a TCP connection, use the **discovery transport-address** command in MPLS LDP interface configuration mode. To return to the default behavior, use the **no** form of this command.

discovery transport-address {*ip-address* | **interface**}

no discovery transport-address {*ip-address* | **interface**}

Syntax Description

<i>ip-address</i>	IP address to be advertised as the transport address in discovery hello messages.
interface	Advertises the IP address of the interface as the transport address in discovery hello messages.

Command Default

LDP advertises its LDP router ID as the transport address in LDP discovery hello messages.

Command Modes

MPLS LDP interface configuration

Command History

Release	Modification
Release 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.

Establishing an LDP session between two routers requires a session TCP connection. To establish the session TCP connection, each router must know the transport address (IP address) of the other router.

The LDP discovery mechanism provides the means for a router to advertise transport addresses. Transport address is implicit or explicit. Implicit addresses do not appear as part of the contents of the discovery hello messages sent to the peer. If explicit, the advertisement appears as part of the contents of discovery hello messages sent to the peer.

The **discovery transport-address** command modifies the default behavior described above. Using the **interface** keyword, LDP advertises the IP address of the interface in LDP discovery hello messages sent from the interface. Using the *ip-address* argument, LDP advertises the IP address in LDP discovery hello messages sent from the interface.



Note

When a router has multiple links connecting it to its peer device, the router must advertise the same transport address in the LDP discovery hello messages it sends on all such interfaces.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to specify an exiting address (10.10.3.1) as the transport address on an interface POS 0/1/0/0:

```
RP/0/RP0/CPU0:router(config-ldp)# interface POS 0/1/0/0
RP/0/RP0/CPU0:router(config-ldp-if)# discovery transport-address 10.10.3.1

RP/0/RP0/CPU0:router# show mpls ldp neighbor

Peer LDP Identifier: 10.44.44.44:0
  TCP connection: 10.44.44.44:65520 - 10.10.3.1:646
  Graceful Restart: Yes (Reconnect Timeout: 15 sec, Recovery: 180 sec)
  State: Oper; Msgs sent/rcvd: 13/9
  Up time: 00:00:11
  LDP Discovery Sources:
    POS 0/1/0/0
  Addresses bound to this peer:
    10.10.3.2      10.44.44.44
```

Related Commands

Command	Description
show mpls ldp discovery, on page 74	Displays the status of the LDP discovery process.
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.

downstream-on-demand

To configure MPLS Label Distribution Protocol (LDP) downstream-on-demand mode, use the **downstream-on-demand** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

downstream-on-demand with *access-list*

nodownstream-on-demand with *access-list*

Syntax Description

with	Displays access list of LDP peers.
<i>access-list</i>	IP access-list name.

Command Default

No default behavior or values

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 4.0.1	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	Operation
mpls-ldp	read, write

Examples

This is a sample output from the **downstream-on-demand** command:

```
RP/0/RP0/CPU0:router(config-ldp)# downstream-on-demand with access-list
```

Related Commands

Command	Description
graceful-restart (MPLS LDP), on page 23	Configures the LDP graceful restart feature.
show mpls ldp bindings, on page 68	Displays the contents of LDP LIB.

explicit-null

To configure a router to advertise explicit null labels instead of implicit null labels, use the **explicit-null** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

explicit-null [*to peer-acl*] **for** *prefix-acl* [*to peer-acl*]

no explicit-null

Syntax Description

to peer-acl

(Optional) Specifies LDP peers for which explicit-null is advertised instead of implicit-null. Range is 1 to 99.

for *prefix-acl*

(Optional) Specifies prefixes for which explicit-null is advertised instead of implicit-null. Range is 1 to 99.

Command Default

Implicit null is advertised as default null label for routes, such as directly connected routes.

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	Support was added for the for and to keywords

Usage Guidelines

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

Normally, LDP advertises an implicit null label for directly connected routes. The implicit null label causes the previous hop router to perform next to last router hop popping.

The **explicit-null** command advertises the explicit-null labels in place of implicit null labels for directly connected prefixes.

LDP supports IPv4 standard access lists only.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following command shows how to advertise explicit null for all directly connected routes to all LDP peers:

```
RP/0/RP0/CPU0:router(config-ldp)# explicit-null
```

The following command sequence shows how to advertise explicit-null for directly connected route 192.168.0.0 to all LDP peers and implicit-null for all other directly connected routes:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_192_168
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 192.168.0.0
RP/0/RP0/CPU0:router(config-ldp)# explicit-null for pfx_acl_192_168
```

The following command sequence shows how to send explicit-null for all directly connected routes to peers 10.1.1.1 and 10.2.2.2 and implicit-null to all other peers:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list peer_acl_10
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.1.1.1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.2.2.2
RP/0/RP0/CPU0:router(config-ldp)# explicit-null to peer_acl_10
```

The following command shows how to advertise explicit-null for prefix 192.168.0.0 to peers 10.1.1.1 and 10.2.2.2 and advertise implicit-null for all other applicable routes to all other peers:

```
RP/0/RP0/CPU0:router(config-ldp)# explicit-null for pfx_acl_192_168 to peer_acl_10
```

Related Commands

Command	Description
show mpls ldp bindings, on page 68	Displays the contents of LDP LIB.
show mpls ldp forwarding, on page 79	Displays the contents of the LDP forwarding database.
show mpls ldp parameters, on page 98	Displays current LDP parameter settings.

graceful-restart (MPLS LDP)

To configure graceful restart, use the **graceful-restart** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

graceful-restart [**reconnect-timeout** *seconds*] **forwarding-state-holdtime** *seconds*]

no graceful-restart [**reconnect-timeout** | **forwarding-state-holdtime**]

Syntax Description

reconnect-timeout <i>seconds</i>	(Optional) Configures the time that the local LDP sends to its graceful restartable peer, indicating how long its neighbor should wait for reconnection in the event of a LDP session failure, in seconds. Range is 60 to 1800.
forwarding-state-holdtime <i>seconds</i>	(Optional) Configures the time the local forwarding state is preserved (without being reclaimed) after the local LDP control plane restarts, in seconds. Range is 60 to 1800.

Command Default

By default, graceful restart is disabled.

reconnect-timeout: 120

forwarding-state-holdtime: 180

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The maximum value for the seconds argument is 1800.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 LDP graceful restart capability to achieve nonstop forwarding (NSF) during an LDP control plane communication failure or restart. To configure graceful restart between two peers, enable LDP graceful restart on both label switch routers (LSRs).

When an LDP graceful restart session is established and there is control plane failure, the peer LSR starts graceful restart procedures, initially keeps the forwarding state information pertaining to the restarting peer, and marks this state as stale. If the restarting peer does not reconnect within the reconnect timeout, the stale forwarding state is removed. If the restarting peer reconnects within the reconnect time period, it is provided recovery time to resynchronize with its peer. After this time, any unsynchronized state is removed.

The value of the forwarding state hold time keeps the forwarding plane state associated with the LDP control-plane in case of a control-plane restart or failure. If the control plane fails, the forwarding plane retains the LDP forwarding state for twice the forwarding state hold time. The value of the forwarding state hold time is also used to start the local LDP forwarding state hold timer after the LDP control plane restarts. When the LDP graceful restart sessions are renegotiated with its peers, the restarting LSR sends the remaining value of this timer as the recovery time to its peers. Upon local LDP restart with graceful restart enabled, LDP does not replay forwarding updates to MPLS forwarding until the forwarding state hold timer expires.

**Note**

In the presence of a peer relationship, any change to the LDP graceful restart configuration will restart LDP sessions. If LDP configuration changes from nongraceful restart to graceful restart, all the sessions are restarted. Only graceful restart sessions are restarted upon graceful restart to nongraceful restart configuration changes.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure an existing session for graceful restart:

```
RP/0/RP0/CPU0:router(config-ldp)# graceful-restart

RP/0/RP0/CPU0:router:Apr  3 10:56:05.392 : mpls_ldp[336]: %ROUTING-LDP-5-NBR_CHANGE : Nbr
2.2.2.2:0, DOWN
RP/0/RP0/CPU0:router:Apr  3 10:56:05.392 : mpls_ldp[336]: %ROUTING-LDP-5-NBR_CHANGE : Nbr
3.3.3.3:0, DOWN
RP/0/RP0/CPU0:router:Apr  3 10:56:09.525 : mpls_ldp[336]: %ROUTING-LDP-5-NBR_CHANGE : Nbr
3.3.3.3:0, UP
RP/0/RP0/CPU0:router:Apr  3 10:56:11.114 : mpls_ldp[336]: %ROUTING-LDP-5-NBR_CHANGE : Nbr
2.2.2.2:0, UP

RP/0/RP0/CPU0:router# show mpls ldp neighbor brief

Peer                GR Up Time                Discovery Address
-----
3.3.3.3:0           Y  00:01:04                3          8
2.2.2.2:0           N  00:01:02                2          5

RP/0/RP0/CPU0:router# show mpls ldp graceful-restart

Forwarding State Hold timer : Not Running
GR Neighbors                : 1

Neighbor ID           Up Connect Count Liveness Timer Recovery Timer
-----
3.3.3.3               Y          1          -              -
```

Related Commands

Command	Description
show mpls ldp forwarding, on page 79	Displays the contents of the LDP forwarding database.
show mpls ldp graceful-restart, on page 84	Displays information related to graceful restart.
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.
show mpls ldp parameters, on page 98	Displays current LDP parameter settings.
show mpls ldp summary, on page 103	Displays summarized information regarding the LDP process.

holdtime (MPLS LDP)

To change the time for which an Label Distribution Protocol (LDP) session is maintained in the absence of LDP messages from the session peer, use the **holdtime** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

holdtime *seconds*

no holdtime

Syntax Description

<i>seconds</i>	Time, in seconds, that an LDP session is maintained in the absence of LDP messages from the session peer. Range is 15 to 65535.

Command Default

seconds: 180

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 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	Operations
mpls-ldp	read, write

Examples

The following example shows how to change the hold time of LDP sessions to 30 seconds:

```
RP/0/RP0/CPU0:router(config-ldp)# holdtime 30
```

Related Commands

Command	Description
show mpls ldp parameters, on page 98	Displays current LDP parameter settings.

igp auto-config disable

To disable Label Distribution Protocol (LDP) auto-configuration, use the **igp auto-config disable** command in MPLS LDP interface configuration mode. To return to the default behavior, use the **no** form of this command.

igp auto-config disable

no igp auto-config disable

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP 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.

IGP auto-configuration can be enabled on ISIS and OSPF. Configuration details are described in *Cisco IOS XR Routing Configuration Guide for the CRS-1 Router*.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples The following example shows how to disable LDP auto-configuration on POS 0/1/0/3:

```
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# interface pos 0/1/0/3
RP/0/RP0/CPU0:router(config-ldp-if)# igp auto-config disable
```

Related Commands	Command	Description
	show mpls ldp interface , on page 89	Displays information about LDP-enabled interfaces.

igp sync delay

To enable Label Distribution Protocol (LDP) Interior Gateway Protocol (IGP) sync delay timer feature, use the **igp sync delay** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

igp sync delay *seconds*

no igp sync delay

Syntax Description

<i>seconds</i>	Time, in seconds, that declaration of LDP sync state being up is delayed after session establishment upon link coming up. Range is 5 to 300.

Command Default

LDP does not delay declaration of sync up and notifies IGP as soon as sync up conditions are met for a link.

Command Modes

MPLS LDP 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.

- By default, LDP declares LDP sync up as soon as all the requisite conditions are met, namely:
 - LDP session is up.
 - LDP has sent all its label bindings to at least one peer.
 - LDP has received at least one label binding from a peer.

This minimizes traffic loss on link up but can still lead to substantial traffic loss under certain circumstances (for example, when interoperating with an LSR with ordered mode operation). It may be necessary to delay declaration of sync up after the session comes up by configuring a timeout period.

- When the graceful-restart event is configured, the IGP sync delay timer does not take effect.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure LDP to delay declaration of sync-up to 30 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# igp sync delay 30
```

Related Commands

Command	Description
show mpls ldp igp sync , on page 86	Displays LDP IGP sync information for link(s).

igp sync delay on-proc-restart

To delay the declaration of synchronization events to the Interior Gateway Protocol (IGP) when the label distribution protocol (LDP) fails or restarts, use the **igp sync delay on-proc restart** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

igp sync delay on-proc restart *seconds*

no igp sync delay on-proc restart *seconds*

Syntax Description

<i>seconds</i>	Time, in seconds, duration of process-level delay for synchronization events when the LDP fails or restarts. Range is from 60 to 600.

Command Default

This command is disabled by default.

Command Modes

MPLS LDP 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.

The **igp sync delay on-proc restart** command enables a process-level delay for synchronization events when the LDP fails or restarts. This delay defers the sending of sync-up events to the IGP until most or all the LDP sessions converge and also allows the LDP to stabilize. This allows the LDP process failure to be less stressful because IGP's receive all the sync-up events in bulk. This means that the IGP is required to run the shortest path first (SPF) and link-state advertisements (LSAs) only one time with an overall view of the sync-up events.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure LDP to delay the declaration of synchronization events to IGP by 60 seconds:

```
RP/0/RP0/CPU0:router# configure
```

```
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# igp sync delay on-proc restart 60
```

The following example shows the status following execution of the command:

```
RP/0/RP0/CPU0:router# show mpls ldp igp sync

Process Restart Sync Delay: 60 sec, Gloal timer running (15 sec remaining)
GigabitEthernet0/3/0/2:
Sync status: Deferred
....
```

When the timer is not running, the output displays the following:

```
Process Restart Sync Delay: 60 sec, Global timer not running
```

Related Commands

Command	Description
show mpls ldp igp sync, on page 86	Displays LDP IGP sync information for link(s).

interface (MPLS LDP)

To configure or enable Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) on an interface, use the **interface** command in MPLS LDP configuration mode. To return to the default behavior, 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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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

MPLS LDP configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The tunnel-ip interface example was added to show that MPLS LDP is supported over GRE tunnels.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 configure LDP on an interface, the LDP process begins neighbor discovery, sending link hello messages on the interface. This can result in a session setup with discovered neighbors. When LDP is enabled on tunnel-te interfaces, targeted discovery procedures apply.

LDP interface configuration supports forward reference; accordingly, it is possible to configure a nonexistent interface under LDP.

**Note**

You cannot enable LDP on loopback interfaces.

MPLS LDP is supported over Generic Route Encapsulation (GRE) tunnels by configuring the tunnel-ip interface. LDP establishes a link session (as opposed to a targeted LDP session) over the GRE tunnel.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure LDP on POS interface 0/1/0/0:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# interface POS 0/1/0/0
RP/0/RP0/CPU0:router(config-ldp-if)#
```

The following example shows how to configure LDP on an MPLS TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# interface tunnel-te 123
RP/0/RP0/CPU0:router(config-ldp-if)#
```

The following example shows how to MPLS LDP over GRE tunnels:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# interface tunnel-ip 1
RP/0/RP0/CPU0:router(config-ldp-if)#
```

Related Commands

Command	Description
show mpls ldp parameters, on page 98	Displays current LDP parameter settings.
show mpls ldp neighbor, on page 92	Displays LDP neighbor session parameters.

label accept

To control the receipt of labels (remote bindings) for a set of prefixes from a peer, use the **label accept** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

label accept for prefix-acl from ip-address

no label accept for prefix-acl from ip-address

Syntax Description

for prefix-acl	Accepts and retains remote bindings for prefixes that are permitted by the prefix access list <i>prefix-acl</i> argument.
from ip-address	Displays the peer IP address.

Command Default

LDP accepts and retains label bindings for all prefixes from all peers.

Command Modes

MPLS LDP 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.

By default, LDP accepts labels (as remote bindings) for all prefixes from all its peers. To save resources (such as memory) configure the access list to specify label and binding acceptance for a set of prefixes from a peer.

If the inbound label filtering policy changes such that it now allows previously denied prefixes from a peer, you must reset the LDP session with the peer using the **clear mpls ldp neighbor** command.

LDP supports IPv4 standard access lists only.



Note

Label acceptance control is also referred to as LDP inbound label filtering.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure inbound label filtering policy. In this example, an LSR is configured to accept and retain label bindings for prefixes 192.168.1.1 (pfx_acl_1) from peer 1.1.1.1, prefix 192.168.2.2 (pfx_acl_2) from peer 2.2.2.2, and prefixes 192.168.1.1, 192.168.2.2, 192.168.3.3 (pfx_acl_3) from peer 3.3.3.3:

```
RP/0/RP0/CPU0:router(config-ldp)# label accept
RP/0/RP0/CPU0:router(config-ldp-lbl-acpt)# for pfx_acl_1 from 1.1.1.1
RP/0/RP0/CPU0:router(config-ldp-lbl-acpt)# for pfx_acl_2 from 2.2.2.2
RP/0/RP0/CPU0:router(config-ldp-lbl-acpt)# for pfx_acl_3 from 3.3.3.3
```

Related Commands

Command	Description
label advertise, on page 38	Controls advertisement of LDP local label bindings (outbound label filtering).
clear mpls ldp neighbor, on page 7	Resets LDP neighbor sessions.
show mpls ldp bindings, on page 68	Displays LDP binding information.

label advertise

To control the advertisement of local labels, use the **label advertise** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

label advertise [**disable**| **for** *prefix-acl* [**to** *peer-acl*]] **interface** *type interface-path-id*

no label advertise [**disable**| **for** *prefix-acl* [**to** *peer-acl*]] **interface** *type interface-path-id*

Syntax Description

disable	(Optional) Disables label advertisement to all peers for all prefixes.
for <i>prefix-acl</i>	(Optional) Specifies prefix destinations for which labels will be advertised.
to <i>peer-acl</i>	(Optional) Specifies which LDP neighbors will receive label advertisements.
interface	(Optional) Specifies an interface for label allocation and advertisement of its interface IP address.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

LDP advertises labels for all known prefixes to all peers. LDP does not advertise labels for local interfaces addresses other than Loopback interfaces.

Command Modes

MPLS LDP 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 **label advertise** command determines how the label switch router (LSR) advertises local labels. The following rules describe the effects of running multiple commands:

- Every command has a prefix-acl or peer-acl pair associated with it, as follows:
 - In the absence of the **for** or **to** keywords, the access list pair is (none, none).
 - When using the **for** keyword without the **to** keyword, the access list is (prefix-acl, none).
- A prefix can have a maximum of one (prefix-acl, peer-acl) pair, as follows:
 - A (prefix-acl, peer-acl) pair applies to a prefix only if the prefix-acl matches the prefix. A match occurs if the prefix-acl permits the prefix.
 - If more than one (prefix-acl, peer-acl) pair from multiple **label advertise** commands matches a prefix, the (prefix-acl, peer-acl) pair in the first command applies to the prefix.
- When an LSR is ready to advertise a label for a prefix, the LSR determines whether a (prefix-acl, peer-acl) pair applies to the prefix.
 - If none applies, and if the **disable** keyword has been configured for the command, the label for the prefix is not advertised to any peer; otherwise, the label is advertised to all peers.
 - If a (prefix-acl, peer-acl) pair applies to the prefix, and if the prefix-acl denies the prefix, the label is not advertised to any peer.
 - If the prefix-acl permits the prefix and the peer-acl is none (that is, the command that applies to the prefix is an **label advertise for prefix-acl** command without the **to** keyword), the label is advertised to all peers.
 - If the prefix-acl permits the prefix and there is a peer-acl, the label is advertised to all peers permitted by the peer-acl.

Normally, LDP advertises labels for non-BGP routes present in the routing table. Additionally, LDP advertises labels from /32 IP addresses on Loopback interfaces and does not advertise /32 addresses for other non-Loopback interfaces. To control advertisement of labels for /32 IP addresses on these interfaces, use the **label advertise interface** command.

LDP supports IPv4 standard access lists only.



Note Label advertisement control is also referred to as LDP outbound label filtering.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to disable advertisement of all locally assigned labels to all peers:

```
RP/0/RP0/CPU0:router(config-ldp)# label advertise
RP/0/RP0/CPU0:router(config-ldp-lbl-advt)# disable
```

The following example shows how to send labels only for prefixes 10.1.1.0 and 20.1.1.0 to all peers:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.1.1.0
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 20.1.1.0

RP/0/RP0/CPU0:router(config-ldp)# label advertise
RP/0/RP0/CPU0:router(config-ldp-lbl-advt)# disable
RP/0/RP0/CPU0:router(config-ldp-lbl-advt)# for pfx_acl_1
```

The following example shows how to send labels for prefix 10.0.0.0 to peers 10.1.1.1 and 10.2.2.2, labels for prefix 20.0.0.0 to peer 20.1.1.1, and labels for all other prefixes to all other peers:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_10
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.0.0.0

RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_20
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 20.0.0.0

RP/0/RP0/CPU0:router(config)# ipv4 access-list peer_acl_10
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.1.1.1
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 10.2.2.2

RP/0/RP0/CPU0:router(config)# ipv4 access-list peer_acl_20
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 20.1.1.1

RP/0/RP0/CPU0:router(config-ldp)# label advertise
RP/0/RP0/CPU0:router(config-ldp-lbl-advt)# for pfx_acl_10 to peer_acl_10
RP/0/RP0/CPU0:router(config-ldp-lbl-advt)# for pfx_acl_20 to peer_acl_20
```



Note

To advertise pfx_acl_10 to peer_acl_10 and pfx_acl_20 to peer_acl_20 and disable all other advertisements to all other peers, include the **disable** keyword with the **label advertise** command.

The following example shows how to use the **interface** keyword to advertise /32 IP address for POS 0/1/0/0:

```
RP/0/RP0/CPU0:router(config-ldp)# label advertise
RP/0/RP0/CPU0:router(config-ldp-lbl-advt)# interface POS 0/1/0/0
```

Related Commands

Command	Description
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.
show mpls ldp bindings, on page 68	Displays information about LDP label bindings.

label allocate

To control allocation of local label only for a set of prefixes, use the **label allocate** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

label allocate for {*prefix-acl* | **host-routes**}

no label allocate

Syntax Description

for	Specifies set of prefixes for which local label needs to be allocated.
<i>prefix-acl</i>	IP access-list name or number. Range is from 1 to 99.
host-routes	Allocates the label for host routes only.

Command Default

LDP allocates local label for all learned routes (prefixes).

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.9.0	The host-routes 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.

Local label allocation control lets you override the default label allocation policy and provides many benefits, including reduced memory usage and fewer forwarding and network updates.

By default, LDP allocates local labels for all learned routes. There are times when you may want to limit label allocation for a given set of prefixes; for example, when using LDP in the core network to provide MPLS transport from one edge to another edge. In such cases, it is necessary to set up label switch packets (LSPs) for Loopback /32 addresses for provider edge (PE) routers (rendering it unnecessary to allocate and advertise local labels for other Interior Gateway Protocol (IGP) prefixes).

LDP supports IPv4 standard access lists only.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure LDP to limit allocation of local labels to prefixes 192.168.1.1, 192.168.2.2, and 192.168.3.3 only:

```
RP/0/RP0/CPU0:router(config)# ipv4 access-list pfx_acl_1  
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 192.168.1.1  
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 192.168.2.2  
RP/0/RP0/CPU0:router(config-ipv4-acl)# permit 192.168.3.3  
  
RP/0/RP0/CPU0:router(config-ldp)# label allocate for pfx_acl_1
```

Related Commands

Command	Description
show mpls ldp bindings, on page 68	Displays information about LDP label bindings.
show mpls ldp forwarding, on page 79	Displays the contents of the LDP forwarding database.

log graceful-restart

To set up notification describing graceful-restart (GR) session events, use the **log graceful-restart** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

log graceful-restart

no log graceful-restart

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP 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.

Use the **log graceful-restart** command to receive a syslog/console message when a graceful restart-related session event occurs, including LDP graceful restart session disconnection, reconnection, and timeout.



Note A logging message is issued upon graceful restart session events.

Task ID	Operations
mpls-ldp	read, write

Examples The following example shows how to enable logging messages for graceful restart session events:

```
RP/0/RP0/CPU0:router(config-ldp)# log graceful-restart
```

The following sample output shows the logging events that can be displayed on the console:

```
RP/0/RP0/CPU0:router: mpls_ldp[340]: %ROUTING-LDP-5-GR : GR session 4.4.4.4:0 (instance 1)
```

disconnected

RP/0/RP0/CPU0:router: mpls_ldp[340]: %ROUTING-LDP-5-GR : GR session 4.4.4.4:0 (instance 2)
reconnected

RP/0/RP0/CPU0:router: mpls_ldp[340]: %ROUTING-LDP-5-GR : GR session 5.5.5.5:0 (instance 3)
timed out

RP/0/RP0/CPU0:router: mpls_ldp[336]: %ROUTING-LDP-5-GR_RESTART_COMPLETE : GR forwarding
state hold timer has expired

Related Commands

Command	Description
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.
show mpls ldp graceful-restart, on page 84	Displays information about LDP GR sessions.

log neighbor

To enable logging of notices describing session changes, use the **log neighbor** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

log neighbor

no log neighbor

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP configuration

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.3.0	The log neighbor command replaced the former log neighbor changes 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 **log neighbor** command to receive a syslog or console message when a neighbor goes up or down.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples The following example shows how to enable logging messages for neighbor session up and down events:

```
RP/0/RP0/CPU0:router(config-ldp)# log neighbor
```



Note

A logging message is issued when an LDP session state changes from up to down (and down to up).

The following shows sample output of logging events that can be displayed on the console:

```
RP/0/RP0/CPU0:router:10 21:11:32.111:mpls_ldp[113]:%LDP-5-NBR_CHANGE: Nbr 10.44.44.44:0,  
DOWN
```

Related Commands

Command	Description
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.

log nsr

To enable logging of nonstop routing (NSR) synchronization events, use the **log nsr** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

log nsr

no log nsr

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP 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
	mpls-ldp	read, write

Examples The following example shows how to enable logging of NSR synchronization events:

```
RP/0/RP0/CPU0:router(config-ldp)# log nsr
```

log session-protection

To enable logging of notices describing LDP session protection events, use the **log session-protection** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

log session-protection

no log session-protection

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS LDP 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 **log session-protection** command to receive a syslog or console message when LDP session protection event occurs. These events include LDP session protection initiation, recovery, and timeout.

Task ID	Task ID	Operations
	mpls-ldp	read, write

Examples The following example shows how to enable logging messages for session protection events:

```
RP/0/RP0/CPU0:router(config-ldp)# log session-protection
```



Note

Logging messages are issued when session protection events occur.

The following sample output shows the logging events that are displayed on the console:

```
RP/0/RP0/CPU0:router:Apr 21 12:15:01.742: mpls_ldp[315]:%ROUTING-LDP-5-SESSION_PROTECTION:
Session hold up initiated for peer 4.4.4.4:0
```

```
RP/0/RP0/CPU0:router:Apr 21 12:18:04.987: mpls_ldp[315]:%ROUTING-LDP-5-SESSION_PROTECTION:  
Session recovery succeeded for peer 4.4.4.4:0
```

Related Commands

Command	Description
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.

maximum interfaces (MPLS LDP)

To configure upper limit on maximum number of LDP configured interfaces, use the **maximum interfaces** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

maximum interfaces *number*

no maximum interfaces

Syntax Description

<i>number</i>	Maximum number of LDP configured interfaces. Default is 800.

Command Default

By default, you can enable LDP on up to 800 interfaces.

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.5.1	Support for this command was removed.
Release 3.8.0	This command was moved to 'hidden' status and is no longer valid.
Release 4.0.1	This command 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.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to set an upper limit of 150 as maximum number of LDP interfaces, which can be enabled on the box:

```
RP/0/RP0/CPU0:router(config-ldp)# maximum interfaces 150
```


Related Commands

Command	Description
show mpls ldp discovery, on page 74	Displays LDP discovery information.
show mpls ldp summary, on page 103	Displays LDP summary information.

mpls ldp

To enter MPLS Label Distribution Protocol (LDP) configuration mode, use the **mpls ldp** command in global configuration mode.

mpls ldp

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Global 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
mpls-ldp	read, write

Examples

The following example shows how to MPLS LDP configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)
```

neighbor password

To configure password authentication using the TCP Message Digest 5 (MD5) option for a neighbor, use the **neighbor password** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

neighbor *IP-address* **password** {**clear** | **encrypted**} *password*

no neighbor *IP-address* **password**

Syntax Description

<i>IP-address</i>	Neighbor IP address.
clear	Clears the password for the encryption parameter to specify that an unencrypted password will follow.
encrypted	Specifies that an encrypted password will follow.
<i>password</i>	Clear text or encrypted password string.

Command Default

LDP sessions are negotiated without any password (and MD5).

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	The command was changed to use clear and encrypted instead of the numbers 0/7 .
Release 3.8.0	The command functionality was modified in the way the neighbor password command was being used for configuring global default passwords.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 security feature is enabled per neighbor, so that a session establishment attempt is allowed only when a password match has been configured. This option must be configured so that both peer passwords match.

To override the default password for a specific neighbor, use the **neighbor IP-address password** command, where the *IP-address* argument is the IP address of the neighbor.

**Note**

The global default password must be configured before being able to override the default password for a specific neighbor.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to configure the password *abc* for neighbor 10.20.20.20:

```
RP/0/RP0/CPU0:router(config-ldp)# neighbor 10.20.20.20 password clear abc
```

Related Commands

Command	Description
neighbor targeted, on page 56	Configures transmission of targeted hellos towards a neighbor.

neighbor password disable

To override an individual neighbor which requires no password, use the **neighbor password disable** command in MPLS LDP configuration mode.

neighbor *IP-address* **password disable**

Syntax Description

<i>IP-address</i>	Neighbor IP address.

Command Default

LDP sessions are negotiated without any password (and MD5).

Command Modes

MPLS LDP 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.

The system uses the global password to compute each neighbor's effective password and overrides the global password with the individual neighbor password, if configured. The session remains stable if you shift from an individual neighbor password to an equal global password. However, if the effective password changes during configuration, the session might be rendered unstable.



Note

You must configure the password for an individual neighbor using the neighbor's LSR ID.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to override the individual password *abc*, for the neighbor:

```
RP/0/RP0/CPU0:router(config-ldp)# neighbor 10.20.20.20 password disable abc
RP/0/RP0/CPU0:router(config-ldp)#
```

neighbor targeted

To configure transmission of targeted hellos toward a neighbor for setting up an LDP session, use the **neighbor targeted** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

neighbor *IP address* **targeted**

no neighbor *IP address* **targeted**

Syntax Description

IP address

Neighbor IP address.

Command Default

No default behavior or values

Command Modes

MPLS LDP 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
mpls-ldp	read, write

Examples

The following example shows how to set up a targeted discovery session for neighbor 200.1.1.1:

```
RP/0/RP0/CPU0:router(config-ldp)# neighbor 200.1.1.1 targeted
```

Related Commands

Command	Description
neighbor password , on page 53	Configures password authentication using MD5.
show mpls ldp neighbor , on page 92	Displays information about LDP neighbors.

Command	Description
show mpls ldp discovery, on page 74	Displays information about LDP discovery sources.

nsr (MPLS-LDP)

To configure nonstop routing for LDP protocols in the event of a disruption in service, use the **nsr** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

nsr

no nsr

Syntax Description

This command has no arguments or keywords.

Command Default

By default, MPLS LDP NSR is disabled.

Command Modes

MPLS LDP 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.

A disruption in service may include any of the following events:

- Route processor (RP) or distributed route processor (DRP) failover
- LDP process restart
- In-service system upgrade (ISSU)
- Minimum disruption restart (MDR)

Enabling NSR causes events such as these to be invisible to the routing peers and provide minimal service disruption.



Note

The LDP Process restart is supported by NSR only if the NSR process-failures switchover is configured, else the process restart causes the session to be unstable.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to enable MPLS LDP NSR:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls ldp  
RP/0/RP0/CPU0:router(config-ldp)# nsr
```

Related Commands

Command	Description
nsr process-failures switchover	Configures switchover as a recovery action for active instances to switch over to a standby RP or a DRP, to maintain NSR. For more information, see <i>Cisco IOS XRIP Addresses and Services Command Reference for the Cisco CRS-1 Router</i> .
show mpls ldp neighbor , on page 92	Displays standby node specific information.

redistribute (MPLS LDP)

To redistribute routes from a Border Gateway Protocol (BGP) autonomous system into an MPLS LDP, use the **redistribute** command in MPLS LDP configuration mode. To disable route redistribution, use the **no** form of this command.

redistribute bgp {*as as-number*| *advertise-to access-list-name*}

no redistribute bgp {*as as-number*| *advertise-to access-list-name*}

Syntax Description

bgp	Redistributes information from BGP protocols.
as <i>as-number</i>	Specifies the BGP autonomous system number.
advertise-to <i>access-list</i>	Advertise the redistributed route information.

Command Default

No default behavior or values

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 4.1.0	This command was introduced.

Usage Guidelines

Task ID

Task ID	Operation
MPLS LDP	read, write

Examples

The following example shows how to redistribute BGP information to MPLS LDP peers:

```
RP/0/RP0/CPU0:router(config)# mpls ldp
RP/0/RP0/CPU0:router(config-ldp)# redistribute bgp ?
  advertise-to  IP access list specifying LDP peers to advertise
  as           BGP AS-number
  <cr>
RP/0/RP0/CPU0:router(config-ldp)# redistribute bgp as 10000
RP/0/RP0/CPU0:router(config-ldp)# commit

RP/0/RP0/CPU0:router# show run mpls ldp | b bgp
bgp
```

```
as 10000  
!
```

router-id (MPLS LDP)

To specify the IP address of a preferred interface or a specific IP address as the LDP router ID, use the **router-id** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

router-id *IP-address*

no router-id

Syntax Description

<i>IP-address</i>	32-bit router ID value specified in four-part, dotted-decimal notation.

Command Default

LDP uses router ID as determined by global router ID agent, IP Address Repository Manager (IP ARM).

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.4.0	Deprecated interface 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 **router-id** command lets you specify an interface with an IP address to be used as the LDP router ID (which is necessary when an IP address selected as the LDP router ID might not be advertisable by the routing protocol to a neighboring router). In such cases, use the **router-id** command to select the IP address of the specified loopback interface (if the interface is operational) or a specific IP address.

LDP uses the router ID from different sources in the following order:

- 1 Configured LDP router ID.
- 2 Global router ID (if configured).
- 3 Calculated (computed) using the primary IPv4 address of the highest numbered configured loopback address. We recommend configuring at least one loopback address.



Note

We recommend that you configure an IP address for the LDP router-id to avoid unnecessary session flaps.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to specify an IP address as the LDP router ID:

```
RP/0/RP0/CPU0:router(config-ldp)#router-id 10.0.0.1
```

Related Commands

Command	Description
show mpls ldp discovery, on page 74	Displays the status of the LDP discovery process.
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.
show mpls ldp parameters, on page 98	Displays current LDP parameter settings.

session protection

To enable the LDP session protection feature for keeping LDP peer session up by means of targeted discovery following the loss of link discovery with a peer, use the **session protection** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

session protection [**duration** *seconds*| **infinite**] [**for** *peer-acl*]

no session protection

Syntax Description

duration <i>seconds</i>	(Optional) Specifies the protection duration, that is, the number of seconds that targeted discovery should continue following the loss of link discovery to a neighbor. Range is 30 to 2147483.
infinite	(Optional) Specifies session protection to last forever after loss of link discovery.
for <i>peer-acl</i>	(Optional) Specifies set of LDP peers for which session protection is to be enabled.

Command Default

By default, session protection is disabled. When enabled without peer-acl and duration, session protection is provided for all LDP peers and continues for 24 hours after a link discovery loss.

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.4.0	Default value for duration keyword changed from infinite to 24 hours. The infinite keyword was added for duration value.

Usage Guidelines

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

LDP session protection feature allows you to enable the automatic setup of targeted hello adjacencies with all or a set of peers and specify the duration for which session needs to be maintained using targeted hellos after loss of link discovery.

LDP supports only IPv4 standard access lists.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to enable session protection for all discovered peers with unlimited duration to maintain the session after link discovery loss:

```
RP/0/RP0/CPU0:router(config-ldp)# session protection
```

The following example shows how to enable session protection for a set of peers (as permitted by a peer ACL) with duration of 30 seconds to maintain the session after link discovery loss:

```
RP/0/RP0/CPU0:router(config-ldp)# session protection for peer_acl duration 30
```

Related Commands

Command	Description
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.

show mpls ldp backoff

To display information about the configured session setup backoff parameters and any potential LDP peers with which session setup attempts are being throttled, use the **show mpls ldp backoff** command in EXEC mode.

show mpls ldp backoff [*location node-id* | *standby*]

Syntax Description

location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The location and standby 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.

You must enable the MPLS LDP application to use the **show mpls ldp backoff** command.

Task ID

Task ID	Operations
mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp backoff** command:

```
RP/0/RP0/CPU0:router# show mpls ldp backoff

Backoff Time:
  Initial:15 sec, Maximum:120 sec

Backoff Table: (2 entries)
```



```

LDP Id                Backoff (sec)  Waiting (sec)
-----
33.33.33.33:0         15          15
11.11.11.11:0         30          30

```

This table describes the significant fields shown in the display.

Table 2: show mpls ldp backoff Command Field Descriptions

Field	Description
Backoff Time	Initial and maximum backoff time parameters, in seconds.
Backoff Table	List of discovered LDP neighbors for which session setup is being delayed because of previous failures to establish a session due to incompatible configuration. The backoff table incorporates the following information: LDP Id Identifies the LDP neighbors. Backoff (sec) Specifies the time that the session setup is delayed. Waiting (sec) Specifies an approximate time the session setup has been delayed.

Related Commands

Command	Description
backoff , on page 3	Configures LDP backoff parameters.
show mpls ldp forwarding , on page 79	Displays the contents of MPLS forwarding table.
show mpls ldp bindings , on page 68	Displays the contents of LDP LIB.

show mpls ldp bindings

To display the contents of the Label Information Base (LIB), use the **show mpls ldp bindings** command in EXEC command.

show mpls ldp bindings [*IP-address /prefix {mask| length}*] [**advertisement-acls**] [**brief**] [**detail**] [**local**] [**local-label** *label* [*to label*]] [**local-only**] [**neighbor** *address*] [**remote-only**][**remote-label** *label* [*to label*]] [**summary**] [**location** *node-id*] **standby**

Syntax Description

<i>IP-address /prefix</i>	(Optional) Destination prefix/mask length, written in A.B.C.D format.
<i>mask</i>	Network mask, written in A.B.C.D format.
<i>length</i>	Mask length, in bits. Range is 0 to 32.
advertisement-acls	(Optional) Displays the label bindings as applied for (advertisement) outbound label filtering ACLs.
brief	(Optional) Displays all the prefixes in the LDP database.
detail	(Optional) Displays the total counts of advertised-to and remote-binding peers in IP address sort order, with remote bindings in tabular format.
local	(Optional) Displays the local label bindings.
local-label <i>label</i> [<i>to label</i>]	(Optional) Displays entries matching local label values. Add the <i>label to label</i> argument to indicate the label range.
local-only	(Optional) Displays binding matches with a local label only.
neighbor <i>address</i>	(Optional) Displays the label bindings assigned by the selected neighbor.
remote-only	(Optional) Displays bindings matches with a remote label only.
remote-label <i>label</i> [<i>to label</i>]	(Optional) Displays entries matching the label values assigned by a neighbor router. Add the <i>label to label</i> argument to indicate the label range. Range is from 0 to 2147483647.
summary	(Optional) Displays a summary of the contents of the Label Information Base (LIB).
location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.2	The advertisement-acls keyword was supported.
	Release 3.6.3	The location , standby , remote-only , remote-label , and local-only 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 **show mpls ldp bindings** command displays local and remote label bindings learned from neighbors for non-BGP routes (such as IGP prefixes and static routes).

You can choose to view the entire database or a subset of entries according to the following criteria:

- Prefix
- Input or output label values or ranges
- Neighbor advertising the label



Note

The **show mpls ldp bindings summary** command displays summarized information from the LIB and is used when testing scalability or when deployed in a large scale network.

Task ID	Task ID	Operations
	mpls-ldp	read

Examples The following sample output displays the contents of the LIB for the default routing domain:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings
5.41.0.0/16 , rev 4
    local binding: label:IMP-NULL
    No remote bindings
5.43.9.98/32 , rev 6
    local binding: label:IMP-NULL
    No remote bindings
10.10.2.0/24 , rev 12
    local binding: label:IMP-NULL
```

show mpls ldp bindings

```

remote bindings :
  lsr:10.255.255.255:0, label:16
  lsr:10.256.256.256:0, label:IMP-NULL
10.10.3.0/24 , rev 10
  local binding: label:IMP-NULL
  remote bindings :
    lsr:10.255.255.255:0, label:IMP-NULL
    lsr:10.256.256.256:0, label:22
22.22.22.22/32 , rev 14
  local binding: label:16
  remote bindings :
    lsr:10.255.255.255:0, label:17
    lsr:10.256.256.256:0, label:IMP-NULL
33.33.33.33/32 , rev 2
  local binding: label:IMP-NULL
  remote bindings :
    lsr:10.255.255.255:0, label:18
    lsr:10.256.256.256:0, label:23

```

The following sample output shows detailed information for the total counts of advertised-to and remote-binding peers in IP address sort order, with remote bindings for 150.150.150.150/32:

```

RP/0/RP0/CPU0:router# show mpls ldp bindings 150.150.150.150/32 detail

150.150.150.150/32, rev 2
  Local binding: label: IMP-NULL
  Advertised to: (6 peers)
    120.120.120.120:0  130.130.130.130:0  150.150.150.1:0  150.150.150.2:0
    150.150.150.3:0   150.150.150.4:0
  Remote bindings:    (3 peers)
    Peer              Label
    -----
    120.120.120.120:0  27018
    130.130.130.130:0  26017
    160.160.160.160:0  27274

```

The following sample output specifies a network number and displays labels learned from label switched router (LSR) 10.255.255.255 for all networks. The **neighbor** keyword is used to suppress the output of remote labels learned from other neighbors:

```

RP/0/RP0/CPU0:router# show mpls ldp bindings neighbor 10.255.255.255

10.10.2.0/24 , rev 12
  local binding: label:IMP-NULL
  remote bindings :
    lsr:10.255.255.255, label:16
10.10.3.0/24 , rev 10
  local binding: label:IMP-NULL
  remote bindings :
    lsr:10.255.255.255:0, label:IMP-NULL
22.22.22.22/32 , rev 14
  local binding: label:16
  remote bindings :
    lsr:10.255.255.255:0, label:17
33.33.33.33/32 , rev 2
  local binding: label:IMP-NULL
  remote bindings :
    lsr:10.255.255.255:0, label:18
44.44.44.44/32 , rev 16
  local binding: label:17
  remote bindings :
    lsr:10.255.255.255:0, label:IMP-NULL

```

This table describes the significant fields shown in the display.

Table 3: show mpls ldp bindings and show mpls ldp bindings neighbor Command Field Descriptions

Field	Description
a.b.c.d/n	IP prefix and mask for a particular destination (network/mask).
rev	Revision number (rev) that is used internally to manage label distribution for this destination.
local binding	Locally assigned label for a prefix.
remote bindings	Outgoing labels for this destination learned from other LSRs. ¹ Each item in this list identifies the LSR from which the outgoing label was learned and reflects the label associated with that LSR. Each LSR in the transmission path is identified by its LDP identifier.
(rewrite)	Binding has been written into MPLS forwarding and is in use.
(no route)	Route is not valid. LDP times it out before the local binding is deleted.

¹ Label switched routers.

The following sample output summarizes the content by using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings summary
```

```
LIB Summary:
  Total Prefix      : 20
  Revision No       : Current:34, Advertised:34
  Local Bindings    : 14
    NULL           : 10 (implicit:10, explicit:0)
    Non-NULL: 4 (lowest:48, highest:51)
  Remote Bindings   : 24
```

This table describes the significant fields shown in the display.

Table 4: show mpls ldp bindings summary Command Field Descriptions

Field	Description
Total Prefix	Number of prefixes (routes) known to LDP LIB. All invalid and timed-out routes display as no-routes.

Field	Description
Revision No	Current revision number of LIB entries as well as the minimum revision number that has been advertised to all peers.
Local Bindings	Total number of local bindings, with information on how many of them are Null, non-null, and lowest/highest label assigned or allocated by LDP.
Remote Bindings	Number of remote bindings.

The following sample output shows the access-list advertisement:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings advertisement-acls

Advertisement Spec:
  Prefix ACL = 'pfx_11'
  Prefix ACL = 'pfx_22'
  Prefix ACL = 'pfx_40_1'; Peer ACL = 'peer_11'

5.41.0.0/16 , rev 82
11.11.11.11/32 , rev 69
  Advert ACL(s): Prefix ACL 'pfx_11'
20.20.20.20/32 , rev 83
22.22.22.22/32 , rev 78
  Advert ACL(s): Prefix ACL 'pfx_22'
40.1.1.0/24 , rev 79
  Advert ACL(s): Prefix ACL 'pfx_40_1'; Peer ACL 'peer_11'
```

This table describes the significant fields shown in the display.

Table 5: show mpls ldp bindings advertisement-acls Command Field Descriptions

Field	Description
Advertisement Spec	Lists all prefix and peer access-lists used as outbound label advertisement control.
Advert ACL(s)	Lists the first matching rule (if any) for the prefix entry for outbound label advertisement control (for prefix-acl).

The following sample output shows all the prefixes in the LDP database using the **brief** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings brief

Prefix                Local Advertised Remote Bindings
Label (peers)         (peers)
-----
1.1.2.2/32            -          0          1
1.2.3.4/32            16010      396        0
4.4.4.4/32            16004      396        3
10.0.0.0/24           19226      396       395
```

The following sample output shows that the binding matches with a local label:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings local-only

10.12.32.2/32, rev 4
  Local binding: label: IMP-NULL
  No remote bindings
```

The following sample output shows that the binding matches with a remote label:

```
RP/0/RP0/CPU0:router# show mpls ldp bindings remote-only

10.26.4.0/24, rev 0
  No local binding
  Remote bindings: (1 peers)
    Peer          Label
    -----
    10.6.6.6:0    IMP-NULL
10.43.4.0/24, rev 0
  No local binding
  Remote bindings: (1 peers)
    Peer          Label
    -----
    10.4.4.4:0    IMP-NULL
10.46.4.0/24, rev 0
  No local binding
  Remote bindings: (2 peers)
    Peer          Label
    -----
    10.4.4.4:0    IMP-NULL
    10.6.6.6:0    IMP-NULL
```

Related Commands

Command	Description
label accept, on page 36	Configures the LDP remote label acceptance.
label advertise, on page 38	Configures the LDP local label advertisement control.
show mpls ldp neighbor, on page 92	Displays information on the LDP neighbors.
show mpls ldp forwarding, on page 79	Displays the contents of the LDP forwarding database.

show mpls ldp discovery

To display the status of the LDP discovery process, use the **show mpls ldp discovery** command in EXEC mode.

show mpls ldp discovery [*IP-address type interface-path-id*] **brief** | **link** | **targeted** | **summary**] [**detail**] [**location node-id**] **standby**]

Syntax Description

<i>IP-address</i>	(Optional) Neighbor IP address.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
brief	(Optional) Displays concise information about a specified LDP-enabled interface.
link	(Optional) Displays link information for LDP discovery.
targeted	(Optional) Displays targeted information for LDP discovery.
summary	(Optional) Displays summarized information for LDP discovery.
detail	(Optional) Displays detailed information (including, inbound label filtering, session KAs, and session protection state) for an LDP session.
location node-id	(Optional) Displays location information for the specified node ID.
standby	(Optional) Displays standby node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	The summary keyword was added.

Release	Modification
Release 3.6.3	The following items were added: • The location keyword was added. • The standby keyword was added. • Sample output was added for the brief keyword.
Release 3.9.0	The following items were added: • The link keyword was added. • The targeted 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.

The **show mpls ldp discovery command** shows both link discovery and targeted discovery. When no interface filter is specified, this command generates a list of interfaces running the LDP discovery process. This command also displays neighbor discovery information for the default routing domain.

Task ID

Task ID	Operations
mpls-ldp	read

Examples

The following sample output is from the **show mpls ldp discovery** command:

```
RP/0/RP0/CPU0:router# show mpls ldp discovery

Local LDP Identifier: 10.44.44.44:0
Discovery Sources:
  Interfaces:
    POS 0/1/0/0 : xmit/recv
      LDP Id: 10.33.33.33:0, Transport address: 10.33.33.33
      Hold time: 15 sec (local:15 sec, peer:15 sec)
```

This table describes the significant fields shown in the display.

Table 6: show mpls ldp discovery Command Field Descriptions

Field	Description
Local LDP Identifier	LDP identifier for the local router. An LDP identifier is a 6-byte construct displayed in the form IP address:number. By convention, the first 4 bytes of the LDP identifier constitute the router ID; integers, starting with 0, constitute the final two bytes of the IP address:number construct.
Interfaces	Interfaces engaged in LDP discovery activity, as follows: xmit field Indicates that the interface is transmitting LDP discovery hello packets. recv field indicates that the interface is receiving LDP discovery hello packets. The LDP identifiers indicate the LDP neighbors discovered on the interface.
Transport Address	Address associated with this LDP peer (advertised in hello messages).
LDP Id	LDP identifier of the LDP peer.
Hold time	State of the forwarding hold timer and its current value.

The following sample output summarizes information for LDP discovery by using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp discovery summary

LDP Identifier: 139.0.0.1:0
Interfaces:
  Configured: 2
  Enabled   : 1
Discovery:
  Hello xmit: 1 (1 link)
  Hello recv: 1 (1 link)
```

This table describes the significant fields shown in the display.

Table 7: show mpls ldp discovery summary Command Field Descriptions

Field	Description
LDP Identifier	The LDP identifier for the local router.

Field	Description
Interfaces	Summary of interfaces engaged in LDP activity. Configured Number of interfaces configured for LDP. Enabled Number of interfaces on which LDP is actively enabled and is thus sending LDP hellos. An interface configured for LDP is enabled only if running IP and not in the down state.
Discovery	Summary of LDP discovery process. Hello xmit Number of local LDP discovery sources (including link and targeted hellos) emitting LDP hellos. Hello rcv Number of discovered hello sources via link or targeted hello mechanics.

The following sample output MPLS LDP discovery hello information in brief form:

```
RP/0/RP0/CPU0:router# show mpls ldp discovery brief
```

```
Local LDP Identifier: 150.150.150.150:0
```

Discovery Source	Peer LDP Id	Holdtime	Session
BE35	130.130.130.130:0	15	Y
Gi0/6/0/6	160.160.160.160:0	15	Y
Gi0/6/2/7.1	174.1.1.2:0	45	Y
Target: 120.120.120.120	120.120.120.120:0	90	Y
Target: 150.150.150.1	150.150.150.1:0	120	Y

Related Commands

Command	Description
discovery hello, on page 12	Configures LDP link hello parameters.
discovery targeted-hello, on page 15	Configures LDP targeted-hello parameters.
neighbor targeted, on page 56	Configures LDP targeted neighbor.
session protection, on page 64	Configures LDP session protection.

Command	Description
interface (MPLS LDP), on page 34	Configures LDP on an interface.
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.

show mpls ldp forwarding

To display the Label Distribution Protocol (LDP) forwarding state installed in MPLS forwarding, use the **show mpls ldp forwarding** command in EXEC mode.

show mpls ldp forwarding [*IP -address*] {*mask*|*length*} [**fast-reroute**] [**detail**] [**next-hop**|**address** *IP-address*|**interface***interface-path-id*|**label** *label-value*|**neighbor** *IP -address*|**unlabelled**] [**local-label** *label-value*] [**location** *node-id*] [**summary**] [**standby**]

Syntax Description

<i>IP-address</i>	(Optional) IP address, specified in four-part, dotted-decimal notation.
<i>mask</i>	Network mask.
<i>length</i>	Mask length, in bits. Range is 0 to 32.
detail	(Optional) Displays detailed information for the LDP timestamp that is used for the routing and forwarding update.
fast-reroute	(Optional) Displays the prefix that is LFA FRR protected in nature.
next-hop	Matches prefixes by next-hop IP address.
local-label <i>label-value</i>	(Optional) Displays the prefix with the specified local label. Range is from 0 to 1048575.
neighbor	Matches prefixes with a path through specified LDP neighbor.
unlabelled	Matches prefixes containing unlabelled paths.
location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
summary	(Optional) Displays the summary information for the LDP forwarding information base (LFIB).
standby	(Optional) Displays standby-node specific information.

Command Default No default behavior or values

Command Modes EXEC

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	Sample output was modified.
Release 3.9.0	The following items were added: • The detail keyword. • Sample output for the detail keyword. • The local-label keyword. • The location keyword. • The standby keyword.
Release 4.0.1	These items were added: • The fast-reroute keyword. • The summary keyword. • The next-hop keyword. • The neighbor keyword. • The unlabelled 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 **show mpls ldp forwarding** command displays the LDP forwarding entries and provides LDP view of its installed forwarding entries.

Task ID	Task ID	Operations
	mpls-ldp	read

Examples

This is a sample output from the **show mpls ldp forwarding** command:

```
RP/0/RP0/CPU0:router# show mpls ldp forwarding
```

Prefix	Label In	Label Out	Outgoing Interface	Next Hop	GR Stale
2.2.2.2/32	22	ImpNull	PO0/2/0/1	12.0.0.2	N N
3.0.0.1/32	24	20	PO0/2/0/1	12.0.0.2	N N
3.0.0.2/32	25	21	PO0/2/0/1	12.0.0.2	N N
3.0.0.3/32	26	22	PO0/2/0/1	12.0.0.2	N N
4.4.4.4/32	20	ExpNullv4	tt10	4.4.4.4	N N
4.4.4.5/32	21	ExpNullv4	tt10	4.4.4.4	N N
123.0.0.0/24	23	ImpNull	PO0/2/0/1	12.0.0.2	N N
3.3.3.3/32	16000	16001	PO0/2/0/3.1	131.1.1.4	Y N
		16002	PO0/2/0/3.2	131.1.2.4	Y N
		16003	PO0/2/0/3.3	131.1.3.4	N N
		16002	PO0/2/0/1	192.11.1.1 (!)	Y N
		Unlabelled	PO0/2/0/2	192.11.2.1 (!)	N N

**Note**

The (!) symbol refers to a non-primary LFA backup path.

This sample output shows detailed information for the LDP timestamp that is used for routing and forwarding update from the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp forwarding 1.1.1.1/32 detail
```

Prefix	Label In	Label Out	Outgoing Interface	Next Hop	GR Stale
3.3.3.3/32	16000	16001	PO0/2/0/3.1	131.1.1.4	N N
		[Protected; path-id 1 backup-path-id 33; peer 13.13.13.1:0]			
		16002	PO0/2/0/3.2	131.1.2.4	Y N
		[Protected; path-id 2 backup-path-id 33; peer 13.13.13.1:0]			
		16003	PO0/2/0/3.3	131.1.3.4	N N
		[Protected; path-id 3 backup-path-id 34; peer 13.13.13.2:0]			
		16002	PO0/2/0/1	192.11.1.1 (!)	Y N
		[Backup; path-id 33; peer 14.14.14.1:0]			
		Unlabelled	PO0/2/0/2	192.11.2.1 (!)	N N
		[Backup; path-id 34]			

```
Routing update   : Mar 31 13:35:25.348 (00:55:32 ago)
Forwarding update: Mar 31 13:35:25.349 (00:55:32 ago)
```

**Note**

The (!) symbol refers to a non-primary LFA backup path.

This sample output shows only LDP prefixes with protection (ECMP or secondary LFA backups) update from the **fast-reroute** keyword:

This sample output shows the statistics of protected prefixes and protected paths from the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp forwarding summary
Forwarding Server (LSD):
  Connected: Yes
```

show mpls ldp forwarding

```

Forwarding State Holdtime: 360 sec
Forwarding States:
Interfaces: 10
Local labels: 8
Rewrites:
  Prefix:
    Total: 8 (0 with ECMP, 8 FRR protected)
    Labelled:
      Primary pathset : 8 labelled (0 partial), 0 unlabelled
      Backup pathset  : 8 labelled (0 partial), 0 unlabelled
      Complete pathset: 8 labelled (0 partial), 0 unlabelled
  Paths:
    Total: 16 (8 backup, 8 FRR protected)
    Labelled: 16 (8 backup)

```

This table describes the significant fields shown in the display.

Table 8: show mpls ldp forwarding Command Field Descriptions

Field	Description
Prefix/mask	Prefix on the FEC ² for an MPLS forwarding entry.
Label In	Local label assigned to the prefix/mask.
Label Out	Outgoing label for the prefix/mask.
Outgoing Interface	Outgoing physical interface.
Next Hop	Next Hop address.
GR	Graceful restart status (Y or N).
Stale	Status of the entry, stale or not stale. An entry is marked stale when the next-hop graceful restart neighbor disconnects and is unmarked when neighbor reconnects and refreshes the label.
Chkpt	Status of the entry, checkpointed or not checkpointed.
path-id	Primary Path-id.
Backup-path-id	The backup path-id is the path-id of the path protecting a given primary path. A protecting path can be primary path or a non-primary path.
Peer	Displays next-hop LDP peer's LDP identifier.
Connected	Displays LDP connection state with LSD forwarding server.
Forwarding State Holdtime	Displays time that LDP has registered with LSD server to keep LDP forwarding state intact upon LDP disconnect event.

Field	Description
Interfaces	Number of LDP enabled MPLS interfaces.
Local Labels	Number of LDP allocated local labels from LSD.
Rewrites	Counts of Forwarding rewrites. Displays total number of known IPv4 prefixes alongwith information on number of prefixes with more than one ECMP path. This also displays number of prefixes with LFA-FRR protection. The labelled set prints the counts related to prefixes with none, all, partial labelled paths as shown by unlabeled, labelled, and partial keywords. This information is available for primary, backup, and complete path set.
Paths	Forwarding path counts. Displays count of total number of known forwarding paths, along with number of backup paths and number of FRR protected paths. It also displays the count of labelled paths indicating how many of non-primary paths are labelled.

² Forwarding Equivalence Class.

Related Commands

Command	Description
graceful-restart (MPLS LDP) , on page 23	Configures the LDP graceful restart feature.
show mpls ldp bindings , on page 68	Displays the contents of LDP LIB.

show mpls ldp graceful-restart

To display the status of the Label Distribution Protocol (LDP) graceful restart, use the **show mpls ldp graceful-restart** command in EXEC mode.

show mpls ldp graceful-restart [**location** *node-id* | **standby**]

Syntax Description

location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The location and standby 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 **show mpls ldp graceful-restart** command displays LDP graceful-restart-related information when the **graceful-restart** command is enabled.

Task ID

Task ID	Operations
mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp graceful-restart** command:

```
RP/0/RP0/CPU0:router# show mpls ldp graceful-restart
```

```
Forwarding State Hold timer : Not Running
GR Neighbors                : 1
```

```
Neighbor ID      Up    Connect Count  Liveness Timer      Recovery Timer
```

```

-----
10.0.0.2      Y      1      -      -

```

This table describes the significant fields shown in the display.

Table 9: show mpls ldp graceful-restart Command Field Descriptions

Field	Description
Forwarding State Hold timer	State of the hold timer—running or not running.
GR Neighbors	Number of graceful restartable neighbors.
Neighbor ID	Router ID of each neighbor.
Up	Neighbor up or down.
Connect Count	Number of times the same neighbor has reconnected.
Liveness Timer	State of the liveness timer (running or not running) and its expiration time, if running.
Recovery Timer	State of the recovery timer (running or not running) and its expiration time, if running.

Related Commands

Command	Description
graceful-restart (MPLS LDP), on page 23	Configures the LDP graceful restart feature.
show mpls ldp neighbor, on page 92	Displays information about LDP neighbors.

show mpls ldp igp sync

To display Label Distribution Protocol (LDP) Interior Gateway Protocol (IGP) synchronization information on interface(s), use the **show mpls ldp igp sync** command in EXEC mode.

show mpls ldp igp sync [*interface type interface-path-id*] [*location node-id* | **standby**]

Syntax Description

interface	(Optional) Displays the 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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 location information for the specified node ID.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.9.0	The location and standby 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.

LDP IGP synchronization addresses traffic loss issues as a result of synchronization between MPLS LDP and IP (IGP). For instance, upon a link up, IGP can advertise a link before MPLS converges on the link. Also, the IGP link is still used even when MPLS session goes down and MPLS LSP is broken on this link. The use of IGP link is determined based on MPLS LDP convergence synchronization status on the link.

Use the **show mpls ldp igp sync** command to display MPLS convergence status. The configuration for LDP IGP synchronization resides in IGPs (OSPF, ISIS); accordingly, LDP displays and advertises this information for all LDP-enabled interfaces (regardless if the interface is configured for LDP IGP).

Task ID

Task ID	Operations
mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp igp sync** command:

```
RP/0/RP0/CPU0:router# show mpls ldp igp sync
```

```
GigabitEthernet0/3/0/0:
  Sync status: Ready
  Peers:
    2.2.2.2:0
    3.3.3.3:0 (GR)
  GR-only Reachability:
    4.4.4.4:0 (Chkpt-created)

POS0/2/0/0:
  Sync status: Not ready
                (Deferred; 24 sec remaining)

POS0/2/0/1:
  Sync status: Not ready
```

This table describes the significant fields shown in the display.

Table 10: show mpls ldp igp sync Command Field Descriptions

Field	Description
Sync status	MPLS LDP convergence status on a given link. Ready indicates that the link is converged and is ready to be used by IGP. Not Ready with Deferred means that the link fulfills LDP IGP synchronization requirements but is deferred by LDP IGP synchronization delay timeout configuration setting. Not Ready means that the link is not ready to be used by IGP.
Peers	List of peers converged on the given link. If the peer session is GR ³ -enabled, output is tagged as GR. If GR-only reachability is indicated due to a GR neighbor record recovered from checkpoint after local start, then Chkpt-created flag is also set.
GR-only Reachability	List of GR ⁴ peers which are not currently converged on a given link but still in the forwarding state.

³ Graceful Restart.

 show mpls ldp igp sync

⁴ Graceful Restart.

Related Commands

Command	Description
igp sync delay, on page 30	Configures LDP IGP sync delay timeout.

show mpls ldp interface

To display information about LDP-enabled interfaces, use the **show mpls ldp interfaces** command in EXEC mode.

show mpls ldp interface [*type interface-path-id* | **summary**] [**brief**] [**location** *node-id* | **standby**]

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 a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
summary	(Optional) Displays summary information about a specified LDP-enabled interface.
brief	(Optional) Displays concise information about a specified LDP-enabled interface.
detail	(Optional) Displays detailed information about a specified LDP-enabled interface.
location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 3.5.0	This command was introduced.
Release 3.9.0	The location and standby keywords were added.
Release 4.2.0	The detail 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
mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp interface** command:

```
RP/0/RP0/CPU0:router# show mpls ldp interface
```

```
Interface GigabitEthernet0/3/0/3
  No LDP config
Interface POS0/2/0/0
  No LDP config
  Auto-config items:
    ospf/100/0
Interface POS0/2/0/1
  No LDP config
  Auto-config items:
    ospf/100/0
Interface POS0/2/0/2
  No LDP config
  Auto-config items:
    ospf/100/0
Interface POS0/2/0/3
  No LDP config
  Auto-config items:
    ospf/100/0
```

This table describes the significant fields shown in the display.

Table 11: show mpls ldp interface Command Field Descriptions

Field	Description
Auto-config items	Lists IGP's that specify an interface for MPLS LDP auto-configuration: OSPF <i>ospf instance area</i> ISIS <i>isis instance</i>

The following shows a sample output from the **show mpls ldp interface detail** command for the mesh groups:

```
RP/0/RP0/CPU0:router# show mpls ldp interface detail
```



```
Interface GigabitEthernet0/2/0/0 (0x20200040)
  Enabled via config: LDP interface
Interface GigabitEthernet0/2/0/1 (0x20200060)
  Disabled via config: IGP Auto-config disable
  Ignoring: LDP interface
Interface GigabitEthernet0/2/0/2 (0x20200080)
  Disabled via config: IGP Auto-config disable
  Ignoring: LDP interface
Interface tunnel-te1 (0x200000f0)
  Disabled
Interface tunnel-te100 (0x20000110)
  Enabled via config: TE Mesh-group 123, TE Mesh-group all
Interface tunnel-te101 (0x20000130)
  Enabled via config: TE Mesh-group 123, TE Mesh-group all
```

Related Commands

Command	Description
igp auto-config disable, on page 28	Disables LDP auto-configuration.

show mpls ldp neighbor

To display the status of Label Distribution Protocol (LDP) sessions, use the **show mpls ldp neighbor** command in EXEC mode.

show mpls ldp neighbor [*IP-address*] [*type interface-path-id*] [**brief**] [**detail**] [**gr**] [**location** *node-id*] [**non-gr**] [**sp**] [**standby**]

Syntax Description

<i>IP-address</i>	(Optional) Neighbor IP address.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
brief	(Optional) Displays the existing LDP sessions in brief format.
detail	(Optional) Displays detailed information (including, inbound label filtering, session KAs, and session protection state) for an LDP session.
gr	(Optional) Displays graceful restartable neighbors.
location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
non-gr	(Optional) Displays non-graceful restartable neighbors.
sp	(Optional) Displays neighbors with session protection.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.

Release	Modification
Release 3.3.0	Introduced two new keywords: • sp keyword filters sessions with session protection capability • detail keyword displays detailed information including session protection state and hold time
Release 3.6.0	Support was added for the standby keyword.
Release 3.9.0	The following items were added: • The tunnel-ip interface type was added to support MPLS LDP over GRE tunnels. • The tunnel-gte interface type was added. • The location keyword was added. • Sample output for the brief keyword was modified to add the NSR and IPv4 Label columns.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 mpls ldp neighbor** command provides information about all LDP neighbors in the entire routing domain—conversely, the show output is filtered to display:

- LDP neighbors with specific IP addresses
- LDP neighbors on a specific interface
- LDP neighbors that are graceful restartable
- LDP neighbors that are nongraceful restartable
- LDP neighbors enabled with session protection

Task ID

Task ID	Operations
mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp neighbor** command using an IP address:

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor 10.22.22.22

Peer LDP Identifier: 10.22.22.22:0
TCP connection: 10.22.22.22:646 - 10.33.33.33:65530
Graceful Restart: No
```

show mpls ldp neighbor

```

State: Oper; Msgs sent/rcvd: 46/43
Up time: 00:31:21
LDP Discovery Sources:
POS 0/2/0/0
Addresses bound to this peer:
10.22.22.22      10.10.2.1

```

The following shows a sample output from the **show mpls ldp neighbor** command using the **non-gr** keyword:

```

RP/0/RP0/CPU0:router# show mpls ldp neighbor non-gr

Peer LDP Identifier: 10.44.44.44:0
  TCP connection: 10.44.44.44:65535 - 10.33.33.33:646
  Graceful Restart: No
  State: Oper; Msgs sent/rcvd: 49/46
  Up time: 00:33:33
  LDP Discovery Sources:
    POS 0/1/0/0
  Addresses bound to this peer:
    10.44.44.44      10.10.3.2
Peer LDP Identifier: 10.22.22.22:0
  TCP connection: 10.22.22.22:646 - 10.33.33.33:65530
  Graceful Restart: No
  State: Oper; Msgs sent/rcvd: 48/45
  Up time: 00:33:11
  LDP Discovery Sources:
    POS 0/2/0/0
  Addresses bound to this peer:
    10.22.22.22      10.10.2.1

```

This table describes the significant fields shown in the display.

Table 12: show mpls ldp neighbor Command Field Descriptions

Field	Description
Peer LDP Identifier	LDP identifier of the neighbor (peer) for this session.
TCP connection	TCP connection used to support the LDP session, shown in the following format: neighbor IP address peer port local IP address local port
Graceful Restart	Graceful-restart status (Y or N).
State	State of the LDP session. Generally this is Oper (operational), but transient is another possible state.
Msgs sent/rcvd	Number of LDP messages sent to and received from the session peer. The count includes the transmission and receipt of periodic keepalive messages, which are required for maintenance of the LDP session.

Field	Description
Up time	The length of time that this session has been up for (in <i>hh:mm:ss</i> format).
LDP Discovery Sources	The source(s) of LDP discovery activity leading to the establishment of the LDP session.
Addresses bound to this peer	The known interface addresses of the LDP session peer. These are addresses that might appear as “next hop” addresses in the local routing table. They are used to maintain the LFIB ⁵ .

⁵ LFIB = Label Forwarding Information Base.

The following shows a sample output from the **show mpls ldp neighbor** command using the **brief** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor brief
```

Peer	GR	NSR	Up Time	Discovery	Address	IPv4 Label
2.2.2.2:0	N	Y	01:39:50	1	4	19
3.3.3.3:0	N	N	01:38:04	1	3	5

This table describes the significant fields shown in the display.

Table 13: show mpls ldp neighbor brief Command Field Descriptions

Field	Description
Peer	LDP identifier of the neighbor (peer) for this session.
GR	Graceful-restart status (Y or N).
Up Time	Time the session has been up (in <i>hh:mm:ss</i> format).
Discovery	Number of LDP discovery sources corresponding to the neighbor.
Address	Number of addresses bound to this peer.

The following shows a sample output from the **show mpls ldp neighbor** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls ldp neighbor detail
```

```
Peer LDP Identifier: 2.2.2.2:0
TCP connection: 2.2.2.2:11707 - 1.1.1.1:646
Graceful Restart: No
Session Holdtime: 180 sec
State: Oper; Msgs sent/rcvd: 33/29
Up time: 00:13:37
LDP Discovery Sources:
  POS0/2/0/1
  Targeted Hello (1.1.1.1 ->2.2.2.2, active)
```

```

Addresses bound to this peer:
  23.0.0.2 2.0.0.2      123.0.4.2      10.42.37.119
  10.2.2.2
Peer holdtime: 180 sec; KA interval: 60 sec; Peer state: Estab
Clients: Dir Adj Client
Inbound label filtering: accept acl 'pfx_acl2'
Session Protection:
  Enabled, state: Ready
  Duration: 30 seconds

```

This table describes the significant fields shown in the display.

Table 14: show mpls ldp neighbor detail Command Field Descriptions

Field	Description
Peer LDP Identifier	LDP identifier of the neighbor (peer) for this session.
TCP connection	TCP connection used to support the LDP session, shown in the following format: neighbor IP address peer port local IP address local port
Graceful Restart	Graceful-restart status (Y or N).
Session Holdtime	Session hold time, in seconds.
State	State of the LDP session (operational or transient).
Msgs sent/rcvd	Number of LDP messages sent to and received from the session peer. The count includes the transmission and receipt of periodic keepalive messages, which are required for maintenance of the LDP session.
Up time	Time the session has been up for (in <i>hh:mm:ss</i> format).
Peer holdtime	Time to keep LDP peer session up without receipt of LDP protocol message from a peer.
Peer state	Peer session state.
Peer holdtime	Time to keep LDP peer session up without receipt of LDP protocol message from a peer.
Clients	LDP (internal) clients requesting session with a neighbor.
Inbound label filtering	LDP neighbor inbound filtering policy.

Field	Description
Session Protection	State of the session protection: Incomplete Targeted discovery requested but not yet up. Ready Targeted discovery and at least one link hello adjacency to the peer are up. Protecting Targeted discovery is up and there is no link hello adjacency to the peer. Targeted discovery is protecting and backing up link discoveries.
Duration	Maximum time to maintain session through targeted discovery upon loss of primary link discovery.
Holdtimer	When in “protecting” state, time to keep LDP peer session up without receipt of LDP protocol message from a peer.

Related Commands

Command	Description
graceful-restart (MPLS LDP), on page 23	Configures the LDP graceful restart feature.
label accept, on page 36	Configures the LDP inbound label filtering feature.
session protection, on page 64	Configures the LDP session protection feature.
show mpls ldp discovery, on page 74	Displays the status of the LDP discovery process.

show mpls ldp parameters

To display current LDP parameters, use the **show mpls ldp parameters** command in EXEC mode.

show mpls ldp parameters [*location node-id* | *standby*]

Syntax Description

location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The location and standby 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 **show mpls ldp parameters** command displays all LDP operational and configuration parameters.

Task ID

Task ID	Operations
mpls-ldp	read
network	read

Examples

The following shows a sample output from the **show mpls ldp parameters** command:

```
RP/0/RP0/CPU0:router# show mpls ldp parameters
```

```
LDP Parameters:
  Protocol Version: 1
  Router ID: 10.11.11.11
  Null Label: Implicit
```



```

Session:
  Hold time: 180 sec
  Keepalive interval: 60 sec
  Backoff: Initial:15 sec, Maximum:120 sec
Discovery:
  Link Hellos:      Holdtime:15 sec, Interval:5 sec
  Targeted Hellos: Holdtime:90 sec, Interval:10 sec
                  (Accepting peer ACL 'peer_acl_10')
Graceful Restart:
  Enabled (Configured)
  Reconnect Timeout:120 sec, Forwarding State Holdtime:180 sec
Timeouts:
  Binding with no-route: 300 sec
  LDP application recovery (with LSD): 360 sec
OOR state
Memory: Normal

```

This table describes the significant fields shown in the display.

Table 15: show mpls ldp parameters Command Field Descriptions

Field	Description
Protocol Version	Version of LDP running on the platform.
Router ID	Currently used router ID.
Null Label	LDP use of implicit-null or explicit-null as label for prefixes where it has to use a null label.
Session Hold time	Time LDP session is to be maintained with an LDP peer without receiving LDP traffic or an LDP keepalive message from the peer.
Session Keepalive interval	Time interval between consecutive transmissions of LDP keepalive messages to an LDP peer.
Session Backoff	Initial maximum backoff time for sessions.
Discovery Link Hellos	Time to remember that a neighbor platform wants an LDP session without receiving an LDP hello message from the neighbor (hold time), and the time interval between the transmission of consecutive LDP hello messages to neighbors (interval).
Discovery Targeted Hellos	Indicates the time: - To remember that a neighbor platform wants an LDP session when the neighbor platform is not directly connected to the router or the neighbor platform has not sent an LDP hello message. This intervening interval is known as <i>hold time</i>. - Interval between the transmission of consecutive hello messages to a neighbor not directly connected to the router and if targeted hellos are being accepted, displaying peer-acl (if any).

Field	Description
Graceful Restart	Status of graceful-restart status (Y or N).
Timeouts	Various timeouts (of interest) that the LDP is using. One timeout is <i>binding no route</i> , which indicates how long the LDP waits for an invalid route before deleting it. It also shows restart recovery time for LSD and LDP.
OOR state	Out of resource memory state: Normal, Major, or Critical.

Related Commands

Command	Description
backoff , on page 3	Configures the parameters for the LDP backoff mechanism.
discovery hello , on page 12	Configures the interval between transmission of LDP discovery messages.
explicit-null , on page 21	Configures a router to advertise an explicit-null label.
graceful-restart (MPLS LDP) , on page 23	Configures the LDP graceful restart feature.
holdtime (MPLS LDP) , on page 26	Configures keepalive message hold time for LDP sessions.
neighbor targeted , on page 56	Specifies the preferred interface or IP address of a Loopback interface for determining the LDP router ID.

show mpls ldp statistics msg-counters

To display statistics of the messages exchanged between neighbors, use the **show mpls ldp statistics msg-counters** command in EXEC mode.

show mpls ldp statistics msg-counters [*IP-address*] [**location** *node-id* | **standby**]

Syntax Description

<i>IP-address</i>	(Optional) Neighbor IP address.
location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The location and standby 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 **show mpls ldp statistics msg-counters** command can provide counter information about different types of messages sent and received between neighbors.

Task ID

Task ID	Operations
mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp statistics msg-counters** command:

```
RP/0/RP0/CPU0:router# show mpls ldp statistics msg-counters

Peer LDP Identifier: 10.33.33.33:0
Msg Sent: (80)
```

show mpls ldp statistics msg-counters

```

Init          : 1
Address       : 1
Address_Withdraw : 0
Label_Mapping : 5
Label_Withdraw : 0
Label_Release : 0
Notification  : 0
KeepAlive     : 73

Msg Rcvd: (81)
Init          : 1
Address       : 1
Address_Withdraw : 0
Label_Mapping : 8
Label_Withdraw : 0
Label_Release : 0
Notification  : 0
KeepAlive     : 71

```

Table 16: [show mpls ldp statistics msg-counters Command Field Descriptions](#), on page 102 describes the significant fields shown in the display.

Table 16: show mpls ldp statistics msg-counters Command Field Descriptions

Field	Description
Peer LDP Identifier	LDP identifier of the neighbor (peer).
Msg Sent	Summary of messages sent to the LDP peer.
Msg Rcvd	Summary of messages received from the LDP peer.

Related Commands

Command	Description
clear mpls ldp msg-counters neighbor , on page 5	Clears MPLS LDP message counter values.
show mpls ldp bindings , on page 68	Displays the contents of LDP LIB.
show mpls ldp neighbor , on page 92	Displays LDP neighbor information.

show mpls ldp summary

To display a summary of LDP information, use the **show mpls ldp summary** command in EXEC mode.

show mpls ldp summary [*location node-id* | *standby*]

Syntax Description

location <i>node-id</i>	(Optional) Displays location information for the specified node ID.
standby	(Optional) Displays standby-node-specific information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The location and standby 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 **show mpls ldp summary** command can provide information about the number of LDP neighbors, interfaces, forwarding state (rewrites), servers connection/registration, and graceful-restart information.

Task ID

Task ID	Operations
mpls-ldp	read

Examples

The following shows a sample output from the **show mpls ldp summary** command:

```
RP/0/RP0/CPU0:router# show mpls ldp summary

Routes       : 4
Neighbors    : 1 (1 GR)
Hello Adj    : 1
Interfaces: 4 (1 forward reference, 2 LDP configured)
Addresses    : 3
Clients      : 0
```

show mpls ldp summary

```

Servers      :
              Connected Registered
              -----
SysDB        Y             Y
IM           Y             Y
IPv4 ARM     Y             -
LSD          Y             Y
RIBv4        Y             Y

```

This table describes the significant fields shown in the display.

Table 17: show mpls ldp summary Command Field Descriptions

Field	Description
Routes	Number of known IP routes (prefixes).
Neighbors	Number of LDP neighbors, including targeted and graceful restartable neighbors.
Hello Adj	Number of discovered LDP discovery sources.
Interfaces	Number of known IP interfaces and number of LDP configured interfaces. LDP is configured on a forward-referenced interface which may not exist or for which no IP address is configured.
Addresses	Number of known local IP addresses.
Clients	Number of external LDP clients. This number is always zero.
Servers	Connection and registration status with servers: SysDB ⁶ , IM ⁷ , IPv4 ARM ⁸ , LSD ⁹ , and IPv4 RIBv4 ¹⁰ .

⁶ SysDB = System Database.

⁷ IM = Interface Manager.

⁸ IPv4 ARM = IPv4 Address Resource Manager.

⁹ LSD = Label Switching Database.

¹⁰ RIBv4 = Routing Information Base.

Related Commands

Command	Description
show mpls ldp bindings, on page 68	Displays the contents of LDP LIB.
show mpls ldp discovery, on page 74	Displays the status of the LDP discovery process.
show mpls ldp forwarding, on page 79	Displays the contents of the LDP forwarding database.
show mpls ldp graceful-restart, on page 84	Displays the status of the LDP graceful restart.

Command	Description
show mpls ldp parameters, on page 98	Displays current LDP parameter settings.

show lcc

To display label consistency checker (LCC) information, use the **show lcc** command in EXEC mode.

show lcc {**ipv4**|**ipv6**} **unicast** {**all**|**label**|**tunnel-interface**|**statistics** | [**summary**|**scan-id** *scan-id*]} [**vrf** *vrfname*]

Syntax Description

ipv4	Specifies IP version 4 address prefixes.
ipv6	Specifies IP version 6 address prefixes.
unicast	Specifies unicast address prefixes.
all	Scans all routes.
label	Scans all labels.
tunnel-interface	Specifies the interface of a tunnel.
statistics	Displays route consistency check statistics information.
scan-id	Specifies the value of scan-id. Range is from 0 to 100000.
summary	Displays background route consistency check statistics summary information.
vrf <i>vrfname</i>	(Optional) Specifies a particular VPN routing and forwarding (VRF) instance or all VRF instances.

Command Default

None

Command Modes

IPv4 address family configuration
IPv6 address family configuration

Command History

Release	Modification
Release 4.2.0	This command was introduced.

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	Operations
IPv4	read
IPv6	read

Examples

The following example shows an outcome of the label consistency checker information:

```
RP/0/RP0/CPU0:router# show lcc ipv4 unicast all
```

```
Sending scan initiation request to IPv4 LSD ... done
Waiting for scan to complete (max time 600 seconds).....
Scan Completed
Collecting scan results from FIBs (max time 30 seconds)... done
Number of nodes involved in the scan: 2
Number of nodes replying to the scan: 2
```

Legend:

```
? - Currently Inactive Node, ! - Non-standard SVD Role
* - Node did not reply
```

Node	Checks Performed	Errors
0/2/CPU0	6	0
0/0/CPU0	6	0

Related Commands

Command	Description
show rcc	Displays route consistency checker related information.

signalling dscp (LDP)

To assign label distribution protocol (LDP) signaling packets a differentiated service code point (DSCP) to assign higher priority to the control packets while traversing the network, use the **signalling dscp** command in MPLS LDP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling dscp *dscp*

no signalling dscp

Syntax Description

<i>dscp</i>	DSCP priority value. Range is 0 to 63.

Command Default

LDP control packets are sent with precedence 6 (*dscp*: 48)

Command Modes

MPLS LDP configuration

Command History

Release	Modification
Release 3.2	This command was 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.

DSCP marking improves signaling setup and teardown times.

Ordinarily, when LDP sends hello discovery or protocol control messages, these are marked using the default control packet precedence value (6, or *dscp* 48). You can use the **signalling dscp** command to override that DSCP value to ensure that all control messages sent are marked with a specified DSCP.



Note

While the **signalling dscp** command controls LDP signaling packets (Discovery hellos and protocol messages), it has no effect on ordinary IP or MPLS data packets.

Task ID

Task ID	Operations
mpls-ldp	read, write

Examples

The following example shows how to assign LDP packets a DSCP value of 56:

```
RP/0/RP0/CPU0:router(config-ldp)# signalling dscp 56
```

snmp-server traps mpls ldp

To inform a network management system of session and threshold cross changes, use the **snmp-server traps mpls ldp** command in global configuration mode.

snmp-server traps mpls ldp {up | down | threshold}

Syntax Description

up	Displays the session-up notification.
down	Displays the session-down notification.
threshold	Displays the session-backoff-threshold crossed notification.

Command Default

LDP does not send SNMP traps.

Command Modes

Global configuration

Command History

Release	Modification
Release 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.

The **snmp-server traps mpls ldp** command sends notifications to the SNMP server. There are three types of traps sent by LDP:

Session up

Generated when sessions go up.

Session down

Generated when sessions go down.

Threshold

Generated when attempts to establish a session fails. The predefined value is 8.

Task ID

Task ID	Operations
mpls-ldp	read, write
mpls-te	read, write
snmp	read, write

Examples

The following example shows how to enable LDP SNMP trap notifications for Session up:

```
RP/0/RP0/CPU0:router(config)# snmp-server traps mpls ldp up
```

 `snmp-server traps mpls ldp`



MPLS Forwarding Commands

This module describes the commands used to configure and use Multiprotocol Label Switching (MPLS) forwarding.

For detailed information about MPLS concepts, configuration tasks, and examples, see *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router*.

- [clear mpls forwarding counters, page 114](#)
- [mpls ip-ttl-propagate, page 116](#)
- [mpls label range, page 118](#)
- [show mpls forwarding, page 120](#)
- [show mpls forwarding exact-route, page 126](#)
- [show mpls interfaces, page 130](#)
- [show mpls label range, page 133](#)
- [show mpls label table, page 135](#)
- [show mpls lsd applications, page 138](#)
- [show mpls lsd clients, page 140](#)
- [show mpls traffic-eng fast-reroute database, page 142](#)
- [show mpls traffic-eng fast-reroute log, page 147](#)

clear mpls forwarding counters

To clear (set to zero) the MPLS forwarding counters, use the **clear mpls forwarding counters** command in EXEC mode.

clear mpls forwarding counters

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

Use the **clear mpls forwarding counters** command to set all MPLS forwarding counters to zero so that you can easily see the future changes.

Task ID	Task ID	Operations
	mpls-te	read, write
	mpls-ldp	read, write
	mpls-static	read, write

Examples The following example shows sample output before and after clearing all counters:

```
RP/0/RP0/CPU0:router# show mpls forwarding
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched	T
18	Exp-Null-v4	33.33.33.33/32	PO0/2/0/0	10.1.2.3	16762	0

```
RP/0/RP0/CPU0:router# clear mpls forwarding counters
```



```
RP/0/RP0/CPU0:router# show mpls forwarding
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched	T O
18	Exp-Null-v4	33.33.33.33/32	P00/2/0/0	10.1.2.3	17000	

Related Commands

Command	Description
show mpls forwarding, on page 120	Displays the contents of MPLS forwarding table.

mpls ip-ttl-propagate

To configure the behavior controlling the propagation of the IP Time-To-Live (TTL) field to and from the MPLS header, use the **mpls ip-ttl-propagate** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls ip-ttl-propagate disable [**forwarded** | **local**]

no mpls ip-ttl-propagate

Syntax Description

disable	Disables the propagation of IP TTL to and from the MPLS header for both forwarded and local packets.
forwarded	(Optional) Disables the propagation of IP TTL to and from the MPLS header for only the forwarded packets. This prevents the traceroute command from displaying the MPLS-enabled nodes beyond the device under the configuration.
local	(Optional) Disables the propagation of IP TTL to the MPLS header for only locally generated packets. This prevents the traceroute command from displaying the MPLS-enabled nodes beyond the device under the configuration.

Command Default

Enabled

Command Modes

Global configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	Both forwarded and local keywords were added as optional.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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, the IP TTL is propagated to the MPLS header when IP packets enter the MPLS domain. Within the MPLS domain, the MPLS TTL is decremented at each MPLS hop. When an MPLS encapsulated IP packet exits the MPLS domain, the MPLS TTL is propagated to the IP header. When propagation is disabled, the MPLS TTL is set to 255 during the label imposition phase and the IP TTL is not altered.

Task ID

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

Examples

The following example shows how to disable IP TTL propagation:

```
RP/0/RP0/CPU0:router(config)# mpls ip-ttl-propagate disable
```

The following example shows how to disable IP TTL propagation for forwarded MPLS packets:

```
RP/0/RP0/CPU0:router(config)# mpls ip-ttl-propagate disable forwarded
```

The following example shows how to disable IP TTL propagation for locally generated MPLS packets:

```
RP/0/RP0/CPU0:router(config)# mpls ip-ttl-propagate disable local
```

mpls label range

To configure the dynamic range of local labels available for use on packet interfaces, use the **mpls label range** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls label range table *table-id minimum maximum*

no mpls label range table *table-id minimum maximum*

Syntax Description

table <i>table-id</i>	Identifies a specific label table; the global label table has table-id = 0. If no table is specified, the global table is assumed. Currently, you can specify table 0 only.
<i>minimum</i>	Smallest allowed label in the label space. Default is 16000.
<i>maximum</i>	Largest allowed label in the label space. Default is 1048575.

Command Default

table-id: 0
minimum: 16000
maximum: 1048575

Command Modes

Global configuration

Command History

Release	Modification
Release 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.

The label range defined by the **mpls label range** command is used by all MPLS applications that allocate local labels (for dynamic label switching Label Distribution Protocol [LDP], MPLS traffic engineering, and so on).

Labels 0 through 15 are reserved by the Internet Engineering Task Force (IETF) (see the draft-ietf-mpls-label-encaps-07.txt for details) and cannot be included in the range using the **mpls label range** command.

Labels 16 through 15999 are reserved for Layer 2 VPN static pseudowires. You should not configure Layer 2 VPN static pseudowires which fall within the dynamic range. If more Layer 2 VPN static pseudowires are required, restrict the dynamic label range using this configuration.

**Note**

- Labels outside the current range and which are allocated by MPLS applications remain in circulation until released.
- You must understand the maximum labels that are supported for each platform versus the labels that are supported for the CLI.

Task ID

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

Examples

The following example shows how to configure the size of the local label space using a *minimum* of 16200 and a *maximum* of 120000:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls label range 16200 120000
```

Related Commands

Command	Description
show mpls label range, on page 133	Displays the range of the MPLS local label space.

show mpls forwarding

To display the contents of the MPLS Label Forwarding Information Base (LFIB), use the **show mpls forwarding** command in EXEC mode.

show mpls forwarding [**detail**] [**hardware**{**ingress** | **egress**}] [**interface** *type interface-path-id*] [**location** *node-id*] [**p2mp** [**local**| **unresolved**| **leafs**]] [**labels** *low-value* [*high-value*]] [**prefix**{*network/mask*| **ipv4 unicast** *network/mask*}] [**private**] [**summary**] [**tunnels** *tunnel-id*] [**vrf** *vrf-name*]

Syntax Description

detail	(Optional) Displays information in long form (includes length of encapsulation, length of Media Access Control [MAC] string, maximum transmission unit [MTU], Packet switched, and label stack).
hardware	(Optional) Displays the hardware location entry.
ingress	(Optional) Reads information from the ingress PSE.
egress	(Optional) Reads information from the egress PSE.
interface	(Optional) Displays information for the specified interface.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
labels <i>low-value</i> [<i>high-value</i>]	(Optional) Entries with a local labels range. Ranges for both <i>low-value</i> and <i>high-value</i> are 0 to 1048575.
location <i>node-id</i>	(Optional) Displays hardware resource counters on the designated node.
p2mp	(Optional) Displays only P2MP LSPs.
local	(Optional) Displays only P2MP LSP MPLS output paths that are local to a line card.
unresolved	(Optional) Displays P2MP LSPs that have failures. For example, one or more MPLS output paths are unresolved or have platform failures.
leafs	(Optional) Displays P2MP LSPs that have failures on the leaf such as platform failures.

prefix <i>network/mask /length</i>	(Optional) Displays the destination address and mask/prefix length. Note The forward slash (/) between <i>network</i> and <i>mask</i> is required.
ipv4 unicast	(Optional) Displays the IPv4 unicast address.
private	(Optional) Displays private information.
summary	(Optional) Displays summarized information.
tunnels <i>tunnel-id</i>	(Optional) Displays entries either for a specified label switch path (LSP) tunnel or all LSP tunnel entries.
vrf <i>vrf-name</i>	(Optional) Displays entries for VPN routing and forwarding (VRF).

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The p2mp , local , unresolved , and leafs keywords were added to support the P2MP feature. The hardware , egress , and ingress keywords were added. The ipv4 and unicast keywords were added.

Usage Guidelines

The optional keywords and arguments described allow specification of a subset of the entire MPLS forwarding table. This router does not support label accounting for vrf labels. Instead, it supports accounting for the IGP and LDP labels. As a result, the Bytes Switched counter is 0 for the **show mpls forwarding vrf** command.

The *node-id* argument is entered in the *rack/slot/module* notation.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following sample output is from the **show mpls forwarding** command using the **location** keyword and a specific node ID:

```
RP/0/RP0/CPU0:router# show mpls forwarding location 0/2/CPU0
```

Local Label	Outgoing Label	Outgoing Interface	Next Hop	Bytes Switched
16000	Unlabelled	ce01::ce01/128[V]	Gi0/1/0/0	0
16001	Aggregate	router: Per-VRF Aggr[V]	\	
		router 0		
16021	16020	P2MP TE:10	Gi0/2/0/3	172.99.1.2
	16040	P2MP TE:10	Gi0/2/0/3	172.99.2.2
	16045	P2MP TE:10	PO0/1/0/4	172.16.1.2
				13912344

The following sample output displays only P2MP LSPs:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp
```

16000	16000	P2MP TE:10	Te0/0/0/1	192.168.140.2	0
	16000	P2MP TE:10	Te0/0/0/2	192.168.170.1	0

The following sample output shows P2MP LSP MPLS output paths which are local to a line card:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp local location 0/1/CPU0
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched
16021	16045	P2MP TE:10	PO0/1/0/4	172.16.1.2	13912344

The following sample output shows P2MP LSP that have failures, for example, one or more MPLS output paths are unresolved or have platform failures:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp unresolved location 0/2/CPU0
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched
16021	16020	P2MP TE:10	Gi0/2/0/3	172.99.1.2	13912344
	16040	P2MP TE:10	Gi0/2/0/3	172.99.2.2	13912344

The following sample output shows the P2MP LSP that have failures on the leaf for platform failures:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp unresolved leaf location 0/2/CPU0
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched
16022	16021	P2MP TE:10	Gi0/2/0/3	172.99.1.2	13912344

The following sample output shows detailed information for the P2MP LSP:

```
RP/0/RP0/CPU0:router# show mpls forwarding p2mp detail
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched
16000	P2MP TE:10				
	Updated Sep 28 16:37:01.736				
	Tunnel Mid/Tail, tunnel ID:10				
	Flags:IP Lookup:set, Expnulv4:not-set, Expnulv6:set,				


```

        Payload Type v4:set, Payload Type v6:not-set
Platform Data:{0xb000, 0xb002, 0x0, 0x1}, RPF-ID:0xa000001
mpls paths: 2, local mpls paths: 0, protected mpls paths: 0

16000      P2MP TE:10          Te0/0/0/1      192.168.140.2    0
Updated Sep 28 16:37:01.736
My Nodeid:513, Interface Nodeid:1, Backup Interface
Nodeid:invalid
Packets Switched: 0

16000      P2MP TE:10          Te0/0/0/2      192.168.170.1    0
Updated Sep 28 16:37:01.731
My Nodeid:513, Interface Nodeid:1, Backup Interface
Nodeid:invalid
Packets Switched: 0

```

The following sample output shows detailed information for the LSP tunnels:

```
RP/0/RP0/CPU0:router# show mpls forwarding prefix 10.241.4.0/24 detail
```

Local Label	Outgoing Label	Prefix or ID	Outgoing Interface	Next Hop	Bytes Switched
16057	16058	10.241.4.0/24	Gi0/1/0/23	10.114.4.11	0
Updated May 10 20:00:15.983 MAC/Encaps: 14/18, MTU: 9202 Label Stack (Top -> Bottom): { 16058 } Packets Switched: 0					
	16058	10.241.4.0/24	Te0/4/0/0	10.114.8.11	0
Updated May 10 20:00:15.983 MAC/Encaps: 14/18, MTU: 9086 Label Stack (Top -> Bottom): { 16058 } Packets Switched: 0					

The following sample output shows the number of P2MP TE heads and midpoints and the number of P2MP route updates that are received from the MRIB from the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls forwarding summary
```

```

Forwarding entries:
Label switching: 91647
MPLS TE tunnel head: 1351, protected: 1
MPLS TE midpoint: 0, protected: 0
MPLS TE internal: 1351, protected: 1
MPLS P2MP TE tunnel head: 499
MPLS P2MP TE tunnel midpoint/tail: 999 Forwarding updates:
messages: 3925
  p2p updates: 229115
  p2mp updates: 13519
    add/modify:12020, deletes:1499,
    dropped:0 (iir trigger drops:0) Labels in use:
Reserved: 3
Lowest: 0
Highest: 112979
Deleted stale label entries: 0

```

This table describes the significant fields shown in the display.

Table 18: show mpls forwarding Field Descriptions

Field	Description
Local Label	Label assigned by this router.

Field	Description
Outgoing Label	Label assigned by the next hop or downstream peer. Some of the entries that display in this column are: Unlabeled No label for the destination from the next hop, or label switching is not enabled on the outgoing interface. Pop Label Next hop advertised an implicit-null label for the destination.
Prefix or Tunnel ID	Address or tunnel to which packets with this label are going.
Outgoing Interface	Interface through which packets with this label are sent.
Next Hop	IP address of neighbor that assigned the outgoing label.
Bytes Switched	Number of bytes switched with this incoming label.
TO	Timeout: Indicated by an "*" if entry is being timed out in forwarding.
Mac/Encaps	Length in bytes of Layer 2 header, and length in bytes of packet encapsulation, including Layer 2 header and label header.
MTU	MTU ¹¹ of labeled packet.
Label Stack	All the outgoing labels on the forwarded packet.
Packets Switched	Number of packets switched with this incoming label.
Label switching	Number of Label switching LFIB ¹² forwarding entries.
IPv4 label imposition	Number of IPv4 label imposition forwarding entries (installed at ingress LSR).
MPLS TE tunnel head	Number of forwarding entries (installed at ingress LSR) on MPLS TE tunnel head.
MPLS TE fast-reroute	Number of forwarding entries (installed at PLR) for MPLS-TE fast reroute.

Field	Description
Forwarding updates	Number of forwarding updates sent from LSD (RP/DRP) to LFIB/MPLS (RP/DRP/LC) using BCDL mechanism, indicating the total number of updates and total number of BCDL messages.
Labels in use	Local labels in use (installed in LFIB). These usually indicate the lowest and highest label in use (allocated by applications). Furthermore, some reserved labels, such as explicit-nullv4, explicit-nullv6, are installed in the forwarding plane. The label range is 0 to 15.

¹¹ MTU = Maximum Transmission Unit.

¹² LFIB = Label Forwarding Information Base.

Related Commands

Command	Description
show mpls forwarding exact-route, on page 126	Displays the exact path for the source and destination address pair.

show mpls forwarding exact-route

To display the exact path for the source and destination address pair, use the **show mpls forwarding exact-route** command in EXEC mode.

show mpls forwarding exact-route *label label-number* [**bottom-label** *value*] **ipv4** *source-address destination-address* | **ipv6** *source-address destination-address* [**detail**] [**protocol** *protocol* **source-port** *source-port* **destination-port** *destination-port* **ingress-interface** *type interface-path-id*] [**location** *node-id*] [**policy-class** *value*] [**hardware** {**ingress** | **egress**}]

Syntax Description

label <i>label-number</i>	Displays the exact path for a source and destination address pair.
bottom-label <i>value</i>	Displays the bottom label value. Range is 0 to 1048575.
ipv4 <i>source-address destination-address</i>	Displays the exact path for IPv4 payload. The IPv4 source address in x.x.x.x format. The IPv4 destination address in x.x.x.x format.
ipv6 <i>source-address destination-address</i>	Displays the exact path for IPv6 payload. The IPv6 source address in x:x::x format. The IPv6 destination address in x:x::x format.
detail	(Optional) Displays detailed information.
protocol <i>protocol</i>	(Optional) Displays the specified protocol for the route.
source-port <i>source-port</i>	Sets the UDP source port. The range is from 0 to 65535.
destination-port <i>destination-port</i>	Sets the UDP destination port. The range is from 0 to 65535.
ingress-interface	Sets the ingress interface.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible 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 hardware resource counters on the designated node.
policy-class <i>value</i>	(Optional) Displays the policy-based tunnel selection (PBTS) to direct traffic into specific TE tunnels. The policy-class attribute maps the correct traffic class to this policy. The range for the policy-class value is from 1 to 7.
hardware	(Optional) Displays the hardware location entry.

ingress	(Optional) Reads information from the ingress PSE.
egress	(Optional) Reads information from the egress PSE.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.6.0	Added command parameters for 7-tuple.
	Release 3.9.0	The following keywords and arguments were added: • detail keyword • location keyword and <i>node-id</i> argument • policy-class keyword and <i>value</i> argument • hardware, ingress, and egress keywords

Usage Guidelines To use this command, you must be in a user group associated with a task 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 mpls forwarding exact-route** command displays information in long form and includes the following information:

- Encapsulation length
- Media Access Control (MAC) string length
- Maximum transmission unit (MTU)
- Packet switching information
- Label stacking information

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

Task ID	Operations
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls forwarding exact-route** command:

```
RP/0/RP0/CPU0:router# show mpls forwarding exact-route label 16000 ipv4 10.74.1.6 127.0.0.15
protocol tcp source-port 3503 destination-port 3503 ingress-interface pos 0/3/4/3
```

```

Local   Outgoing   Prefix      Outgoing     Next Hop      Bytes
Label   Label      or ID       Interface    Next Hop      Switched
-----
16000   16001      5.5.5.5/32  PO0/1/5/1   1.24.1.192    N/A
      Via: PO0/1/5/1, Next Hop: point2point
      MAC/Encaps: 4/8, MTU: 1500
      Label Stack (Top -> Bottom): { 16001 }
```

This table describes the significant fields shown in the display.

Table 19: show mpls forwarding exact-route Field Descriptions

Field	Description
Local Label	Label assigned by this router.
Outgoing Label	Label assigned by the next hop or downstream peer. Some of the entries that display in this column are: Unlabeled No label for the destination from the next hop, or label switching is not enabled on the outgoing interface. Pop Label Next hop advertised an implicit-null label for the destination.
Prefix or Tunnel ID	Address or tunnel to which packets with this label are going.
Outgoing Interface	Interface through which packets with this label are sent.
Next Hop	IP address of neighbor that assigned the outgoing label.
Bytes Switched	Number of bytes switched with this incoming label.
TO	Timeout: Indicated by an "*" if entry is being timed out in forwarding.

Field	Description
MAC/Encaps	Length in bytes of Layer 2 header, and length in bytes of packet encapsulation, including Layer 2 header and label header.
MTU	MTU ¹³ of labeled packet.
Label Stack	All the outgoing labels on the forwarded packet.
Packets Switched	Number of packets switched with this incoming label.
Label switching	Number of Label switching LFIB ¹⁴ forwarding entries.
IPv4 label imposition	Number of IPv4 label imposition forwarding entries (installed at ingress LSR).
MPLS TE tunnel head	Number of forwarding entries (installed at ingress LSR) on MPLS TE tunnel head.
MPLS TE fast-reroute	Number of forwarding entries (installed at PLR) for MPLS-TE fast reroute.
Forwarding updates	Number of forwarding updates sent from LSD (RP/DRP) to LFIB/MPLS (RP/DRP/LC) using BCDL mechanism, indicating the total number of updates and total number of BCDL messages.
Labels in use	Local labels in use (installed in LFIB). These usually indicate the lowest and highest label in use (allocated by applications). Furthermore, some reserved labels, such as explicit-nullv4, explicit-nullv6, are installed in the forwarding plane. The label range is 0 to 15.

¹³ MTU = Maximum Transmission Unit.

¹⁴ LFIB = Label Forwarding Information Base.

Related Commands

Command	Description
show mpls forwarding, on page 120	Displays the contents of the MPLS LFIB.

show mpls interfaces

To display information about one or more interfaces that have been configured for MPLS, use the **show mpls interfaces** command in EXEC mode.

show mpls interfaces [*type interface-path-id*] [**location** *node-id*] [**detail**]

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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 hardware resource counters on the designated node.
detail	(Optional) Displays detailed information for the designated node.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 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.

This command displays MPLS information about a specific interface or about all interfaces where MPLS is configured.

Task ID

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

Task ID	Operations
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls interfaces** command:

```
RP/0/RP0/CPU0:router# show mpls interfaces
```

Interface	LDP	Tunnel	Enabled
POS0/4/0/0	Yes	Yes	Yes
POS0/4/0/1	Yes	Yes	Yes
POS0/4/0/2	Yes	Yes	Yes

The following shows a sample output from the **show mpls interfaces** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls interfaces detail
```

```
Interface POS0/4/0/0:
  LDP labelling enabled
  LSP labelling enabled (TE-Control)
  MPLS enabled
  MTU = 4474
Interface POS0/4/0/1:
  LDP labelling enabled
  LSP labelling enabled (TE-Control)
  MPLS enabled
  MTU = 4474
Interface POS0/4/0/2:
  LDP labelling enabled
  LSP labelling enabled (TE-Control)
  MPLS enabled
  MTU = 4474
```

The following shows a sample output from the **show mpls interfaces** command using the **location** keyword:

```
RP/0/RP0/CPU0:router# show mpls interfaces location pos 0/4/0/0
```

Interface	LDP	Tunnel	Enabled
POS0/4/0/0	Yes	Yes	Yes

```
RP/0/RP0/CPU0:router# show mpls interfaces pos 0/4/0/0 detail
```

```
Interface POS0/4/0/0:
  LDP labelling enabled
  LSP labelling enabled (TE-Control)
  MPLS enabled
  MTU = 4474
```

This table describes the significant fields in the sample display.

Table 20: show mpls interfaces Command Field Descriptions

Field	Description
LDP	State of LDP labelling.
Tunnel	State of LSP Tunnel labelling.

Field	Description
MTU	MTU ¹⁵ of labeled packet.
Caps	Capsulation switching chains installed on an interface.
M	MPLS switching capsulation/switching chains are installed on the interface and are ready to switch MPLS traffic.

¹⁵ MTU = Maximum Transmission Unit.

show mpls label range

To display the range of local labels available for use on packet interfaces, use the **show mpls label range** command in EXEC mode.

show mpls label range

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

You can use the **show mpls label range** command to configure a range for local labels that is different from the default range.

Task ID	Task ID	Operations
	mpls-te	read, write
	mpls-ldp	read, write
	mpls-static	read, write

Examples The following shows a sample output from the **show mpls label range** command:

```
RP/0/RP0/CPU0:router# show mpls label range
Range for dynamic labels: Min/Max: 16000/144000
```

This table describes the significant fields shown in the display.

Table 21: show mpls label range Command Field Descriptions

Field	Description
Range for dynamic labels	Minimum and maximum allowable range for local labels (which differs from the default range).

Related Commands

Command	Description
mpls label range , on page 118	Configures a range of values for use as local labels.

show mpls label table

To display the local labels contained in the MPLS label table, use the **show mpls label table** command in EXEC mode.

show mpls label table *table-index* [**application** *application*] [**label** *label-value*] [**summary**] [**detail**]

Syntax Description

<i>table-index</i>	Index of the label table to display. The global label table is 0. Currently, you can specify table 0 only.
application <i>application</i>	(Optional) Displays all labels owned by the selected application. Options are: bgp-ipv4 , bgp-spr , bgp-vpn-ipv4 , internal , ldp , none , l2vpn , static , te-control , te-link , and test .
label <i>label-value</i>	(Optional) Displays a selected label based on the label value. Range is 0 to 1048575.
summary	(Optional) Displays a summary of local labels.
detail	(Optional) Displays detailed information for the MPLS label table.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The detail 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

Labels 16 to 15999 are reserved for static Layer 2 VPN pseudowires.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls label table** command:

```
RP/0/RP0/CPU0:router# show mpls label table 0
```

Table	Label	Owner	State	Rewrite
0	0	LSD	InUse	Yes
0	1	LSD	InUse	Yes
0	2	LSD	InUse	Yes
0	3	LSD	InUse	Yes
0	16	TE-Link	InUse	Yes

This table describes the significant fields shown in the display.

Table 22: show mpls label table Command Field Descriptions

Field	Description
Table	Table ID.
Label	Label index.
Owner	Application that allocated the label. All labels displaying "InUse" state have an owner.

Field	Description
State	InUse Label allocated and in use by an application. Alloc Label allocated but is not yet in use by an application. Pend Label was in use by an application that has terminated unexpectedly, and the application has not reclaimed the label. Pend-S Label was in use by an application, but the MPLS LSD¹⁶ server has recently restarted and the application has not reclaimed the label.
Rewrite	Number of initiated rewrites.

¹⁶ LSD = Label Switching Database.

Related Commands

Command	Description
show mpls forwarding, on page 120	Displays entries in the MPLS forwarding table. Label switching entries are indexed by their local label.
show mpls lsd applications, on page 138	Displays MPLS applications that are registered with the MPLS LSD server.

show mpls lsd applications

To display the MPLS applications registered with the MPLS Label Switching Database (LSD) server, use the **show mpls lsd applications** command in EXEC mode.

show mpls lsd applications [**application** *application*]

Syntax Description

application <i>application</i>	(Optional) Displays all labels owned by the selected application. Options are: bgp-ipv4 , bgp-spkrr , bgp-vpn-ipv4 , internal , ldp , none , l2vpn , static , te-control , te-link , and test .

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The application 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.

MPLS applications include Traffic Engineering (TE) control, TE Link Management, and label distribution protocol (LDP). The application must be registered with MPLS LSD for its features to operate correctly. All applications are clients (see the [show mpls lsd clients, on page 140](#) command), but not all clients are applications.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following shows a sample output from the **show mpls lsd applications** command:

```
RP/0/RP0/CPU0:router# show mpls lsd applications
```

Type	State	RecoveryTime	Node
LDP	Active	300	0/0/CPU0
TE-Control	Active	100	0/0/CPU0
TE-Link	Active	600	0/0/CPU0

This table describes the significant fields shown in the display.

Table 23: show mpls lsd applications Command Field Descriptions

Field	Description
Type	LSD application type.
State	Active Application registered with MPLS LSD and is functioning correctly. Recover Application registered with MPLS LSD and is recovering after recently restarting. In this state, the RecoveryTime value indicates how many seconds are left before the application becomes active. Zombie Application not reregistered after an unexpected termination. In this case, RecoveryTime indicates how many seconds are left before MPLS LSD gives up on the application.
RecoveryTime	Seconds remaining before MPLS LSD gives up or resumes the application.
Node	Node expressed in standard <i>rack/slot/module</i> notation.

Related Commands

Command	Description
show mpls lsd clients, on page 140	Displays MPLS clients connected to the MPLS LSD server.

show mpls lsd clients

To display the MPLS clients connected to the MPLS Label Switching Database (LSD) server, use the **show mpls lsd clients** command in EXEC mode.

show mpls lsd clients

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

MPLS clients include Traffic Engineering (TE) Control, TE Link Management, Label Distribution Protocol (LDP), and Bulk Content Downloader (BCDL) Agent. Not all clients are applications (see the **show mpls lsd applications** command), but all applications are clients.

Task ID	Task ID	Operations
	mpls-te	read, write
	mpls-ldp	read, write
	mpls-static	read, write

Examples The following shows a sample output from the **show mpls lsd clients** command:

```
RP/0/RP0/CPU0:router# show mpls lsd clients
```

```

Id  Services                Node
--  -
0   BA(p=none)             0/0/CPU0
1   A(TE-Link)             0/0/CPU0
2   A(LDP)                 0/0/CPU0
```

```
3 A(TE-Control) 0/0/CPU0
```

The following table describes the significant fields shown in the display.

Table 24: show mpls lsd clients Command Field Descriptions

Field	Description
Id	Client identification number.
Services	A(xxx) means that this client is an application and xxx is the application name, BA(yyy) means that this client is a BCDL Agent and yyy is expert data. Depending on system conditions, there can be multiple BCDL Agent clients (this is normal).
Node	Node expressed in standard rack/slot/module notation.

Related Commands

Command	Description
show mpls lsd applications	Displays MPLS applications registered with the MPLS LSD server.

show mpls traffic-eng fast-reroute database

To display the contents of the fast reroute (FRR) database, use the **show mpls traffic-eng fast-reroute database** command in EXEC mode.

show mpls traffic-eng fast-reroute database [*ip-address*] [*ip-address /length*] [**afi-all** { **safi-all** | **unicast** } {*ip-address* | *ip-address/length*}] [**backup-interface**] [**tunnel** *tunnel-id*] [**unresolved**] [**interface** *type interface-path-id*] [**ipv4** { **safi-all** | **unicast** } {*ip-address* | *ip-address/length*}] [**labels** *low-number high-number*] [**state** {**active** | **complete** | **partial** | **ready**}] [**role** {**head** | **midpoint**}] [**summary**] [**location** *node-id*]

Syntax Description

<i>ip-address</i>	(Optional) IP address of the destination network.
<i>ip-address/length</i>	(Optional) Bit combination indicating the portion of the IP address that is being used for the subnet address.
afi-all	(Optional) Returns data for all specified address family identifiers.
safi-all	(Optional) Returns data for all sub-address family identifiers.
unicast	(Optional) Returns unicast data only.
backup-interface	(Optional) Displays entries with the specified backup interface.
tunnel <i>tunnel-id</i>	(Optional) Tunnel and tunnel ID to which packets with this label are going. The summary suboption is available.
unresolved	(Optional) Displays entries whose backup interface has not yet been fully resolved.
interface	(Optional) Displays entries with this primary outgoing interface. The summary keyword is available.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
ipv4	(Optional) Displays only IPv4 data.
labels	(Optional) Displays database entries that possess in-labels assigned by this router (local labels). Specify either a starting value or a range of values. The state suboption is available.

state	(Optional) Filters the database according to the state of the entry: active FRR rewrite is in the forwarding active database (where it can be placed onto appropriate incoming packets). complete FRR rewrite is assembled, ready or active. partial FRR rewrite is fully created; its backup routing information is still incomplete. ready FRR rewrite was created but is not in the forwarding active state.
role	(Optional) Displays entries associated either with the tunnel head or tunnel midpoint . The summary suboption is available.
summary	(Optional) Displays summarized information about the FRR database.
location <i>node-id</i>	(Optional) Displays hardware resource counters on the designated node.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	Sample output was modified to support the Point-to-Multipoint (P2MP) feature.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 P2MP tunnel carries multicast traffic. For fast reroute (FRR) information in regards to multicast label forwarding, see *Cisco IOS XR Software Multicast Command Reference for the Cisco CRS-1 Router*.

If the location is specified, Fast-Reroute (FRR) entries for both Point-to-Point (P2P) and P2MP tunnels are available. If the location is not specified, only P2P tunnel entries are available.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng fast-reroute database** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database
```

```
Tunnel head FRR information:
Tunnel      Out intf/label    FRR intf/label    Status
-----
tt4000      PO0/3/0/0:34      tt1000:34          Ready
tt4001      PO0/3/0/0:35      tt1001:35          Ready
tt4002      PO0/3/0/0:36      tt1001:36          Ready
```



Note

The Prefix field indicates the IP address where packets with this label are headed.

The following sample output displays filtering of the FRR database using the **backup-interface** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast database backup-interface
```

```
LSP midpoint FRR information:
LSP Identifier      Out Intf/      FRR Intf/      Status
                    Label          Label
-----
10.10.10.10 1006 [54]      Gi0/6/5/2:Pop  tt1060:Pop     Ready
```

The following sample output displays the FRR database filtered by the primary outgoing interface:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database interface pos0/3/0/0
```

```
Tunnel head FRR information:
Tunnel      Out intf/label    FRR intf/label    Status
-----
tt4000      PO0/3/0/0:34      tt1000:34          Ready
tt4001      PO0/3/0/0:35      tt1001:35          Ready
tt4002      PO0/3/0/0:36      tt1001:36          Ready
```

The following sample output displays a summary of the FRR database with the role as head:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database role head summary
```

```
Status      Count
-----
Active       0
Ready        3
Partial      0
```

The following sample output displays summarized information for the FRR database with the role as midpoint:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database role midpoint summary
```

```
Status      Count
-----
Active       0
Ready        2
```

Partial 0

The following sample output displays the summary for the P2MP tunnel:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute database location 0/0/CPU0
```

```
Tunnel head FRR information:
Tunnel      Out intf/label  FRR intf/label  Status
-----
tt3010      BP64:Pop        tt3001:Pop      Ready
tm3000      BP64:19444      tt3001:19444    Ready
tm3001      BP64:19445      tt3001:19445    Ready
```

This table describes the significant fields shown in the display.

Table 25: show mpls traffic-eng fast-reroute database Command Field Descriptions

Field	Description
Tunnel	Short form of tunnel interface name.
Out intf/label	Out interface Short name of the physical interface through which traffic goes to the protected link. Out label At a tunnel head, this is the label that the tunnel destination device advertises. The value “Unlabeled” indicates that no such label is advertised. At a tunnel midpoint, this is the label selected by the next hop device. The value “Pop Label” indicates that the next hop is the final hop for the tunnel.

Field	Description
FRR intf/label	Fast reroute interface Backup tunnel interface. Fast reroute label At a tunnel head, this is the label that the tunnel tail selected to indicate the destination network. The value “Unlabeled” indicates that no label is advertised. At a tunnel midpoint, this has the same value as the Out label.
Status	State of the rewrite: partial, ready, or active.

Related Commands

Command	Description
show mpls traffic-eng fast-reroute log, on page 147	Displays the contents of the FRR event log.

show mpls traffic-eng fast-reroute log

To display a history of fast reroute (FRR) events, use the **show mpls traffic-eng fast-reroute log** command in EXEC mode.

show mpls traffic-eng fast-reroute log [*interface* *type* *interface-path-id* | *location* *node-id*]

Syntax Description

interface	(Optional) Displays all FRR events for the selected protected interface.
<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 possible 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 all FRR events that occurred on the selected node.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	Sample output was modified.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng fast-reroute log** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute log

Node          Protected LSPs  Rewrites When          Switching Time
Interface
-----
0/0/CPU0 PO0/1/0/1 1      1      Feb 27 19:12:29.064000  147
```

This table describes the significant fields shown in the display.

Table 26: show mpls traffic-eng fast-reroute log Field Descriptions

Field	Description
Node	Node address.
Protected Interface	Type and interface-path-id that is being protected.
LSPs	LSP ¹⁷ associated with each interface being protected.
Rewrites	Number of rewrites initiated on the LSP.
When	Date the interface was protected.
Switching Time	Time required to switch the protected interface in microseconds.

¹⁷ LSP = Link-state Packet.

Related Commands

Command	Description
show mpls traffic-eng fast-reroute database , on page 142	Displays the contents of the FRR database.



MPLS Traffic Engineering Commands

This module describes the commands used to configure Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) on the Cisco IOS XR Software.

Your network must support the following Cisco features before you can enable MPLS-TE:

- MPLS
- IP Cisco Express Forwarding (CEF)
- Intermediate System-to-Intermediate System (IS-IS) or Open Shortest Path First (OSPF) routing protocol
- Resource Reservation Protocol (RSVP)

MPLS Label Distribution Protocol (LDP), Resource Reservation Protocol (RSVP), and Universal Control Plane (UCP) command descriptions are documented separately.

For detailed information about MPLS concepts, configuration tasks, and examples, see *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router*.

- [adjustment-threshold \(MPLS-TE\), page 155](#)
- [admin-weight, page 157](#)
- [affinity, page 159](#)
- [affinity-map, page 163](#)
- [application \(MPLS-TE\), page 165](#)
- [attribute-flags, page 167](#)
- [attribute-names, page 169](#)
- [attribute-set, page 171](#)
- [auto-bw \(MPLS-TE\), page 175](#)
- [auto-bw collect frequency \(MPLS-TE\), page 177](#)
- [autoroute announce, page 179](#)
- [autoroute metric, page 181](#)
- [auto-tunnel backup \(MPLS-TE\), page 183](#)
- [backup-bw, page 185](#)

- [backup-path tunnel-te](#), page 188
- [bw-limit \(MPLS-TE\)](#), page 190
- [clear mpls lmp](#), page 192
- [clear mpls traffic-eng auto-bw \(MPLS-TE EXEC\)](#), page 193
- [clear mpls traffic-eng auto-tunnel backup unused](#), page 195
- [clear mpls traffic-eng auto-tunnel mesh](#), page 197
- [clear mpls traffic-eng counters auto-tunnel mesh](#), page 198
- [clear mpls traffic-eng counters auto-tunnel backup](#), page 199
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- [ipv4 unnumbered \(MPLS\), page 261](#)
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- [link-management timers preemption-delay, page 267](#)
- [load-share, page 268](#)
- [load-share unequal, page 270](#)
- [lmp hello \(GMPLS\), page 272](#)
- [lmp neighbor \(MPLS-TE\), page 274](#)
- [lmp router-id \(MPLS-TE\), page 276](#)
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- [logging events lsp-status \(MPLS-TE\), page 280](#)
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- [match \(GMPLS\), page 284](#)
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- [pce tolerance keepalive \(MPLS-TE\), page 340](#)
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- [priority \(MPLS-TE\), page 344](#)
- [record-route, page 346](#)
- [remote \(GMPLS\), page 348](#)
- [reoptimize \(MPLS-TE\), page 350](#)
- [reoptimize timers delay \(MPLS-TE\), page 352](#)
- [router-id secondary \(MPLS-TE\), page 355](#)
- [show explicit-paths, page 357](#)
- [show mpls traffic-eng affinity-map, page 359](#)
- [show mpls traffic-eng attribute-set , page 361](#)
- [show mpls traffic-eng autoroute, page 363](#)
- [show mpls traffic-eng auto-tunnel backup, page 365](#)
- [show mpls traffic-eng auto-tunnel mesh, page 368](#)
- [show mpls traffic-eng collaborator-timers, page 370](#)
- [show mpls traffic-eng counters signaling, page 372](#)
- [show mpls traffic-eng ds-te te-class, page 378](#)
- [show mpls traffic-eng forwarding, page 380](#)

- [show mpls traffic-eng forwarding-adjacency, page 384](#)
- [show mpls traffic-eng igp-areas, page 385](#)
- [show mpls traffic-eng link-management admission-control, page 387](#)
- [show mpls traffic-eng link-management advertisements, page 391](#)
- [show mpls traffic-eng link-management bandwidth-allocation, page 394](#)
- [show mpls traffic-eng link-management bfd-neighbors, page 397](#)
- [show mpls traffic-eng link-management igp-neighbors, page 399](#)
- [show mpls traffic-eng link-management interfaces, page 401](#)
- [show mpls traffic-eng link-management statistics, page 404](#)
- [show mpls traffic-eng link-management summary, page 406](#)
- [show mpls traffic-eng lmp, page 408](#)
- [show mpls traffic-eng maximum tunnels, page 412](#)
- [show mpls traffic-eng pce peer, page 415](#)
- [show mpls traffic-eng pce tunnels, page 417](#)
- [show mpls traffic-eng preemption log, page 419](#)
- [show mpls traffic-eng topology, page 420](#)
- [show mpls traffic-eng tunnels, page 430](#)
- [show mpls traffic-eng tunnels auto-bw brief, page 463](#)
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- [show srlg, page 467](#)
- [signalled-bandwidth, page 470](#)
- [signalled-name, page 472](#)
- [signalling advertise explicit-null \(MPLS-TE\), page 473](#)
- [snmp traps mpls traffic-eng, page 475](#)
- [soft-preemption, page 477](#)
- [srlg, page 478](#)
- [switching \(GMPLS\), page 480](#)
- [switching endpoint \(GMPLS\), page 482](#)
- [switching transit \(GMPLS\), page 484](#)
- [timers loose-path \(MPLS-TE\), page 486](#)
- [timers removal unused \(auto-tunnel backup\), page 488](#)
- [timeout \(soft-preemption\), page 490](#)
- [topology holddown sigerr \(MPLS-TE\), page 491](#)

- [tunnel-id \(auto-tunnel backup\)](#), page 493

adjustment-threshold (MPLS-TE)

To configure the tunnel bandwidth change threshold to trigger an adjustment, use the **adjustment-threshold** command in MPLS-TE automatic bandwidth interface configuration mode. To disable this feature, use the **no** form of this command.

adjustment-threshold *percentage* [**min** *minimum bandwidth*]

no adjustment-threshold *percentage* [**min** *minimum bandwidth*]

Syntax Description

<i>percentage</i>	Bandwidth change percent threshold to trigger an adjustment if the largest sample percentage is higher or lower than the current tunnel bandwidth. The range is from 1 to 100. The default is 5.
min <i>minimum bandwidth</i>	(Optional) Configures the bandwidth change value to trigger an adjustment. The tunnel bandwidth is changed only if the largest sample is higher or lower than the current tunnel bandwidth, in kbps. The range is from 10 to 4294967295. The default is 10.

Command Default

percentage: 5
minimum bandwidth: 10

Command Modes

MPLS-TE automatic bandwidth interface 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 you configure or modify the adjustment threshold while the automatic bandwidth is already running, the next bandwidth application is impacted for that tunnel. The new adjustment threshold determines if an actual bandwidth takes place.

Examples

The following example configures the tunnel bandwidth change threshold to trigger an adjustment:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
```

```
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# adjustment-threshold 20 min 500
```

Related Commands

Command	Description
application (MPLS-TE), on page 165	Configures the application frequency, in minutes, for the applicable tunnel.
auto-bw (MPLS-TE), on page 175	Configures automatic bandwidth on a tunnel interface and enters MPLS-TE automatic bandwidth interface configuration mode.
bw-limit (MPLS-TE), on page 190	Configures the minimum and maximum automatic bandwidth to set on a tunnel.
collect-bw-only (MPLS-TE), on page 208	Enables only the bandwidth collection without adjusting the automatic bandwidth.
overflow threshold (MPLS-TE), on page 309	Configures tunnel overflow detection.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

admin-weight

To override the Interior Gateway Protocol (IGP) administrative weight (cost) of the link, use the **admin-weight** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

admin-weight *weight*

no admin-weight *weight*

Syntax Description

<i>weight</i>	Administrative weight (cost) of the link. Range is 0 to 4294967295.

Command Default

weight: IGP Weight (default OSPF 1, ISIS 10)

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 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.

To use MPLS the **admin-weight** command for MPLS LSP path computations, path-selection metric must be configured to TE.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to override the IGP cost of the link and set the cost to 20:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/7/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# admin-weight 20
```

Related Commands

Command	Description
interface (MPLS-TE), on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
path-selection metric (interface), on page 326	Specifies an MPLS-TE tunnel path-selection metric type.

affinity

To configure an affinity (the properties the tunnel requires in its links) for an MPLS-TE tunnel, use the **affinity** command in interface configuration mode. To disable this behavior, use the **no** form of this command.

affinity {*affinity-value* **mask** *mask-value* | **exclude** *name* | **exclude-all** | **include** *name* | **include-strict** *name*}
no affinity {*affinity-value* **mask** *mask-value* | **exclude** *name* | **exclude-all** | **include** *name* | **include-strict** *name*}

Syntax Description

<i>affinity-value</i>	Attribute values that are required for links to carry this tunnel. A 32-bit decimal number. Range is from 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute is 0 or 1.
mask <i>mask-value</i>	Checks the link attribute. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute mask is 0 or 1.
exclude <i>name</i>	Configures a particular affinity to exclude.
exclude-all	Excludes all affinities.
include <i>name</i>	Configures the affinity to include in the loose sense.
include-strict <i>name</i>	Configures the affinity to include in the strict sense.

Command Default

affinity-value: 0X00000000
mask-value: 0xFFFFFFFF

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.4.0	Support was added for the Name-Based Affinity Constraint scheme.
Release 3.7.0	Affinity colors definition for MPLS-TE 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.

Affinity determines the link attributes of the tunnel (that is, the attributes for which the tunnel has an affinity). The attribute mask determines which link attribute the router should check. If a bit in the mask is 0, the attribute value of a link or that bit is irrelevant. If a bit in the mask is 1, the attribute value of that link and the required affinity of the tunnel for that bit must match.

A tunnel can use a link if the tunnel affinity equals the link attributes and the tunnel affinity mask.

Any properties set to 1 in the affinity should be 1 in the mask. The affinity and mask should be set as follows:

```
tunnel_affinity=tunnel_affinity and tunnel_affinity_mask
```

You can configure up to 16 affinity constraints under a given tunnel. These constraints are used to configure affinity constraints for the tunnel:

Include constraint

Specifies that a link is considered for CSPF if it contains all affinities associated with the include constraint. An acceptable link contains more affinity attributes than those associated with the include statement. You can have multiple include statements under a tunnel configuration.

Include-strict constraint

Specifies that a link is considered for CSPF if it contains only the colors associated with the include-strict statement. The link cannot have any additional colors. In addition, a link without a color is rejected.

Exclude constraint

Specifies that a link satisfies an exclude constraint if it does not have all the colors associated with the constraint. In addition, a link that does not have any attribute satisfies an exclude constraint.

Exclude-all constraint

Specifies that only the links without any attribute are considered for CSPF. An exclude-all constraint is not associated with any color; whereas, all other constraint types are associated with up to 10 colors.

You set one bit for each color; however, the sample output shows multiple bits at the same time. For example, you can configure red and black colors on GigabitEthernet0/4/1/3 from the **interface** command. The sample output from the [show mpls traffic-eng link-management interfaces](#), [on page 401](#) command shows that the Attributes field is set to 0x21, which means that there are 0x20 and 0x1 bits on the link.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to configure the tunnel affinity and mask:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity 0101 mask 303
```

This example shows that a link is eligible for CSPF if the color is red.. The link can have any additional colors.

```
RP/0/RP0/CPU0:router# configure
```

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity include red
```

This example shows that a link is eligible for CSPF if it has at least red and black colors. The link can have any additional colors.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity include red black
```

This sample output shows that the include constraint from the **show mpls traffic-eng tunnels** command is 0x20 and 0x1:

```
Name: tunnel-te1 Destination: 0.0.0.0
Status:
  Admin:      up Oper: down  Path: not valid  Signalling: Down
  G-PID: 0x0800 (internally specified)

Config Parameters:
  Bandwidth:      0 kbps (CT0) Priority:  7  7
  Number of configured name based affinity constraints: 1
  Name based affinity constraints in use:
  Include bit map      : 0x21
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled
  Loadshare:          0 equal loadshares
  Auto-bw: disabled(0/0) 0 Bandwidth Requested:      0
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned

Reason for the tunnel being down: No destination is configured
History:
```

This example shows that a tunnel can go over a link that contains red or black affinity. A link is eligible for CSPF if it has a red color or a black color. Thus, a link with red and any other colors and a link with black and other additional colors must meet the constraint.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity include red
RP/0/RP0/CPU0:router(config-if)# affinity include black
```

This sample output shows that the include constraint from the **show mpls traffic-eng tunnels** command is 0x20 or 0x1:

```
Name: tunnel-te1 Destination: 0.0.0.0
Status:
  Admin:      up Oper: down  Path: not valid  Signalling: Down
  G-PID: 0x0800 (internally specified)

Config Parameters:
  Bandwidth:      0 kbps (CT0) Priority:  7  7
  Number of configured name based affinity constraints: 2
  Name based affinity constraints in use:
    Include bit map      : 0x1
    Include bit map      : 0x20
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled
  Loadshare:          0 equal loadshares
  Auto-bw: disabled(0/0) 0 Bandwidth Requested:      0
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned
```

Reason for the tunnel being down: No destination is configured
History:

This example shows that a link is eligible for CSPF if it has only red color. The link must not have any additional colors.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity include-strict red
```

This example shows that a link is eligible for CSPF if it does not have the red attribute:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity exclude red
```

This example shows that a link is eligible for CSPF if it does not have red and blue attributes. Thus, a link that has only a red attribute or only a blue attribute is eligible for CSPF.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity exclude red blue
```

This example shows that a link is eligible for CSPF if it does not have either a red or a blue attribute:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# affinity exclude red
RP/0/RP0/CPU0:router(config-if)# affinity exclude blue
```

Related Commands

Command	Description
affinity-map, on page 163	Assigns a numerical value to each affinity name.
attribute-names, on page 169	Configures attribute names for the interface.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
show mpls traffic-eng affinity-map, on page 359	Displays the color name-to-value mappings configured on the router.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

affinity-map

To assign a numerical value to each affinity name, use the **affinity-map** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

affinity-map *affinity name* {*affinity value*| **bit-position** *value*}

no affinity-map *affinity name* {*affinity value*| **bit-position** *value*}

Syntax Description

<i>affinity name</i>	Affinity map name-to-value designator (in hexadecimal, <i>0-ffffff</i>).
<i>affinity value</i>	Affinity map value designator. Range is from 1 to 80000000.
bit-position	Configures the value of an affinity map for the bit position of the 32-bit number.
<i>value</i>	Bit position value. Range is from 0 to 31.

Command Default

No default behavior or values

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.9.0	The following command syntax was enhanced: • The <i>affinity value</i> argument range was changed to 1 to 80000000. • The bit-position keyword and <i>value</i> argument were added. • Sample output was added to show how to configure the value for the bit position.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 name-to-value mapping must represent a single bit of a 32-bit value.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to assign a numerical value to each affinity name:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# affinity-map red 1
RP/0/RP0/CPU0:router(config-mpls-te)# affinity-map blue 2
```

The following example shows how to configure the value of 15 for an affinity map by bit position:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# affinity-map red2 bit-position 15
```

Related Commands

Command	Description
affinity , on page 159	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng affinity-map , on page 359	Displays the color name-to-value mappings configured on the router.

application (MPLS-TE)

To configure the application frequency, in minutes, for the applicable tunnel, use the **application** command in MPLS-TE automatic bandwidth interface configuration mode. To disable this feature, use the **no** form of this command.

application *minutes*

no application *minutes*

Syntax Description

<i>minutes</i>	Frequency, in minutes, for the automatic bandwidth application. The range is from 5 to 10080 (7 days). The default is 1440.

Command Default

minutes : 1440 (24 hours)

Command Modes

MPLS-TE automatic bandwidth interface 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 you configure and modify the application frequency, the application period can reset and restart for that tunnel. The next bandwidth application for the tunnel happens within the specified minutes.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure application frequency to 1000 minutes for MPLS-TE interface 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# application 1000
```

Related Commands

Command	Description
adjustment-threshold (MPLS-TE), on page 155	Configures the tunnel-bandwidth change threshold to trigger an adjustment.
auto-bw (MPLS-TE), on page 175	Configures automatic bandwidth on a tunnel interface and enters MPLS-TE automatic bandwidth configuration mode.
bw-limit (MPLS-TE), on page 190	Configures the minimum and maximum automatic bandwidth to set on a tunnel.
collect-bw-only (MPLS-TE), on page 208	Enables only the bandwidth collection without adjusting the automatic bandwidth.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
overflow threshold (MPLS-TE), on page 309	Configures tunnel overflow detection.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

attribute-flags

To configure attribute flags for an interface, use the **attribute-flags** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

attribute-flags *attribute-flags*

no attribute-flags *attribute-flags*

Syntax Description

attribute-flags

Links attributes that are compared to the affinity bits of a tunnel during selection of a path. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits) where the value of an attribute is 0 or 1.

Command Default

attributes : 0x0

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 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.

The **attribute-flags** command assigns attributes to a link so that tunnels with matching attributes (represented by their affinity bits) prefer this link instead of others that do not match.

The interface attribute is flooded globally so that it can be used as a tunnel headend path selection criterion.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set attribute flags to 0x0101:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/7/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# attribute-flags 0x0101
```

Related Commands

Command	Description
admin-weight , on page 157	Overrides the IGP administrative weight of the link.
affinity , on page 159	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
attribute-names , on page 169	Configures the attribute names for the interface.
interface (MPLS-TE) , on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.

attribute-names

To configure attributes for the interface, use the **attribute-names** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

attribute-names *attribute name*

no attribute-names *attribute name*

Syntax Description

<i>attribute name</i>	Attribute name expressed using alphanumeric or hexadecimal characters.

Command Default

No default behavior or values

Command Modes

MPLS-TE 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.



Note

The name-to-value mapping must represent a single bit of a 32-bit value.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to assign an attribute name (in this case, red) to a TE link:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface pos 0/2/0/1
RP/0/RP0/CPU0:router(config-mpls-te-if)# attribute-name red
```

Related Commands

Command	Description
affinity, on page 159	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
attribute-flags, on page 167	Configures attribute flags for the interface.
interface (MPLS-TE), on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.

attribute-set

To configure attribute-set for auto-backup tunnels, use the **attribute-set** command in MPLS-TE configuration mode.

attribute-set auto-backup *attribute-set-name* {**affinity** {*affinity-value* **mask** *mask-value*| **exclude** *name*| **exclude-all**| **include** *name*| **include-strict** *name*}| **logging events lsp-status** {**reoptimize**| **state**}| **policy-class** {*range*| **default**}| **priority** *setup-range* *hold-range*| **record-route**}

To configure attribute-set for auto-mesh tunnels, use the **attribute-set** command in MPLS-TE configuration mode.

attribute-set auto-mesh *attribute-set-name* {**affinity** {*affinity-value* **mask** *mask-value*| **exclude** *name*| **exclude-all**| **include** *name*| **include-strict** *name*}| **auto-bw** **collect-bw-only**| **autoroute announce**| **bandwidth** *bandwidth*| **fast-reroute** [**protect** {*bandwidth* *node*| *node* *bandwidth*}]| **logging events lsp-status** {**insufficient-bandwidth**| **reoptimize**| **reroute**| **state**}| **policy-class** {*range*| **default**}| **priority** *setup-range* *hold-range*| **record-route**| **signalled-bandwidth** *bandwidth* [*class-type* *cl*] **soft-preemption**}

To configure attribute-set for a path-option, use the **attribute-set** command in MPLS-TE configuration mode.

attribute-set path-option *attribute-set-name* {**affinity** {*affinity-value* **mask** *mask-value*| **exclude** *name*| **exclude-all**| **include** *name*| **include-strict** *name*}| **signalled-bandwidth** *bandwidth* [*class-type* *cl*]}

To disable this behavior, use the **no** form of this command.

no attribute-set

Syntax Description

auto-backup	Specifies the values of an attribute set for the auto-backup group.
auto-mesh	Specifies the values of an attribute set for the auto-mesh group.
path-option	Specifies the values of an attribute set for the path option.
<i>attribute-set-name</i>	A 32-bit character string, specifies the name of the attribute-set template.
<i>affinity-value</i>	Attribute values that are required for links to carry this tunnel. A 32-bit decimal number, representing 32 attributes (bits), where the value of an attribute is 0 or 1. Range is from 0x0 to 0xFFFF.
mask <i>mask-value</i>	Checks the link attribute. A 32-bit decimal number, representing 32 attributes (bits), where the value of an attribute mask is 0 or 1. Range is from 0x0 to 0xFFFF.

exclude <i>name</i>	Configures a specific affinity that is to be excluded.
exclude-all	Excludes all affinities.
include <i>name</i>	Configures the affinity to include in the loose sense.
include-strict <i>name</i>	Configures the affinity to include in the strict sense.
logging	Per-interface logging configuration.
events	Per-interface logging events.
lsp-status	Enables interface LSP state change alarms.
reoptimize	Enables interface LSP REOPT change alarms.
state	Enables interface LSP UP/DOWN change alarms.
policy-class	Specifies class for policy-based tunnel selection.
<i>range</i>	Tunnel policy class range 1 to 7.
default	Default class for policy-based tunnel selection.
priority	Specifies the tunnel priority.
<i>setup-range</i>	Specifies setup priority. Range is 0 to 7.
<i>hold-range</i>	Specifies hold priority. Range is 0 to 7.
record-route	Records the route used by the tunnel.
signalled-bandwidth	Specifies the tunnel bandwidth requirement to be signalled.
<i>bandwidth</i>	Bandwidth required for an MPLS-TE tunnel, specified in kilobits per second. By default, bandwidth is reserved in the global pool. Range is from 0 to 4294967295.
class-type <i>ct</i>	(Optional) Configures the class type of the tunnel bandwidth request. Range is 0 to 1. Class-type 0 is equivalent to global-pool. Class-type 1 is equivalent to subpool.
soft-preemption	Enables the soft-preemption feature on this tunnel.

Command Default*affinity-value: 0x0*

mask-value: 0xFFFF

Command Modes

MPLS TE configuration

Command History

Release	Modification
Release 4.2.0	This command was introduced. The sub-pool keyword is not supported.
Release 4.2.1	Support for configuring attribute-set for auto-backup tunnels was added. The policy-class keyword was added for auto-mesh attribute-set.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 values specified for an attribute within a **path-option attribute-set** does not prevent the configuration of the same attribute at the tunnel level. However, only one level is taken into consideration. The configuration at the **path-option** level is considered more specific than the one at the level of the tunnel, and is therefore used.

Attributes that are **not** specified within an **attribute-set** picks their default values, as usual, from the configuration at the tunnel level, the configuration at the global mpls level, or default values.

An XRO attribute-set can be specified as part of the path-option, if required. An empty XRO attribute set results in the GMPLS tunnel being signaled with no exclusions, and therefore no XRO.

Task ID

Task ID	Operation
mpls-te	read, write

Examples

This example shows how to configure an attribute-set to a TE interface for an auto-backup tunnel:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface GigabitEthernet 0/1/0/3
RP/0/RP0/CPU0:router(config-mpls-te-if)# auto-tunnel backup
RP/0/RP0/CPU0:router(config-mpls-te-if-auto-backup)# attribute-set ab
RP/0/RP0/CPU0:router(config-mpls-te-if-auto-backup)#
```

This example shows how to configure an attribute-set to a TE interface for an auto-mesh tunnel:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel mesh
RP/0/RP0/CPU0:router(config-te-auto-mesh)# group 1
RP/0/RP0/CPU0:router(config-te-mesh-group)# attribute-set am1
RP/0/RP0/CPU0:router(config-te-mesh-group)# destination-list dl1
```

This example shows how to configure the attribute-set for auto-backup tunnels:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
```

```

RP/0/RP0/CPU0:router(config-mpls-te)# attribute-set auto-backup ab
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity 0x1 mask 0x1
RP/0/RP0/CPU0:router(config-te-attribute-set)# priority 3 3
RP/0/RP0/CPU0:router(config-te-attribute-set)# policy-class 6
RP/0/RP0/CPU0:router(config-te-attribute-set)# logging events lsp-status reoptimize
RP/0/RP0/CPU0:router(config-te-attribute-set)# logging events lsp-status state
RP/0/RP0/CPU0:router(config-te-attribute-set)# policy-class default
RP/0/RP0/CPU0:router(config-te-attribute-set)# record-route

```

This example shows how to configure the attribute-set for auto-mesh tunnels:

```

RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# attribute-set auto-mesh mesh1
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity include red blue
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity include-strict yellow green
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity exclude black
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity exclude-all
RP/0/RP0/CPU0:router(config-te-attribute-set)# policy-class default

```

This example shows how to configure the tunnel affinity and signalled-bandwidth for a path-option:

```

RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# attribute-set path-option myset
RP/0/RP0/CPU0:router(config-te-attribute-set)# affinity 0x3 mask 0x3
RP/0/RP0/CPU0:router(config-te-attribute-set)# signalled-bandwidth 2000

```

Related Commands

Command	Description
affinity-map, on page 163	Assigns a numerical value to each affinity name.
attribute-names, on page 169	Configures attribute names for the interface.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
show mpls traffic-eng affinity-map, on page 359	Displays the color name-to-value mappings configured on the router.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

auto-bw (MPLS-TE)

To configure automatic bandwidth on a tunnel interface and to enter MPLS-TE automatic bandwidth interface configuration mode, use the **auto-bw** command in MPLS-TE interface configuration mode. To disable the automatic bandwidth on that tunnel, use the **no** form of this command.

auto-bw

no auto-bw

Syntax Description	This command has no arguments or keywords.

Command Default	By default, automatic bandwidth is not enabled.

Command Modes	MPLS-TE interface 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.

Use the **auto-bw** command to enter MPLS-TE automatic bandwidth interface configuration mode.

The **auto-bw** and **load-share unequal** commands should not be used together.

The **load-share unequal** command determines the load-share for a tunnel based on the bandwidth. However, the MPLS-TE automatic bandwidth feature changes the bandwidth around. If you are configuring both the **load-share unequal** command and the MPLS-TE automatic bandwidth feature, we recommend that you specify an explicit load-share value configuration under each MPLS-TE automatic bandwidth tunnel.

The following automatic bandwidth scenarios are described:

- If you configure the automatic bandwidth on a tunnel, the automatic bandwidth is enabled on that tunnel. If no other configuration is specified, defaults for the various parameters are used, the operation stops.
- The automatic operation (for example, output rate collection) starts as soon as the automatic bandwidth is enabled on one tunnel. If automatic bandwidth is disabled from all tunnels, the operation stops.
- If the output rate collection is already active when the automatic bandwidth is configured on a tunnel, the statistics collection for that tunnel starts at the next collection configuration.

**Note**

Because the collection timer is already running, the first collection event for that tunnel happens in less than C minutes (for example, on an average of C/2 minutes).

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enter MPLS-TE automatic bandwidth interface configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)#
```

Related Commands

Command	Description
adjustment-threshold (MPLS-TE), on page 155	Configures the tunnel-bandwidth change threshold to trigger an adjustment.
application (MPLS-TE), on page 165	Configures the application frequency, in minutes, for the applicable tunnel.
bw-limit (MPLS-TE), on page 190	Configures the minimum and maximum automatic bandwidth to set on a tunnel.
collect-bw-only (MPLS-TE), on page 208	Enables only the bandwidth collection without adjusting the automatic bandwidth.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
overflow threshold (MPLS-TE), on page 309	Configures tunnel overflow detection.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

auto-bw collect frequency (MPLS-TE)

To configure the automatic bandwidth collection frequency, use the **auto-bw collect frequency** command in MPLS-TE configuration mode. To reset the automatic bandwidth frequency to its default value, use the **no** form of this command.

auto-bw collect frequency *minutes*

no auto-bw collect frequency *minutes*

Syntax Description

<i>minutes</i>	Interval between automatic bandwidth adjustments, in minutes. The range is from 1 to 10080. The default is 5.

Command Default

minutes: 5

In addition, the **no** form of this command resets to the default.

Command Modes

MPLS-TE 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.

The **auto-bw collect frequency** command configures the automatic bandwidth collection frequency for all the tunnels.

Modifying the global collection frequency does not restart the tunnel for the current application period. The application period continues with the modified collection frequency.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example configures a tunnel for an automatic bandwidth adjustment of 100 minutes:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
```

```
RP/0/RP0/CPU0:router(config-mpls-te)# auto-bw collect frequency 100
```

Related Commands

Command	Description
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
mpls traffic-eng auto-bw apply (MPLS-TE), on page 289	Configures the highest bandwidth available on a tunnel without waiting for the current application period to end.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

autoroute announce

To specify that the Interior Gateway Protocol (IGP) should use the tunnel (if the tunnel is up) in its enhanced shortest path first (SPF) calculation, use the **autoroute announce** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

autoroute announce

no autoroute announce

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes Interface configuration

Release	Modification
Release 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.

Currently, the only way to forward traffic over a tunnel is to use the **autoroute announce** or **static routes** commands.

When you configure more than one IGP, the tunnel is announced to the IGP used to find the path to the tunnel destination.

By default, the route metric of the tunnel path to the destination equals the route metric of the shortest IGP path to that destination when the **autoroute announce** command is configured.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to configure IGP to use the tunnel in its enhanced SPF calculation when the tunnel is up:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
```

```
RP/0/RP0/CPU0:router(config-if)# autoroute announce
```

Related Commands

Command	Description
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.

autoroute metric

To specify the MPLS-TE tunnel metric that the Interior Gateway Protocol (IGP) enhanced Shortest Path First (SPF) calculation uses, use the **autoroute metric** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

autoroute metric {**absolute**|**relative**} *value*

no autoroute metric {**absolute**|**relative**} *value*

Syntax Description

absolute	Displays the absolute metric mode; you can enter a positive metric value.
relative	Displays the relative metric mode; you can enter a positive, negative, or zero value.
<i>value</i>	Metric that the IGP enhanced SPF calculation uses. Relative value range is –10 to 10. Absolute value is 1 to 2147483647.

Command Default

relative *value* : 0

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The absolute value range is from 1 to 2147483647.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 **autoroute metric** command overwrites the default tunnel route metric of the shortest IGP path to the destination.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure the IGP enhanced SPF calculation using MPLS-TE tunnel metric as relative negative 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# autoroute metric relative -1
```

Related Commands

Command	Description
autoroute announce , on page 179	Instructs the IGP to use the tunnel (if it is up) in its enhanced SPF calculation.
interface tunnel-te , on page 255	Configures an MPLS-TE tunnel interface.
show mpls traffic-eng autoroute , on page 363	Displays the tunnels announced to the IGP, including interface, destination, and bandwidth.

auto-tunnel backup (MPLS-TE)

To automatically build next-hop (NHOP) and next-next-hop (NNHOP) backup tunnels, and to enter auto-tunnel backup configuration mode, use the **auto-tunnel backup** command in MPLS-TE configuration mode. To clear the NHOP and NNHOP backup tunnels, use the **no** form of this command.

auto-tunnel backup

no auto-tunnel backup

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS-TE 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.

The range of *tunnel-ID* is required to be mentioned for the auto-tunnel backup tunnels; otherwise, none of the tunnels are created.

The **no** form of this command deletes both NHOP and NNHOP backup tunnels that are configured using either the **auto-tunnel backup** command or the **nhop-only** command.

Task ID	Task ID	Operation
	mpls-te	read, write

Examples The following example automatically builds NHOP and NNHOP backup tunnels:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel backup
```

Related Commands

Command	Description
clear mpls traffic-eng auto-tunnel backup unused, on page 195	Clears the unused automatic backup tunnels.
<code>mpls traffic-eng <i>interface-path-id</i> auto-tunnel backup</code>	Configures the automatic backup tunnel for a specific interface.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.
tunnel-id (auto-tunnel backup), on page 493	Configures range of tunnel interface numbers for automatic backup tunnels.

backup-bw

To configure the backup bandwidth for an MPLS-TE backup tunnel (that is used to protect a physical interface), use the **backup-bw** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

backup-bw {*backup bandwidth* {**any-class-type** | **class-type** *ct*}} | **global-pool** {*bandwidth* | **unlimited**}} | **sub-pool** {*bandwidth* | **unlimited**}} | **unlimited** {**any-class-type** | **class-type** *ct*}}

no backup-bw {*backup bandwidth* {**any-class-type** | **class-type** *ct*}} | **global-pool** {*bandwidth* | **unlimited**}} | **sub-pool** {*bandwidth* | **unlimited**}} | **unlimited** {**any-class-type** | **class-type** *ct*}}

Syntax Description

<i>backup bandwidth</i>	Backup bandwidth in any-pool provided by an MPLS-TE backup tunnel. Bandwidth is specified in kilobits per second (kbps). Range is 1 to 4294967295.
any-class-type	Displays the backup bandwidth assigned to any class-type protected tunnels.
class-type <i>ct</i>	Displays the class type of the backup bandwidth. Range is 0 to 1.
global-pool <i>bandwidth</i>	(In Prestandard DS-TE with RDM) Displays the backup bandwidth in global pool provided by an MPLS-TE backup tunnel. Bandwidth is specified in kilobits per second. Range is 1 to 4294967295.
unlimited	Displays the unlimited bandwidth.
sub-pool <i>bandwidth</i>	(In Prestandard DS-TE with RDM) Displays the backup bandwidth in sub-pool provided by an MPLS-TE backup tunnel. Bandwidth is specified in kilobits per second. Range bandwidth is 1 to 4294967295. Only label switched paths (LSPs) using bandwidth from the sub-pool can use the backup tunnel.

Command Default

Any class-type unlimited.

Command Modes

Interface configuration

Command History

Release	Modification
Release 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.

Backup bandwidth can be limited or unlimited or specific to a global pool, sub-pool, or non-specific any-pool. Backup with backup-bw in global-pool protects global-pool LSPs only; backup-bw in sub-pool protects sub-pool LSPs only.

Backup tunnels configured with limited backup bandwidth (from any/global/sub pool) are not assigned to protect LSPs configured with zero signaled bandwidth.

Backup bandwidth provides bandwidth protection for fast reroute (FRR). Bandwidth protection for FRR supports DiffServ-TE with two bandwidth pools (class-types).

Class-type 0 is strictly equivalent to global-pool; class-type 1 is strictly equivalent to sub-pool bandwidth using the Russian Doll Model (RDM).

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure backup tunnel 1 for use only by LSPs that take their bandwidth from the global pool (class-type 0 tunnels). Backup tunnel 1 does not provide bandwidth protection.

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# backup-bw global-pool unlimited
```

or

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# backup-bw unlimited class-type 0
```

In the following example, backup tunnel 2 is used by LSPs that take their bandwidth from the sub-pool (class-type 1 tunnels) only. Backup tunnel 2 provides bandwidth protection for up to 1000 units.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 2
RP/0/RP0/CPU0:router(config-if)# backup-bw sub-pool 1000
```

or

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 2
RP/0/RP0/CPU0:router(config-if)# backup-bw 1000 class-type 1
```

Related Commands

Commands	Description
backup-path tunnel-te , on page 188	Assigns one or more backup tunnels to a protected interface.
fast-reroute , on page 229	Enables FRR protection for an MPLS-TE tunnel.
interface tunnel-te , on page 255	Configures an MPLS-TE tunnel interface.

backup-path tunnel-te

To set an MPLS-TE tunnel to protect a physical interface against failure, use the **backup-path tunnel-te** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

backup-path tunnel-te *tunnel-number*

no backup-path tunnel-te *tunnel-number*

Syntax Description

<i>tunnel-number</i>	Number of the tunnel protecting the interface. Range is 0 to 65535.

Command Default

No default behavior or values

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 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.

When the protected interface is down (shut down or removed), the traffic it was carrying (for the other label switched paths [LSPs], referred to as the protected LSPs) is rerouted, using fast reroute (FRR) onto the backup tunnels.

The following guidelines pertain to the FRR process:

- Multiple (backup) tunnels can protect the same interface by entering this command multiple times for different tunnels. The same (backup) tunnel can protect multiple interfaces by entering this command for each interface.
- The backup tunnel used to protect a physical interface must have a valid IP address configured.
- The backup tunnel cannot pass through the same interface that it is protecting.
- TE tunnels that are configured with the FRR option, cannot be used as backup tunnels.
- For the backup tunnel to provide protection to the protected LSP, the backup tunnel must have a terminating-end node in the path of a protected LSP.
- The source IP address of the backup tunnel and the merge point (MP) address (the terminating-end address of the backup tunnel) must be reachable.

**Note**

You must configure record-route on TE tunnels that are protected by multiple backup tunnels merging at a single node.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to protect PoS interface 0/7/0/0 using tunnel 100 and tunnel 150:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/7/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# backup-path tunnel-te 100
RP/0/RP0/CPU0:router(config-mpls-te-if)# backup-path tunnel-te 150
```

Related Commands

Command	Description
backup-bw, on page 185	Configures backup bandwidth for bandwidth protection.
fast-reroute, on page 229	Enables FRR protection for an MPLS-TE tunnel.
interface (MPLS-TE), on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

bw-limit (MPLS-TE)

To configure the minimum and maximum automatic bandwidth to be set on a tunnel, use the **bw-limit** command in MPLS-TE automatic bandwidth interface configuration mode. To disable this feature, use the **no** form of this command.

bw-limit *min* *bandwidth* [*max* *bandwidth*]

no bw-limit

Syntax Description

min <i>bandwidth</i>	Configures the minimum automatic bandwidth, in kbps, on a tunnel. The range is from 0 to 4294967295. The default is 0.
max <i>bandwidth</i>	Configures the maximum automatic bandwidth, in kbps, on a tunnel. The range is from 0 to 4294967295. The default is 4294967295.

Command Default

min: 0

max: 4294967295

Command Modes

MPLS-TE automatic bandwidth interface 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.

Both the **min** and **max** keywords must be configured.

The **bw-limit** command automatically sets the minimum bandwidth to the default value of 0, or the **bw-limit** command automatically sets the maximum to the default value of 4294967295 kbps.

If the value of the **min** keyword is greater than the **max** keyword, the **bw-limit** command is rejected. If you configure and modify the minimum or maximum bandwidth while the automatic bandwidth is already running, the next bandwidth application for that tunnel is impacted. For example, if the current tunnel requested bandwidth is 30 Mbps and the minimum bandwidth is modified to 50 Mbps, the next application sets the tunnel bandwidth to 50 Mbps.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure the minimum and maximum bandwidth for the tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# bw-limit min 30 max 80
```

Related Commands

Command	Description
adjustment-threshold (MPLS-TE), on page 155	Configures the tunnel-bandwidth change threshold to trigger an adjustment.
application (MPLS-TE), on page 165	Configures the application frequency, in minutes, for the applicable tunnel.
auto-bw (MPLS-TE), on page 175	Configures automatic bandwidth on a tunnel interface and enters MPLS-TE automatic bandwidth interface configuration mode.
collect-bw-only (MPLS-TE), on page 208	Enables only the bandwidth collection without adjusting the automatic bandwidth.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
overflow threshold (MPLS-TE), on page 309	Configures tunnel overflow detection.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

clear mpls lmp

To clear Link Management Protocol (LMP) management hello settings, use the **clear mpls lmp** command in EXEC mode.

clear mpls lmp

Syntax Description This command has no arguments or keywords.

Command Modes EXEC

Command History	Release	Modification
	Release 3.3.0	This command was introduced
	Release 3.8.0	This command was moved under Cisco support.

Usage Guidelines To use this command, you must be in a user group associated with a task 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 LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to clear all LMP management hello settings:

```
RP/0/RP0/CPU0:router# clear mpls lmp
```

clear mpls traffic-eng auto-bw (MPLS-TE EXEC)

To clear automatic bandwidth sampled output rates and to restart the application period for the specified tunnel, use the **clear mpls traffic-eng auto-bw** command in EXEC mode.

clear mpls traffic-eng auto-bw {all | internal | tunnel-te *tunnel-number*}

Syntax Description

all	Clears the automatic bandwidth sampled output rates for all tunnels.
internal	Clears all the automatic bandwidth internal data structures.
tunnel-te <i>tunnel-number</i>	Clears the automatic bandwidth sampled output rates for a specific tunnel. The <i>tunnel-number</i> argument is the tunnel ID used to clear the sampled output rates.

Command Default

No default behavior or values

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.

If no tunnel is specified, the **clear mpls traffic-eng auto-bw** command clears all the automatic bandwidth enabled tunnels.

For each tunnel in which the automatic bandwidth adjustment is enabled, information is maintained about the sampled output rates and the time remaining until the next bandwidth adjustment. The application period is restarted and values such as the largest collected bandwidth get reset. The tunnel continues to use the current bandwidth until the next application.

Task ID

Task ID	Operations
mpls-te	execute

Examples

The following example displays the information for the automatic bandwidth for tunnel number 0 from the **show mpls traffic-eng tunnels auto-bw brief** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 0 auto-bw brief
```

Tunnel	LSP Name	Last appl ID	Requested BW (kbps)	Signalled BW (kbps)	Highest BW (kbps)	Application BW (kbps)	Time Left
tunnel-te0		278	100	100	100	150	12m 38s

The following example shows how to clear the automatic bandwidth sampled output rates for tunnel number 0:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng auto-bw tunnel-te 0
```

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 0 auto-bw brief
```

Tunnel	LSP Name	Last appl ID	Requested BW (kbps)	Signalled BW (kbps)	Highest BW (kbps)	Application BW (kbps)	Time Left
tunnel-te0		278	100	100	100	0	24m 0s

Related Commands

Command	Description
clear mpls traffic-eng counters signaling, on page 201	Clears the automatic bandwidth configuration in a tunnel.
show mpls traffic-eng tunnels auto-bw brief, on page 463	Displays the list of automatic-bandwidth-enabled tunnels, and indicates if the current signaled bandwidth of the tunnel is identical to the bandwidth that is applied by the automatic bandwidth.

clear mpls traffic-eng auto-tunnel backup unused

To remove unused automatic backup tunnels, use the **clear mpls traffic-eng auto-tunnel backup unused** command in global configuration mode.

clear mpls traffic-eng auto-tunnel backup unused {all| tunnel-te *tunnel-number*}

Syntax Description

all	Clears all the unused automatic backup tunnels.
tunnel-te <i>tunnel-number</i>	Clears a specific unused automatic backup tunnel.

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 **unused** auto-tunnel backup tunnel is the tunnel that is not assigned to protect any FRR tunnel.

The behavior of this command is the same as the expiration of the **timers removal unused** command in which, when the timeout value is reached, the automatic backup tunnel is removed.

Task ID

Task ID	Operation
mpls-te	execute

Examples

The following example displays the information for the unused backup automatic tunnels from the **show mpls traffic-eng tunnels unused** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels unused
```

The following example shows how to clear the unused backup automatic tunnels:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng auto-tunnel backup unused all
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels unused
```

 clear mpls traffic-eng auto-tunnel backup unused**Related Commands**

Command	Description
show mpls traffic-eng tunnels , on page 430	Displays information about MPLS-TE tunnels.

clear mpls traffic-eng auto-tunnel mesh

To clear all unused auto-tunnel mesh destinations, use the **clear mpls traffic-eng auto-tunnel mesh** command in EXEC mode.

clear mpls traffic-eng auto-tunnel mesh unused {all| tunnel-te}

Syntax Description

all	Clears all applicable unused auto-tunnel destinations.
tunnel-te <i>id</i>	Clears an unused auto-tunnel destinations identified by a tunnel identifier.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 4.1.1	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
mpls-te	execute

Examples

This is sample output from the **clear mpls traffic-eng auto-tunnel mesh** command:

```
clear mpls traffic-eng auto-tunnel mesh
```

clear mpls traffic-eng counters auto-tunnel mesh

To clear all auto-tunnel mesh counters, use the **clear mpls traffic-eng counters auto-tunnel mesh** command in EXEC mode.

clear mpls traffic-eng counters auto-tunnel mesh

This command has no arguments or keywords.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 4.1.1	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
mpls-te	execute

Examples

This is sample output from the **clear mpls traffic-eng counters auto-tunnel mesh** command:

```
RP/0/RP0/CPU0:routerclear mpls traffic-eng counters auto-tunnel mesh
```

clear mpls traffic-eng counters auto-tunnel backup

To clear MPLS-TE automatic tunnel backup counters, use the **clear mpls traffic-eng counters auto-tunnel backup** command in EXEC mode.

clear mpls traffic-eng counters auto-tunnel backup

Syntax Description This command has no arguments or keywords.

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	Operation
	mpls-te	execute

Examples The following example removes all counters for the automatic backup tunnels:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters auto-tunnel backup
```

Related Commands	Command	Description
	show mpls traffic-eng counters auto-tunnel backup	Displays the MPLS-TE automatic tunnel backup counters.
	show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

clear mpls traffic-eng counters global

To clear the internal MPLS-TE tunnel counters, use the **clear mpls traffic-eng counters global** command in EXEC mode.

clear mpls traffic-eng counters global

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

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.

Task ID	Task ID	Operations
	mpls-te	execute

Examples The following example shows how to clear the internal MPLS-TE tunnel counters:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters global
```

clear mpls traffic-eng counters signaling

To clear (set to zero) the MPLS tunnel signaling counters, use the **clear mpls traffic-eng counters signaling** command in EXEC mode.

```
clear mpls traffic-eng counters signaling {all| [heads | mids | tails]| name name | summary}
```

Syntax Description

all	Clears counters for all MPLS-TE tunnels.
heads	(Optional) Displays tunnels with their heads at this router.
mids	(Optional) Displays tunnels with their midpoints at this router.
tails	(Optional) Displays tunnels with their tails at this router.
name <i>name</i>	Clears counters for an MPLS-TE tunnel with the specified name.
summary	Clears the counter's summary.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced as clear mpls traffic-eng counters tunnels .
Release 3.5.0	Support was added for the middles keyword.
Release 3.8.0	The clear mpls traffic-eng counters tunnels command was replaced by clear mpls traffic-eng counters signaling 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 **clear mpls traffic-eng counters signaling** command to set all MPLS counters to zero so that changes can be seen easily.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to clear all counters:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters signaling all
```

Related Commands

Command	Description
show mpls traffic-eng counters signaling , on page 372	Displays tunnel signaling statistics.

clear mpls traffic-eng counters soft-preemption

To clear (set to zero) the counters for soft-preemption statistics, use the **clear mpls traffic-eng counters soft-preemption** command in EXEC mode.

clear mpls traffic-eng counters {all| soft-preemption}

Syntax Description

all	Clears counters for all MPLS-TE tunnels.
soft-preemption	Clears the statistics for soft preemption counters.

Command Default

None

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.

When all counters are cleared using the **clear mpls traffic-eng counters all** command, the counters for soft-preemption statistics are automatically cleared.

Task ID

Task ID	Operations
mpls-te	execute

Examples

This example shows how to clear all counters:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng counters signaling all
```

 clear mpls traffic-eng counters soft-preemption**Related Commands**

Command	Description
show mpls traffic-eng counters signaling , on page 372	Displays tunnel signaling statistics.

clear mpls traffic-eng fast-reroute log

To clear the log of MPLS fast reroute (FRR) events, use the **clear mpls traffic-eng fast-reroute log** command in EXEC mode.

clear mpls traffic-eng fast-reroute log

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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	Operations
	mpls-te	read, write

Examples The following example shows sample output before clearing the log of FRR events:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng fast-reroute log
```

Node	Protected LSPs Interface	Rewrites	When	Switching Time (usec)
0/0/CPU0	PO0/1/0/1 1	1	Feb 27 19:12:29.064000	147
0/1/CPU0	PO0/1/0/1 1	1	Feb 27 19:12:29.060093	165
0/2/CPU0	PO0/1/0/1 1	1	Feb 27 19:12:29.063814	129
0/3/CPU0	PO0/1/0/1 1	1	Feb 27 19:12:29.062861	128

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng fast-reroute log
```

clear mpls traffic-eng link-management statistics

To clear all the MPLS-TE admission control statistics, use the **clear mpls traffic-eng link-management statistics** command in EXEC mode.

clear mpls traffic-eng link-management statistics

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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	Operations
	mpls-te	read, write

Examples The following example shows how to clear all the MPLS-TE statistics for admission control:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng link-management statistics
```

clear mpls traffic-eng pce

To clear the path computation element (PCE) statistics, use the **clear mpls traffic-eng pce** command in EXEC mode.

clear mpls traffic-eng pce [**peer** *ipv4 address*]

Syntax Description

peer	(Optional) Clears the statistics for one peer.
ipv4 address	(Optional) Configures the IPv4 address for PCE.

Command Default

Clears statistics for all the PCE peers.

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.

Task ID

Task ID	Operations
mpls-te	execute

Examples

The following example shows how to clear the statistics for the PCE:

```
RP/0/RP0/CPU0:router# clear mpls traffic-eng pce
```

Related Commands

Command	Description
show mpls traffic-eng pce peer, on page 415	Displays the status of the PCE peer address and state.

collect-bw-only (MPLS-TE)

To configure only the bandwidth collection without adjusting the bandwidth automatically, use the **collect-bw-only** command in MPLS-TE automatic bandwidth interface configuration mode. To disable this feature, use the **no** form of this command.

collect-bw-only

no collect-bw-only

Syntax Description

This command has no arguments or keywords.

Command Default

Bandwidth collection is either enabled or disabled.

Command Modes

MPLS-TE automatic bandwidth interface 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 you enable the **collect-bw-only** command while the automatic bandwidth is already running on a tunnel, the bandwidth application is disabled from that moment. Before you enable the actual bandwidth application, you can get the status of the automatic bandwidth behavior.

If you disable the **collect-bw-only** command on a tunnel from which the automatic bandwidth is already running, the actual bandwidth application takes place on the tunnel at the next application period.

It is also possible to manually activate a bandwidth application regardless of the collect bandwidth only flag that is being specified on a tunnel. To activate the bandwidth application, use the [mpls traffic-eng auto-bw apply \(MPLS-TE\)](#), on page 289 command in EXEC mode.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable only the bandwidth collection without adjusting the automatic bandwidth:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# collect-bw-only
```

Related Commands

Command	Description
adjustment-threshold (MPLS-TE), on page 155	Configures the tunnel-bandwidth change threshold to trigger an adjustment.
application (MPLS-TE), on page 165	Configures the application frequency, in minutes, for the applicable tunnel.
auto-bw (MPLS-TE), on page 175	Configures automatic bandwidth on a tunnel interface and enters MPLS-TE automatic bandwidth interface configuration mode.
bw-limit (MPLS-TE), on page 190	Configures the minimum and maximum automatic bandwidth to set on a tunnel.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
overflow threshold (MPLS-TE), on page 309	Configures tunnel overflow detection.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

destination (MPLS-TE)

To configure the destination address of a TE tunnel, use the **destination** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

destination *ip-address*

no destination *ip-address*

Syntax Description

<i>ip-address</i>	Destination address of the MPLS-TE router ID.

Command Default

No default behavior or values

Command Modes

Interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The Point-to-Multipoint (P2MP) TE tunnel destination configuration 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

The tunnel destination address must be a unique MPLS-TE router ID; it cannot be an MPLS-TE link address on a node.

Use the **interface tunnel-mte** command to configure destinations for the Point-to-Multipoint (P2MP) TE tunnel and to enter P2MP destination interface configuration mode. The maximum number of destinations, which are configured under P2MP tunnels, is 500.

For P2MP tunnels, the **destination** command acts as a configuration mode. The **path-option** command is under the destination for P2MP; whereas, it is under the tunnel-te interface configuration mode for P2P tunnels. For Point-to-Point (P2P) tunnels, the **destination** command is used as a single-line command.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the destination address for tunnel-te1 to 10.10.10.10:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te1
RP/0/RP0/CPU0:router(config-if)# destination 10.10.10.10
```

The following example shows how to set the destination address for tunnel-mte 10 to 150.150.150.150:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-mte10
RP/0/RP0/CPU0:router(config-if)# destination 150.150.150.150
RP/0/RP0/CPU0:router(config-if-p2mp-dest)#
```

Related Commands

Command	Description
interface tunnel-mte, on page 253	Configures an MPLS-TE P2MP tunnel interface.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
path-option (P2MP TE), on page 316	Configures the primary or fallback path setup option for an P2MP TE tunnel.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

direction (GMPLS)

To configure a bidirectional optical tunnel for GMPLS, use the **direction** command in interface tunnel-gte configuration mode. To return to the default behavior, use the **no** form of this command.

direction bidirectional

no direction bidirectional

Syntax Description

bidirectional	Enables bidirectional tunneling.

Command Default

Default is unidirectional.

Command Modes

Interface tunnel-gte configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.8.0	GMPLS interfaces were supported under the tunnel-gte interface type.
Release 3.9.0	This command 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.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

There are two types of MPLS-TE tunnels:

- Generic packet MPLS-TE tunnels
- Optical MPLS-TE tunnel (GMPLS tunnel)

At the configuration level, you cannot tell the difference between a packet MPLS or a GMPLS-TE tunnel. The packet TE tunnels are unidirectional, whereas GMPLS tunnels are bidirectional; therefore, you can identify the optical GMPLS tunnel by identifying the bidirectional configuration.

The GMPLS-TE tunnel requires that you specify the endpoint and transit switching capability so that the path computation module can determine the links that the tunnel can traverse.

The transit switching capability describes the switching capability of the LSP region that the tunnel crosses. The endpoint switching capability describes the switching capability and encoding required for the tunnel interface associated with the two ends of the bidirectional tunnel (namely, active, and passive side).

Finally, for GMPLS functionality to work, you must configure the **direction** and **switching** commands.

**Note**

Bidirectional tunnel support is available on optical (GMPLS) tunnels only.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to change the tunnel direction from the default (unidirectional) to bidirectional:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-gte 99
RP/0/RP0/CPU0:router(config-if)# direction bidirectional
```

Related Commands

Command	Description
flooding-igp (GMPLS), on page 235	Floods selected GMPLS Traffic Engineering links.
interface tunnel-gte, on page 251	Configures an MPLS-TE tunnel interface for GMPLS interfaces.
lmp hello (GMPLS), on page 272	Configures LMP IPCC management hello settings.
match (GMPLS), on page 284	Configures or matches active and passive tunnels.
passive (GMPLS), on page 311	Configures passive GMPLS tunnels.
remote (GMPLS), on page 348	Configures remote TE links.
switching (GMPLS), on page 480	Configures TE-link switching attributes.

disable (explicit-path)

To prevent the path from being used by MPLS-TE tunnels while it is configured, use the **disable** command in explicit path configuration mode. To return to the default behavior, use the **no** form of this command.

disable

no disable

Syntax Description This command has no arguments or keywords.

Command Default Explicit path is enabled.

Command Modes Explicit path configuration

Command History	Release	Modification
	Release 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	Operations
	mpls-te	read, write

Examples The following example shows how to disable explicit path 200:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 200
RP/0/RP0/CPU0:router(config-expl-path)# disable
```

Related Commands

Command	Description
index exclude-address, on page 241	Specifies the next IP address to exclude from the explicit path.
index next-address, on page 245	Specifies path entries at a specific index.

Command	Description
show explicit-paths, on page 357	Displays the configured IP explicit paths.

disable (P2MP TE)

To disable the given destination for the Point-to-Multipoint (P2MP) tunnel interface, use the **disable** command in P2MP destination interface configuration mode. To return to the default behavior, use the **no** form of this command.

disable

no disable

Syntax Description This command has no arguments or keywords.

Command Default None

Command Modes P2MP destination 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 **disable** command is not configured, the destination is enabled.

We recommend that you disable those destinations about which you have prior knowledge. This is because those destinations do not have valid MPLS-TE paths; therefore these destinations can be excluded from the P2MP tree computation.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to disable destination 140.140.140.140:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-mte 10
RP/0/RP0/CPU0:router(config-if)# destination 140.140.140.140
RP/0/RP0/CPU0:router(config-if-p2mp-dest)# disable
```

Related Commands

Command	Description
destination (MPLS-TE), on page 210	Configures the destination address of a TE tunnel.
interface tunnel-mte, on page 253	Configures an MPLS-TE P2MP tunnel interface.

ds-te bc-model

To enable a specific bandwidth constraint model (Maximum Allocation Model or Russian Doll Model) on the entire label switched router (LSR), use the **ds-te bc-model** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

ds-te bc-model mam

no ds-te bc-model mam

Syntax Description

mam	Enables the Maximum Allocation Model (MAM) bandwidth constraints model.

Command Default

RDM is the default bandwidth constraint model.

Command Modes

MPLS-TE 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.

You can configure both the MAM and RDM bandwidth values on a single interface before swapping to an alternate global MPLS-TE BC model.

If you configure bandwidth constraints without configuring the corresponding bandwidth constraint values, the router uses default bandwidth constraint values.

MAM is not supported in prestandard DS-TE mode. MAM and RDM are supported in IETF DS-TE mode; RDM is supported in prestandard DS-TE mode.



Note

Changing the bandwidth constraints model affects the entire router and may have a major impact on system performance as nonzero-bandwidth tunnels are torn down.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable the MAM bandwidth constraints model:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# ds-te bc-model mam
```

Related Commands

Command	Description
ds-te mode, on page 220	Configures standard DS-TE mode.
ds-te te-classes, on page 222	Enters DS-TE te-class map configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng ds-te te-class, on page 378	Displays the Diff-Serv TE-class map in use.

ds-te mode

To configure standard differentiated-service TE mode (DS-TE), use the **ds-te mode** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

ds-te mode ietf

no ds-te mode ietf

Syntax Description

ietf	Enables IETF standard mode.

Command Default

Prestandard DS-TE is the default differentiated service mode.

Command Modes

MPLS-TE 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 following two DS-TE modes are supported:

- Prestandard mode
 - The Cisco proprietary mechanism for IGP and RSVP signalling are used and DS-TE does not interoperate with third-party vendor equipment.
- IETF mode
 - Standard defined extensions are used for IGP and RSVP signalling and DS-TE in this mode interoperates with third-party equipment.
 - IETF mode supports two bandwidth constraint models: the Russian Doll Model (RDM) and Maximum Allocation Model (MAM).
 - RDM is the default model.
 - Router advertises variable-length bandwidth constraints, max-reservable- bandwidth, and unreserved bandwidths in TE-classes.
 - tunnels must have valid class-type and priority configured as per TE-class map in use; otherwise, tunnels remain down.

- TE-class map (a set of tunnel priority and class-type values) is enabled to interpret unreserved bandwidth values advertised in IGP; therefore, TE-class map must be identical on all nodes for TE tunnels to be successfully established

For DS-TE to function properly, DS-TE modes must be configured identically on all MPLS-TE nodes. If you need to change the DS-TE mode, you must bring down all tunnel interfaces and after the change, you should flood the updated bandwidth values through the network.

**Note**

Changing the DS-TE mode affects the entire LSR and can have a major impact on system performance when tunnels are torn down.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable IETF standard mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# ds-te mode ietf
```

Related Commands

Command	Description
ds-te bc-model, on page 218	Enables a specific bandwidth constraint model (Maximum Allocation Model or Russian Doll Model) on the LSR.
ds-te te-classes, on page 222	Configures MPLS DS-TE TE-class maps.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
mpls traffic-eng fast-reroute promote, on page 291	Configures the router to assign new or more efficient backup MPLS-TE tunnels to protected MPLS-TE tunnels.
show mpls traffic-eng ds-te te-class, on page 378	Displays the Diff-Serv TE-class map in use.

ds-te te-classes

To enter DS-TE te-class map configuration mode, use the **ds-te te-classes** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

ds-te te-classes te-class *te_class_index* {**class-type** *class_type_number* {**priority** *pri_number*}| **unused**}

no ds-te te-classes te-class *te_class_index* {**class-type** *class_type_number* {**priority** *pri_number*}| **unused**}

Syntax Description

te-class	Configures the te-class map.
<i>te_class_index</i>	TE class-map index. Range is 0 to 7.
class-type	Configures the class type.
<i>class_type_number</i>	Class type value in the te-class map. Range is 0 to 1.
priority	Configures the TE tunnel priority.
<i>pri_number</i>	TE tunnel priority value. Range is 0 to 7.
unused	Marks the TE-class as unused.

Command Default

The following default te-class maps are used in IETF DS-TE mode:

te-class index	class-type	priority
0	0	7
1	1	7
2	UNUSED	—
3	UNUSED	—
4	0	0
5	1	0
6	UNUSED	—
7	UNUSED	—

**Note**

The default mapping has 4 TE-classes used with 2 class-types and, 4 TE-classes are unused. TE-class map is not used in prestandard DS-TE mode.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.8.0	The unused 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.

In IETF DS-TE mode, modified semantic of the unreserved bandwidth TLV is used. Each of the eight available bandwidth values advertised in the IGP corresponds to a TE class. Because IGP advertises only eight bandwidth values, only eight TE-Classes can be supported in a IETF DS-TE network. The TE-Class mapping must be configured the same way on every router in a DS-TE domain. There is, however, no method to automatically detect or enforce this required consistency.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a TE-class 7 parameter:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# ds-te te-classes te-class 7 class-type 0 priority 4
```

Related Commands

Command	Description
ds-te bc-model, on page 218	Enables a specific bandwidth constraint model (Maximum Allocation Model or Russian Doll Model) on the LSR.
ds-te mode, on page 220	Configures standard DS-TE mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.

Command	Description
show mpls traffic-eng ds-te te-class, on page 378	Displays the Diff-Serv TE-class map in use.

exclude srlg (auto-tunnel backup)

To specify that automatic backup tunnels should avoid Shared Risk Link Groups (SRLGs) of protected interface, use the **exclude srlg** command in auto-tunnel backup configuration mode. To disable this feature, use the **no** form of this command.

exclude srlg [preferred]

no exclude srlg [preferred]

Syntax Description

preferred	(Optional) Causes the backup tunnel to avoid SRLGs of its protected interface(s); however, the backup tunnel is created if SRLGs are not avoided.

Command Default

Strict SRLG

Command Modes

Auto-tunnel backup 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.

Strict SRLG configuration of this command means that the path computed for the backup tunnel that is automatically created, must not contain any links that are part of the excluded SRLG groups. If such a path cannot be found, the backup tunnel does not come up.

Configuration of the preferred option allows the automatic backup tunnel to come up even if a path that excludes SRLGs can not be found.

Task ID

Task ID	Operation
mpls-te	read, write

Examples

In the following example, automatic backup tunnels must avoid SRLGs of the protected interface.

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface pos 0/1/0/1
```

 **exclude srlg (auto-tunnel backup)**

```
RP/0/RP0/CPU0:router(config-mpls-te-if)# auto-tunnel backup  
RP/0/RP0/CPU0:router(config-mpls-te-if-auto-backup)# exclude srlg preferred
```

Related Commands

Command	Description
auto-tunnel backup (MPLS-TE), on page 183	Builds automatic next-hop and next-next-hop tunnels, and enters auto-tunnel configuration mode.

explicit-path

To configure an explicit path for an MPLS-TE tunnel, use the **explicit-path** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

explicit-path {*identifier number* | *name pathname*}

no explicit-path

Syntax Description

identifier <i>number</i>	Configures an explicit path using a number.
name <i>pathname</i>	Configures an explicit path using a pathname.

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.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure an explicit path for an MPLS-TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 200
```

Related Commands

Command	Description
disable (explicit-path) , on page 214	Prevents a path from being used by MPLS-TE tunnels.

Command	Description
show explicit-paths, on page 357	Displays the configured IP explicit paths.

fast-reroute

To enable fast-reroute (FRR) protection for an MPLS-TE tunnel, use the **fast-reroute** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

fast-reroute

no fast-reroute

Syntax Description This command has no arguments or keywords.

Command Default FRR is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	Release 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.

When a protected link used by the fast-reroutable label switched path (LSP) fails, the traffic is rerouted to a previously assigned backup tunnel. Configuring FRR on the tunnel informs all the nodes that the LSP is traversing that this LSP desires link/node/bandwidth protection.

You must allow sufficient time after an RP switchover before triggering FRR on standby RPs to synchronize with the active RP (verified using the **show redundancy** command). All TE tunnels must be in the recovered state and the database must be in the ready state for all ingress and egress line cards. To verify this information, use the **show mpls traffic-eng tunnels** and **show mpls traffic-eng fast-reroute database** commands.



Note Wait approximately 60 seconds before triggering FRR after verifying the database state.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples

The following example shows how to enable FRR on an MPLS-TE tunnel:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1  
RP/0/RP0/CPU0:router(config-if)# fast-reroute
```

Related Commands

Command	Description
fast-reroute protect, on page 231	Configures node and bandwidth protection for an MPLS-TE tunnel.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
show mpls traffic-eng forwarding, on page 380	Displays the contents of the FRR database.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

fast-reroute protect

To enable node and bandwidth protection for an MPLS-TE tunnel, use the **fast-reroute protect** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

fast-reroute protect {bandwidth | node}

no fast-reroute protect

Syntax Description

bandwidth	Enables bandwidth protection request.
node	Enables node protection request.

Command Default

FRR is disabled.

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
mpls-te	read, write

Examples

The following example shows how to enable bandwidth protection for a specified TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# fast-reroute protect bandwidth
```

Related Commands

Command	Description
fast-reroute , on page 229	Enables FRR protection for an MPLS-TE tunnel.
interface tunnel-te , on page 255	Configures an MPLS-TE tunnel interface.
show mpls traffic-eng tunnels , on page 430	Displays information about MPLS-TE tunnels.

fast-reroute timers promotion

To configure how often the router considers switching a protected MPLS-TE tunnel to a new backup tunnel if additional backup-bandwidth or a better backup tunnel becomes available, use the **fast-reroute timers promotion** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

fast-reroute timers promotion *interval*

no fast-reroute timers promotion

Syntax Description

<i>interval</i>	Interval, in seconds, between scans to determine if a label switched path (LSP) should use a new, better backup tunnel. Range is 0 to 604800. A value of 0 disables backup tunnel promotions.

Command Default

interval: 300

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 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.

Setting the interval to a low value puts more load on the CPU because it has to scan all protected LSPs more frequently. It is not recommended that the timer be configured below the default value of 300 seconds.

Pacing mechanisms have been implemented to distribute the load on the CPU when backup promotion is active. Because of this, when a large number of protected LSPs are promoted, some delay is noticeable in backup promotion. If the promotion timer is configured to a very low value (depending on the number of protected LSPs) some protected LSPs may never get promoted.

To disable the timer, set the value to zero.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to specify that LSPs are scanned every 600 seconds (10 minutes) to determine if they should be promoted to a better backup tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# fast-reroute timers promotion 600
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.
mpls traffic-eng fast-reroute promote , on page 291	Configures the router to use a new or more efficient backup MPLS-TE tunnel when a current tunnel is overloaded.

flooding-igp (GMPLS)

To flood the GMPLS Traffic Engineering link into a specific OSPF area and instance, use the **flooding-igp** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

flooding-igp ospf *instance area area*

no flooding-igp ospf *instance area area*

Syntax Description

ospf	Floods the interface into an OSPF instance
<i>instance</i>	Name of the OSPF instance into which the GMPLS link is to be flooded.
area <i>area</i>	Displays the area into which the GMPLS link is to be flooded (where TE is configured).

Command Default

No default behavior or values

Command Modes

MPLS-TE 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.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

A GMPLS link won't be flooded into any IGP topology unless this command is used.



Note

The **flooding-igp** command is valid for GMPLS-TE only.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to flood the optical GMPLS link on POS 0/1/0/0 into area 0 of OSPF instance “optical”:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface pos0/1/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# flooding-igp ospf optical area 0
```

Related Commands

Command	Description
destination (MPLS-TE), on page 210	Configures bidirectional optical tunnels.
interface (MPLS-TE), on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
lmp hello (GMPLS), on page 272	Configures LMP IPCC management hello settings.
match (GMPLS), on page 284	Configures or matches active and passive tunnels.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
passive (GMPLS), on page 311	Configures passive GMPLS tunnels.
remote (GMPLS), on page 348	Configures remote TE links.
switching (GMPLS), on page 480	Configures TE-link switching attributes.

flooding thresholds

To set the reserved bandwidth thresholds for a link, use the **flooding thresholds** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

flooding thresholds {**down** | **up**} *percent* [*percent1* | *percent2* | *percent3* | ... *percent 15*]

no flooding thresholds {**down** | **up**}

Syntax Description

down	Configures the threshold for decreased resource availability.
up	Configures the threshold for increased resource availability.
<i>percent</i> [<i>percent</i>]	Bandwidth threshold level. Range is 0 to 100 for all 16 levels.

Command Default

down: 100, 99, 98, 97, 96, 95, 90, 85 , 80, 75 , 60, 45, 30, 15

up: 5, 30, 45, 60, 75, 80, 85, 90, 95, 97 , 98, 99, 100

Command Modes

MPLS-TE interface configuration

Command History

Release	Modification
Release 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.

You can configure up to 16 flooding threshold values. The first value is mandatory; the next 15 are optional.

When a threshold is crossed, MPLS-TE link management advertises updated link information. If no thresholds are crossed, changes can be flooded periodically unless periodic flooding was disabled.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the reserved bandwidth threshold for the link for decreased resource availability (down) and for increased resource availability (up) thresholds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/7/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# flooding thresholds down 100 75 25
RP/0/RP0/CPU0:router(config-mpls-te-if)# flooding thresholds up 25 50 100
```

Related Commands

Command	Description
interface (MPLS-TE) , on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.
link-management timers periodic-flooding , on page 265	Sets the length of the interval used for periodic flooding.
show mpls traffic-eng link-management advertisements , on page 391	Displays local link information currently being flooded by MPLS-TE link management into the global TE topology.
show mpls traffic-eng link-management bandwidth-allocation , on page 394	Displays current local link information.

forwarding-adjacency

To configure an MPLS-TE forwarding adjacency, use the **forwarding-adjacency** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

forwarding-adjacency [**holdtime** *time*]

no forwarding-adjacency [**holdtime** *time*]

Syntax Description

holdtime <i>time</i>	(Optional) Configures the holdtime value, in milliseconds, that is associated with each forwarding-adjacency LSP. The default is 0.

Command Default

holdtime *time*: 0

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.

If you do not specify a **holdtime** *time* value, a delay is introduced with the following results:

- When forwarding-adjacency is configured on a tunnel that is up, TE notifies IGP without any additional delay.
- When forwarding-adjacency is not configured on a tunnel, TE notifies IGP without any additional delay.
- When forwarding-adjacency is configured on a tunnel that is down, TE does not notify IGP.
- When a tunnel on which forwarding-adjacency has been configured comes up, TE holds the notification to IGP for the period of holdtime (assuming nonzero holdtime). When the holdtime elapses, TE notifies IGP if the tunnel is still up.

The paths that traffic is taking to the destination can be manipulated by adjusting the forwarding adjacency link metric. To do that, use the **bandwidth** command. The unit of possible bandwidth values is in kbps.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure forwarding adjacency with a holdtime value of 60 milliseconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 888
RP/0/RP0/CPU0:router(config-if)# forwarding-adjacency holdtime 60
```

Related Commands

Command	Description
bandwidth (RSVP) , on page 500	Configures RSVP bandwidth on an interface using prestandard DS-TE mode.
interface tunnel-te , on page 255	Configures an MPLS-TE tunnel interface.
show mpls traffic-eng forwarding-adjacency , on page 384	Displays forwarding-adjacency information.

index exclude-address

To exclude an address from a tunnel path entry at a specific index, use the **index exclude-address** command in explicit path configuration mode. To return to the default behavior, use the **no** form of this command.

index *index-id* **exclude-address** { **ipv4 unicast** *IP address* }

no **index** *index-id*

Syntax Description

<i>index-id</i>	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
ipv4 unicast <i>IP address</i>	Excludes the IPv4 unicast address.

Command Default

No default behavior or values

Command Modes

Explicit path configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	Support for the ipv4 unicast keyword was added.
Release 3.4.0	The index (explicit path) command was modified to create two separate commands: index exclude-address and index next-address .

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 cannot include or exclude addresses from an IP explicit path unless explicitly configured using the **exclude-address** keyword.

Use the **exclude-address** keyword only after entering the explicit path configuration mode.

If you use the **exclude-address** keyword and specify the IP address of a link, the constraint-based routine does not consider that link when it sets up MPLS-TE paths. If the excluded address is a flooded MPLS-TE router ID, the constraint-based shortest path first (SPF) routine does not consider that entire node.

**Note**

The person who performs the configuration must know the IDs of the routers, as it may not be apparent if the value refers to the link or to the node.

MPLS-TE accepts IP explicit paths composed of all excluded addresses configured using the **exclude-address** keyword.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to exclude address 192.168.3.2 at index 3 of the explicit path 200:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 200
RP/0/RP0/CPU0:router(config-expl-path)# index 3 exclude-address ipv4 unicast 192.168.3.2
```

Related Commands

Command	Description
index next-address, on page 245	Specifies path entries at a specific index.
show explicit-paths, on page 357	Displays the configured IP explicit paths.

index exclude-srlg

To exclude an address to get SRLGs from a tunnel path entry at a specific index, use the **index exclude-srlg** command in explicit path configuration mode. To return to the default behavior, use the **no** form of this command.

index *index-id* **exclude-srlg** **ipv4** **unicast** *IP address*

no **index** *index-id*

Syntax Description

<i>index-id</i>	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
exclude-srlg	Specifies an IP address to get SRLG values from for exclusion.
ipv4 unicast <i>IP address</i>	Excludes the IPv4 unicast address.

Command Default

No default behavior or values

Command Modes

Explicit path 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.

Task ID

Task ID	Operation
mpls-te	read, write

Examples

The following example shows how to exclude the SRLG values from the IP address 192.168.3.2 at index 1 of the explicit path 100:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 100
RP/0/RP0/CPU0:router(config-expl-path)# index 1 exclude-srlg ipv4 unicast 192.168.3.2
```

index next-address

To include a path entry at a specific index, use the **index next-address** command in explicit path configuration mode. To return to the default behavior, use the **no** form of this command.

index *index-id* **next-address** [**loose** | **strict**] **ipv4 unicast** *IP-address*
no **index** *index-id*

Syntax Description

<i>index-id</i>	Index number at which the path entry is inserted or modified. Range is 1 to 65535.
ipv4 unicast <i>IP-address</i>	Includes the IPv4 unicast address (strict address).
loose ipv4 unicast <i>IP-address</i>	(Optional) Specifies the next unicast address in the path as a loose hop.
strict ipv4 unicast <i>IP-address</i>	(Optional) Specifies the next unicast address in the path as a strict hop.

Command Default

No default behavior or values

Command Modes

Explicit path configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	Support for the ipv4 unicast keyword was added.
Release 3.4.0	The index (explicit path) command was added to create two separate commands: index exclude-address and index next-address . Support was added for loose and strict keywords for the index next-address 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.

You cannot include addresses from an IP explicit path unless explicitly configured using the **next-address** keyword.

Use the **next-address** keyword only after entering the explicit path configuration mode.

**Note**

The person who performs the configuration must know the IDs of the routers, as it may not be apparent if the value refers to the link or to the node.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to insert the **next-address** 192.168.3.2 at index 3 of the explicit path 200:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# explicit-path identifier 200
RP/0/RP0/CPU0:router(config-expl-path)# index 3 next-address ipv4 unicast 192.168.3.2
```

Related Commands

Command	Description
index exclude-address, on page 241	Specifies the next IP address to exclude from the explicit path.
show explicit-paths, on page 357	Displays the configured IP explicit paths.

interface (MPLS-TE)

To enable MPLS-TE on an interface and to enter MPLS-TE interface configuration mode, use the **interface** command in global configuration mode. To return to the default behavior, 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 possible 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 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.

You must enter MPLS-TE interface mode to configure specific interface parameters on physical interfaces. Configuring MPLS-TE links or a tunnel TE interface begins the TE-control process on RP.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enter the MPLS-TE interface configuration mode:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls traffic-eng  
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/7/0/1
```

The following example shows how to remove an interface from the MPLS-TE domain:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls traffic-eng  
RP/0/RP0/CPU0:router(config-mpls-te)# no interface POS 0/7/0/1
```

interface (SRLG)

To enable Shared Risk Link Groups (SRLGs) on an interface and to enter SRLG interface configuration mode, use the **interface** command in SRLG configuration mode. To return to the previous 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 possible 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

SRLG 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.

Task ID

Task ID	Operation
mpls-te	read, write

Examples

The following example shows how to enter SRLG interface configuration mode:

```
RP/0/RP0/CPU0:router(config)# srlg
RP/0/RP0/CPU0:router(config-srlg)# interface POS 0/1/0/1
```

```
RP/0/RP0/CPU0:router(config-srlg-if)# value 10
RP/0/RP0/CPU0:router(config-srlg-if)#value 50
```

Related Commands

Command	Description
interface (MPLS-TE), on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.

interface tunnel-gte

To configure an MPLS-TE tunnel interface for GMPLS interfaces, use the **interface tunnel-gte** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

interface tunnel-gte *tunnel-id*

no interface tunnel-gte *tunnel-id*

Syntax Description

<i>tunnel-id</i>	Tunnel number. Range is 0 to 65535.

Command Default

Tunnel interfaces are disabled.

Command Modes

Global 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.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

You cannot have two tunnels using the same encapsulation mode with exactly the same source and destination address. The workaround is to create a loopback interface and use the loopback interface address as the source address of the tunnel.

Configuring MPLS-TE links or a tunnel TE interface begins the TE-control process on RP.

The **interface tunnel-gte** command indicates that the tunnel interface is for an MPLS-TE tunnel and enables the various tunnel MPLS-TE GMPLS tunnel interface options.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to configure tunnel-gte interface 1:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# interface tunnel-gte 1
```

Related Commands

Command	Description
match (GMPLS), on page 284	Matches an active tunnel to a passive tunnel.
passive (GMPLS), on page 311	Configures passive GMPLS tunnels.
switching endpoint (GMPLS), on page 482	Specifies the switching capability and encoding types for all endpoint TE links used to signal the optical tunnel that is mandatory to set up the GMPLS LSP.
switching transit (GMPLS), on page 484	Specifies the switching capability and encoding types for all transit TE links used to signal the optical tunnel to configure an optical LSP.

interface tunnel-mte

To configure an MPLS-TE P2MP tunnel interface, use the **interface tunnel-mte** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

interface tunnel-mte *tunnel-id*

no interface tunnel-mte *tunnel-id*

Syntax Description

<i>tunnel-id</i>	Tunnel number. Range is from 0 to 65535.

Command Default

Tunnel interfaces are disabled.

Command Modes

Global 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.

Configuring MPLS-TE links or tunnel-te, tunnel-gte, or tunnel-mte interfaces begins the TE-control process on route processor (RP).

The **interface tunnel-mte** command indicates that the tunnel interface is for an MPLS-TE P2MP tunnel and enables these MPLS-TE P2MP configuration options.



Note

You must configure record-route on TE tunnels that are protected by multiple backup tunnels merging at a single node.

To use the P2MP tunnels, you must configure a Loopback address and use the **ipv4 unnumbered** command for the Loopback interface type.

Task ID

Task ID	Operations
interface	read, write

Examples

This example shows how to configure tunnel interface 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-mte 1
RP/0/RP0/CPU0:router(config-if)# ipv4 unnumbered loopback0
```

Related Commands

Command	Description
affinity, on page 159	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
backup-bw, on page 185	Configures backup bandwidth for FRR.
fast-reroute, on page 229	Enables FRR protection for an MPLS-TE tunnel.
path-selection metric (interface), on page 326	Configures a path selection metric—TE or IGP.
priority (MPLS-TE), on page 344	Configures setup and reservation priority for an MPLS-TE tunnel.
record-route, on page 346	Configures record-route on an MPLS-TE tunnel.
signalled-bandwidth, on page 470	Configures the bandwidth required for an MPLS-TE tunnel.
signalled-name, on page 472	Configures the name of the tunnel required for an MPLS-TE tunnel.

interface tunnel-te

To configure an MPLS-TE tunnel interface, use the **interface tunnel-te** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

interface tunnel-te *tunnel-id*

no interface tunnel-te *tunnel-id*

Syntax Description

<i>tunnel-id</i>	Tunnel number. Range is 0 to 65535.

Command Default

Tunnel interfaces are disabled.

Command Modes

Global configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.7.0	Policy-based tunnel selection example 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 cannot have two tunnels using the same encapsulation mode with exactly the same source and destination address. The workaround is to create a loopback interface and to use the loopback interface address as the source address of the tunnel.

Configuring MPLS-TE links or Tunnel-TE interface begins the TE-control process on RP.

The **interface tunnel-te** command indicates that the tunnel interface is for an MPLS-TE tunnel and enables the various tunnel MPLS configuration options.



Note

You must configure record-route on TE tunnels that are protected by multiple backup tunnels merging at a single node.

Task ID

Task ID	Operations
interface	read, write

Examples

The following example shows how to configure tunnel interface 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# ipv4 unnumbered loopback0
```

The following example shows how to set the tunnel-class attribute to map the correct traffic class to the tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# policy-class 1
```

Related Commands

Command	Description
affinity, on page 159	Configures affinity (the properties that the tunnel requires in its links) for an MPLS-TE tunnel.
autoroute metric, on page 181	Instructs the IGP to use the tunnel in its enhanced SPF calculation, if the tunnel is in an up state.
backup-bw, on page 185	Configures backup bandwidth for FRR.
fast-reroute, on page 229	Enables FRR protection for an MPLS-TE tunnel.
path-option (MPLS-TE), on page 313	Configures a path option for an MPLS tunnel.
path-selection metric (interface), on page 326	Configures a path selection metric—TE or IGP.
policy-class, on page 342	Configures PBTS to direct traffic into specific TE tunnels.
priority (MPLS-TE), on page 344	Configures setup and reservation priority for an MPLS-TE tunnel.
record-route, on page 346	Configures record-route on an MPLS-TE tunnel.

ipcc interface (MPLS-TE)

To configure an interface-bound IP based control channel to a specific LMP neighbor with the option to specify a custom destination address that is useful for GigabitEthernet interfaces, use the **ipcc interface** command in MPLS-TE neighbor configuration mode. To disable this feature, use the **no** form of this command.

ipcc interface *type interface-path-id* [**dest** **ipv4 address**]

no ipcc interface *type interface-path-id* [**dest** **ipv4 address**]

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.
dest	(Optional) Configures the remote endpoint address.
ipv4 address	(Optional) Configures the IPv4 address.

Command Default

No default behavior or values

Command Modes

MPLS-TE neighbor 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
mpls-te	read, write

Examples

The following example shows how to configure the IPCC interface for Loopback0:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# lmp neighbor OXC1
RP/0/RP0/CPU0:router(config-mpls-te-nbr-OXC1)# ipcc interface Loopback0
```

Related Commands

Command	Description
ipcc routed (MPLS-TE), on page 259	Configures an IPCC that is routable.
lmp neighbor (MPLS-TE), on page 274	Configures or updates an LMP neighbor and its associated parameters and enters MPLS-TE neighbor configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng lmp, on page 408	Displays information about the LMP.

ipcc routed (MPLS-TE)

To configure a routed IP-based control channel for a specific LMP neighbor, use the **ipcc routed** command in MPLS-TE neighbor configuration mode. To return to the default behavior, use the **no** form of this command.

ipcc routed

no ipcc routed

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS-TE neighbor 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
	mpls-te	read, write

Examples The following example shows how to configure a routed IPCC for neighbor router1 in which the destination IP address is the node ID of the neighbor router1 on an interface determined dynamically by an IP routing protocol:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# lmp neighbor router1
RP/0/RP0/CPU0:router(config-mpls-te-nbr-router1)# ipcc routed
```

Related Commands	Command	Description
	ipcc interface (MPLS-TE), on page 257	Configures an IPCC.

Command	Description
imp neighbor (MPLS-TE), on page 274	Configures or updates an LMP neighbor and its associated parameters and enters MPLS-TE neighbor configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng lmp, on page 408	Displays information about the LMP.

ipv4 unnumbered (MPLS)

To specify the MPLS-TE tunnel Internet Protocol Version 4 (IPv4) address, use the **ipv4 unnumbered** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

ipv4 unnumbered *type interface-path-id*

no ipv4 unnumbered *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 IP address is set.

Command Modes

Interface configuration

Command History

Release	Modification
Release 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.

Tunnel-te is not signaled until an IP address is configured on the tunnel interface; therefore, the tunnel state stays down without IP address configuration.

Loopback is commonly used as the interface type.

Task ID

Task ID	Operations
network	read, write

Examples

The following example shows how to configure the MPLS-TE tunnel to use the IPv4 address used on loopback interface 0:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# ipv4 unnumbered loopback0
```

link-management timers bandwidth-hold

To set the length of time that bandwidth is held for a Resource Reservation Protocol (RSVP) Path (setup) message to wait for the corresponding RSVP Resv message to return, use the **link-management timers bandwidth-hold** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

link-management timers bandwidth-hold *holdtime*

no link-management timers bandwidth-hold *holdtime*

Syntax Description

<i>holdtime</i>	Number of seconds that bandwidth can be held. Range is 1 to 300. Default is 15.

Command Default

holdtime: 15

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 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.

The **link-management timers bandwidth-hold** command determines the time allowed for an RSVP message to return from a neighbor RSVP node.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the bandwidth to be held for 10 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# link-management timers bandwidth-hold 10
```

Related Commands

Command	Description
link-management timers periodic-flooding , on page 265	Sets the length of the interval used for periodic flooding.
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng link-management bandwidth-allocation , on page 394	Displays current local link information and bandwidth hold time.

link-management timers periodic-flooding

To set the length of the interval for periodic flooding, use the **link-management timers periodic-flooding** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

link-management timers periodic-flooding *interval*

no link-management timers periodic-flooding

Syntax Description	<i>interval</i>	Length of the interval, in seconds, for periodic flooding. Range is 0 to 3600. A value of 0 turns off periodic flooding. The minimum value is 30.

Command Default	<i>interval</i> : 180

Command Modes	MPLS-TE configuration

Command History	Release	Modification
	Release 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.
	The link-management timers periodic-flooding command advertises the link state information changes that do not trigger immediate action, such as a change to the allocated bandwidth that does not cross a threshold.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples	The following example shows how to set the interval length for periodic flooding to 120 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# link-management timers periodic-flooding 120
```

Related Commands

Command	Description
flooding thresholds, on page 237	Sets the reserved bandwidth flooding thresholds for a link.
link-management timers bandwidth-hold, on page 263	Sets the length of time that bandwidth is held for a RSVP Path (setup) message to wait for the corresponding RSVP Resv message to return.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng link-management summary, on page 406	Displays the current periodic flooding interval.

link-management timers preemption-delay

To set the length of the interval for delaying LSP preemption, use the **link-management timers preemption-delay** command in MPLS-TE configuration mode. To disable this behavior, use the **no** form of this command.

link-management timers preemption-delay bundle-capacity *sec*

Syntax Description	bundle-capacity <i>sec</i>	Specifies the bundle-capacity preemption timer value in seconds.

Command Default	None

Command Modes	MPLS-TE 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.

The value 0 as bundle-capacity value in the **link-management timers preemption-delay** command disables this timer. This means there is no delay before preemption sets in when the bundle capacity goes down.

Task ID	Task ID	Operation
	mpls-te	read, write

Examples	This example shows how to set the interval length for preemption-delay:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# link-management timers preemption-delay bundle-capacity
180
```

load-share

To determine load-sharing balancing parameters for a specified interface, use the **load-share** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

load-share *value*

no load-share

Syntax Description

<i>value</i>	Load-share value, equivalent to the bandwidth in kbps (that is, the same value in configuration). Range is 1 to 4294967295. Default is 0.

Command Default

The default load-share for tunnels with no explicit configuration is the configured signalled bandwidth.
value: 0 (if no value is assigned)

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.

Configuration schemas are supported for load balancing.

To enable the **load-share** command, you must enable unequal load balancing using the **load-share unequal** command.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure load-sharing parameters on a specified interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 100
RP/0/RP0/CPU0:router(config-if)# load-share 100
```

Related Commands

Command	Description
load-share unequal, on page 270	Enables unequal load-sharing.
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
signalled-bandwidth, on page 470	Configures the bandwidth required for an MPLS-TE tunnel.

load-share unequal

To configure unequal load-sharing for an MPLS-TE tunnel, use the **load-share unequal** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

load-share unequal

no load-share unequal

Syntax Description

This command has no arguments or keywords.

Command Default

By default, unequal load-balancing is disabled and equal load-balancing occurs.

Command Modes

MPLS-TE 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 **auto-bw** and **load-share unequal** commands should not be used together.

The **load-share unequal** command determines the load-share for a tunnel based on the bandwidth. However, the MPLS-TE automatic bandwidth feature changes the bandwidth around. If you are configuring both the **load-share unequal** command and the MPLS-TE automatic bandwidth feature, we recommend that you specify an explicit load-share value configuration under each MPLS-TE automatic bandwidth tunnel.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enable unequal load-sharing:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# load-share unequal
```

Related Commands

Command	Description
load-share , on page 268	Configures load-sharing balancing parameters for a specified interface.
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.
signalled-bandwidth , on page 470	Configures the bandwidth required for an MPLS-TE tunnel.

Imp hello (GMPLS)

To configure Link Management Protocol (LMP) IPCC management hello settings, use the **imp hello** command in global MPLS-TE neighbor lmp configuration mode. To return to the default behavior, use the **no** form of this command.

imp hello *hello-send -interval hello-dead-interval*

no imp hello *hello-send-interval hello-dead-interval*

Syntax Description

<i>hello-send-interval</i>	Time, in milliseconds, between sending hello keep alive message. Range is 100 to 21845.
<i>hello-dead-interval</i>	Time, in milliseconds, to wait without receiving a hello from the neighbor before declaring the IPCC down again. Range is 100 to 21845.

Command Default

No default behavior or values

Command Modes

MPLS-TE neighbor lmp 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.

You can disable hellos using the **lmp static** command.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure Link Management Protocol (LMP) IPCC management hello settings:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# lmp neighbor lmp
RP/0/RP0/CPU0:router(config-mpls-te-nbr-lmp)# lmp hello 400 1200
```

Related Commands

Command	Description
destination (MPLS-TE), on page 210	Configures bidirectional optical tunnels.
lmp neighbor (MPLS-TE), on page 274	Configures or updates an LMP neighbor and its associated parameters and enters MPLS-TE neighbor configuration mode.
match (GMPLS), on page 284	Configures or matches active and passive tunnels.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
passive (GMPLS), on page 311	Configures passive GMPLS tunnels.
remote (GMPLS), on page 348	Configures remote TE links.
switching (GMPLS), on page 480	Configures TE-link switching attributes.

Imp neighbor (MPLS-TE)

To configure or update an LMP neighbor with its associated identifier and enter MPLS-TE neighbor configuration mode, use the **imp neighbor** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

imp neighbor *name*

no imp neighbor *name*

Syntax Description

<i>name</i>	Text string representing the name of the LMP neighbor.

Command Default

No default behavior or values

Command Modes

MPLS-TE 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.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enter MPLS-TE neighbor configuration mode for router1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# imp neighbor router1
RP/0/RP0/CPU0:router(config-mpls-te-nbr-router1)#
```


Related Commands

Command	Description
imp hello (GMPLS), on page 272	Configures LMP management hello settings.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng lmp, on page 408	Displays information about the LMP.

Imp router-id (MPLS-TE)

To configure the router ID for the optical instance using the LMP protocol, use the **imp router-id** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

Imp router-id {*ipv4 address* | *type interface-path-id*}

no Imp router-id {*ipv4 address* | *type interface-path-id*}

Syntax Description

<i>ipv4 address</i>	Router ID expressed as an IPv4 address.
<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

MPLS-TE 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.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how configure the LMP router ID for IPv4 address 172.24.20.164:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# lmp router-id router 127.0.0.1
```

Related Commands

Command	Description
clear mpls lmp, on page 192	Clears LMP management hello settings.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.

logging events link-status (MPLS-TE)

To enable the logging events so that the software sends a log message when a tunnel goes up or goes down, use the **logging events link-status** command in tunnel-mte interface configuration mode. To disable this feature, use the **no** form of this command.

logging events link-status

no logging events link-status

Syntax Description This command has no arguments or keywords.

Command Default By default, no logs are sent out.

Command Modes Tunnel-mte 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.

The **logging events link-status** command enables the configuration to be notified of tunnel state changes through log messages.

In addition, the **logging events link-status** command applies to both tunnel-mte and tunnel-te interfaces.

Task ID	Task ID	Operation
	interface	read, write

Examples The following example shows how to enable logging events for the interface and line-protocol state change alarms:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-mte 10
RP/0/RP0/CPU0:router(config-if)# logging events link-status
```

Related Commands

Command	Description
interface tunnel-mte , on page 253	Configures an MPLS-TE P2MP tunnel interface
logging events lsp-status (MPLS-TE) , on page 280	Sends out a log message when LSP events occur.
logging events sub-lsp-status state (MPLS-TE) , on page 282	Sends out a log message when a point-to-multipoint sub-lsp goes up or goes down when the software is enabled.

logging events lsp-status (MPLS-TE)

To send out a log message when LSP events occur, use the **logging events lsp-status** command in tunnel-mte interface configuration mode. To disable this feature, use the **no** form of this command.

logging events lsp-status {reoptimize | reroute | state | switchover}

nologging events lsp-status {reoptimize | reroute | state | switchover}

Syntax Description

reoptimize	Sends out the log message when the tunnel LSP is reoptimized when the software is enabled.
reroute	Sends out the log message when the tunnel LSP is rerouted due to an FRR event when the software is enabled. Note Only FRR tunnels are applicable.
state	Sends out the log message when the tunnel LSP goes up or down when the software is enabled.
switchover	Sends out the log message when the tunnel LSP switches to the standby LSP due to a path protection event when the software is enabled. Note Only applicable to path protected tunnels.

Command Default

By default, no logs are sent out.

Command Modes

Tunnel-mte 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.

The **logging events lsp-status** command can be configured to notify the various LSP status changes through log messages. One or several of these LSP status changes can be enabled at once.

In addition, the **logging events lsp-status** command applies to both tunnel-mte and tunnel-te interfaces.

Task ID

Task ID	Operation
mpls-te	read, write

Examples

The following example shows how to enable the interface LSP state change alarms for reoptimization:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-mte 10
RP/0/RP0/CPU0:router(config-if)# logging events lsp-status reoptimize
```

Related Commands

Command	Description
interface tunnel-mte, on page 253	Configures an MPLS-TE P2MP tunnel interface
logging events link-status (MPLS-TE), on page 278	Enables the logging events so that the software sends a log message when a tunnel goes up or goes down.
logging events sub-lsp-status state (MPLS-TE), on page 282	Sends out a log message when a point-to-multipoint sub-lsp goes up or goes down when the software is enabled.

logging events sub-lsp-status state (MPLS-TE)

To send out a log message when a point-to-multipoint sub-lsp goes up or goes down when the software is enabled, use the **logging events sub-lsp-status state** command in tunnel-mte interface configuration mode. To disable this feature, use the **no** form of this command.

logging events sub-lsp-status state

Syntax Description

This command has no arguments or keywords.

Command Default

By default, no logs are sent out.

Command Modes

Tunnel-mte 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.

The **logging events sub-lsp-status state** command can be configured to notify the state changes per-destination for the P2MP tunnel.

logging events sub-lsp-status state command applies only to the tunnel-mte interface.

Task ID

Task ID	Operation
mpls-te	read, write

Examples

The following example shows how to enable the console logging for sub-lsp events to change the alarms state:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-mte 10
RP/0/RP0/CPU0:router(config-if)# logging events sub-lsp-status state
```

Related Commands

Command	Description
interface tunnel-mte , on page 253	Configures an MPLS-TE P2MP tunnel interface.

Command	Description
logging events link-status (MPLS-TE), on page 278	Enables the logging events so that the software sends a log message when a tunnel goes up or goes down.
logging events lsp-status (MPLS-TE), on page 280	Sends out a log message when LSP events occur.

match (GMPLS)

To match an active tunnel to a passive tunnel, use the **match** command in interface tunnel-gte configuration mode. To return to the default behavior, use the **no** form of this command.

match identifier *tunnel-number*

no match identifier *tunnel-number*

Syntax Description

identifier	Configures the identifier of the active tunnel to match with this passive tunnel.
<i>tunnel-number</i>	Tunnel number. Range is 0 to 65535.

Command Default

No default behavior or values

Command Modes

Interface tunnel-gte configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.8.0	GMPLS interfaces were supported under the tunnel-gte interface type.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 LMP and GMPLS-NNI features are not supported on x86 RPs.

GMPLS interfaces are used under the tunnel-gte interface type.

You must enter the hostname for the head router then underscore _t, and the tunnel number for the head router. If tunnel-gte1 is configured on the head router with a hostname of gmpls1, CLI is match identifier gmpls1_t1.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to match the active tunnel ID to the passive tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-gte 1
RP/0/RP0/CPU0:router(config-if)# match identifier gmpls1_t1
```

Related Commands

Command	Description
destination (MPLS-TE) , on page 210	Configures bidirectional optical tunnels.
interface tunnel-gte , on page 251	Configures an MPLS-TE tunnel interface for GMPLS interfaces.
lmp hello (GMPLS) , on page 272	Configures LMP IPCC management hello settings.
passive (GMPLS) , on page 311	Configures passive GMPLS tunnels.
remote (GMPLS) , on page 348	Configures remote TE links.
switching (GMPLS) , on page 480	Configures TE-link switching attributes.

maxabs (MPLS-TE)

To specify the maximum number of MPLS-TE tunnels that can be configured, use the **maxabs** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

maxabs tunnels *tunnel-limit* **destinations** *dest-limit*

no maxabs tunnels *tunnel-limit* **destinations** *dest-limit*

Syntax Description

tunnels	Configures all tunnels for MPLS-TE.
<i>tunnel-limit</i>	Maximum number of tunnel TE interfaces. Range is 1 to 65536.
destinations	Configures all destinations for MPLS-TE.
<i>dest-limit</i>	Maximum total number of destinations that can be configured. Range is 1 to 65536.

Command Default

tunnel-limit: 4096

dest-limit: 4096

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 3.8.0	This command was introduced.
Release 3.9.0	This command 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.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the tunnel-te configuration limit to 1000:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls traffic-eng  
RP/0/RP0/CPU0:router(config-mpls-te)# maxabs tunnels 1000 destinations 1000
```

Related Commands

Command	Description
show mpls traffic-eng maximum tunnels, on page 412	Displays the configuration of the maximum tunnel-te interfaces allowed.

mpls traffic-eng

To enter MPLS-TE configuration mode, use the **mpls traffic-eng** command in global configuration mode.

mpls traffic-eng

Syntax Description

This command has no arguments or keywords.

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.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to enter MPLS-TE configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)#
```

mpls traffic-eng auto-bw apply (MPLS-TE)

To apply the highest bandwidth collected on a tunnel without waiting for the current application period to end, use the **mpls traffic-eng auto-bw apply** command in EXEC mode.

mpls traffic-eng auto-bw apply {all| tunnel-te *tunnel-number*}

Syntax Description

all	Applies the highest bandwidth collected instantly on all the automatic bandwidth-enabled tunnels.
tunnel-te <i>tunnel-number</i>	Applies the highest bandwidth instantly to the specified tunnel. The range is from 0 to 65535.

Command Default

No default behavior or values

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.

The **mpls traffic-eng auto-bw apply** command can forcefully expire the current application period on a specified tunnel and immediately apply the highest bandwidth recorded so far instead of waiting for the application period to end on its own.



Note

The predefined threshold check still applies on the configuration, and if the delta is not significant enough, the automatic bandwidth functionality overrides this command.

The bandwidth application is performed only if at least one output rate sample has been collected for the current application period.

To guarantee the application of a specific signaled bandwidth value when triggering a manual bandwidth application, follow these steps:

- 1 Configure the minimum and maximum automatic bandwidth to the bandwidth value that you want to apply by using the **bw-limit (MPLS-TE)**, [on page 190](#) command.
- 2 Trigger a manual bandwidth application by using the **mpls traffic-eng auto-bw apply** command.

- 3 Revert the minimum and maximum automatic bandwidth value back to their original value.

Task ID

Task ID	Operations
mpls-te	execute

Examples

The following example applies the highest bandwidth to a specified tunnel:

```
RP/0/RP0/CPU0:router# mpls traffic-eng auto-bw apply tunnel-te 1
```

Related Commands

Command	Description
auto-bw collect frequency (MPLS-TE), on page 177	Configures the automatic bandwidth collection frequency and controls the manner in which the bandwidth for a tunnel collects output rate information, but does not adjust the tunnel bandwidth.
show mpls traffic-eng tunnels auto-bw brief, on page 463	Displays the list of automatic-bandwidth-enabled tunnels, and indicates if the current signaled bandwidth of the tunnel is identical to the bandwidth that is applied by the automatic bandwidth.

mpls traffic-eng fast-reroute promote

To configure the router to assign new or more efficient backup MPLS-TE tunnels to protected MPLS-TE tunnels, use the **mpls traffic-eng fast-reroute promote** command in EXEC mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng fast-reroute promote

no mpls traffic-eng fast-reroute promote

Syntax Description This command has no arguments or keywords.

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
	mpls-te	read, write

Examples The following example shows how to initiate backup tunnel promote and assignment:

```
RP/0/RP0/CPU0:router# mpls traffic-eng fast-reroute promote
```

Related Commands	Command	Description
	fast-reroute , on page 229	Enables FRR protection for an MPLS-TE tunnel.

mpls traffic-eng level

To configure a router running Intermediate System-to-System (IS-IS) MPLS-TE at IS-IS Level 1 and Level 2, use the **mpls traffic-eng level** command in router configuration mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng level *isis-level*

no mpls traffic-eng level *isis-level*

Syntax Description

<i>isis-level</i>	IS-IS level (1, 2, or both) where MPLS-TE is enabled.

Command Default

No default behavior or values

Command Modes

Router configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.4.0	Support was added to enable MPLS Traffic Engineering in both IS-IS Level 1 and Level 2.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 **mpls traffic-eng level** command is supported for IS-IS and affects the operation of MPLS-TE only if MPLS-TE is enabled for that routing protocol instance.

Task ID

Task ID	Operations
isis	read, write

Examples

The following example shows how to configure a router running IS-IS MPLS to flood TE for IS-IS level 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router isis 1
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# mpls traffic-eng level 1
```

```
RP/0/RP0/CPU0:router(config-isis-af)# metric-style wide
```

Related Commands

Command	Description
mpls traffic-eng router-id (MPLS-TE router), on page 304	Specifies that the TE router identifier for the node is the IP address associated with a given interface.

mpls traffic-eng link-management flood

To enable immediate flooding of all the local MPLS-TE links, use the **mpls traffic-eng link-management flood** command in EXEC mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng link-management flood

no mpls traffic-eng link-management flood

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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

If there is no change in the LSA since last flooding, IGP may dampen the advertisement.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to initiate flooding of the local MPLS-TE links:

```
RP/0/RP0/CPU0:router# mpls traffic-eng link-management flood
```

Related Commands

Command	Description
show mpls traffic-eng link-management advertisements , on page 391	Displays MPLS-TE link-management advertisements.

mpls traffic-eng path-protection switchover gmpls

To trigger a manual switchover for path protection for a GMPLS optical LSP, use the **mpls traffic-eng path-protection switchover gmpls** command in EXEC mode. To disable this feature, use the **no** form of this command.

mpls traffic-eng path-protection switchover gmpls *tunnel name*

no mpls traffic-eng path-protection switchover gmpls *tunnel name*

Syntax Description

<i>tunnel name</i>	Name of the tunnel that is used for a switchover.

Command Default

No manual path protection is invoked on either the head or tail 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.

The **mpls traffic-eng path-protection switchover gmpls** command is used for the following functions:

- Runs on both tunnel head and tunnel tail at the same time.
- Configures both head and tail router of the GMPLS LSP to achieve the complete path switchover at both ends.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	execute

Examples

The following example triggers the switchover for path-protection for GMPLS:

```
RP/0/RP0/CPU0:router# mpls traffic-eng path-protection switchover gmpls
```

Related Commands

Command	Description
path-option (MPLS-TE), on page 313	Configures a path option for an MPLS-TE tunnel.

mpls traffic-eng pce activate-pcep

To force idle peers to be reestablished without waiting for a timer, use the **mpls traffic-eng pce activate-pcep** command in EXEC mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng pce activate-pcep {*address* | **all**}

no mpls traffic-eng pce activate-pcep {*address* | **all**}

Syntax Description

<i>address</i>	Address of the idle peer.
all	Activates all the idle peers.

Command Default

No default behavior or values

Command Modes

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
mpls-te	read, write, execute

Examples

The following example shows how to trigger a path computation client (PCC) or PCE to activate an idle path computation element protocol (PCEP) session:

```
RP/0/RP0/CPU0:router# mpls traffic-eng pce activate-pcep all
```


Related Commands

Command	Description
mpls traffic-eng pce reoptimize, on page 300	Triggers reoptimization manually either for all tunnels or a specific PCE-based tunnel.

mpls traffic-eng pce reoptimize

To trigger reoptimization manually either for all or a specific PCE-based tunnel, use the **mpls traffic-eng pce reoptimize** command in EXEC mode. To disable this feature, use the **no** form of this command.

mpls traffic-eng pce reoptimize [*tunnel ID*] [force]

no mpls traffic-eng pce reoptimize [*tunnel ID*] [force]

Syntax Description

<i>tunnel ID</i>	(Optional) Tunnel ID to be reoptimized. Range is from 0 to 65535.
force	(Optional) Forces the router to start using the newly calculated route even if the used path has a better metric.

Command Default

Reoptimizes all the PCE tunnels.

Command Modes

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.

If you do not run the **mpls traffic-eng pce reoptimize** command, the system tries to reoptimize at an interval of 3600 seconds.

Task ID

Task ID	Operations
mpls-te	read, write, execute

Examples

The following example shows how to trigger reoptimization for all PCE-based tunnels:

```
RP/0/RP0/CPU0:router# mpls traffic-eng pce reoptimize
```

Related Commands

Command	Description
mpls traffic-eng pce activate-pcep, on page 298	Forces idle peers to be re-established without waiting for a timer.

mpls traffic-eng reoptimize (EXEC)

To trigger the reoptimization interval of all TE tunnels, use the **mpls traffic-eng reoptimize** command in EXEC mode.

mpls traffic-eng reoptimize [*tunnel-id*] [*tunnel-name*] [**all**] [**p2mp** { **all** | *tunnel-id* }] [**p2p** { **all** | *tunnel-id* }]

Syntax Description

<i>tunnel-id</i>	(Optional) MPLS-TE tunnel identification expressed as a number. Range is from 0 to 65535.
<i>tunnel-name</i>	(Optional) TE tunnel identification expressed as a name.
all	(Optional) Forces an immediate reoptimization for all P2MP tunnels.
p2mp	(Optional) Forces an immediate reoptimization of all P2MP TE tunnels.
<i>tunnel-id</i>	P2MP TE tunnel identification to be reoptimized. Range is from 0 to 65535.
p2p	(Optional) Forces an immediate reoptimization of all P2P TE tunnels.
all	(Optional) Forces an immediate reoptimization for all P2P tunnels.
<i>tunnel-id</i>	P2P TE tunnel identification to be reoptimized. Range is from 0 to 65535.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The following keywords and arguments were added to support the P2MP TE feature and P2P feature: • all keyword • p2mp keyword, all keyword, and <i>tunnel-id</i> argument • p2p keyword, all keyword, and <i>tunnel-id</i> argument

Usage Guidelines

To use this command, you must be in a user group associated with a task 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
mpls-te	execute

Examples

The following example shows how to immediately reoptimize all TE tunnels:

```
RP/0/RP0/CPU0:router# mpls traffic-eng reoptimize
```

The following example shows how to immediately reoptimize TE tunnel-te90:

```
RP/0/RP0/CPU0:router# mpls traffic-eng reoptimize tunnel-te90
```

The following example shows how to immediately reoptimize all P2MP TE tunnels that originated from this TE LSR:

```
RP/0/RP0/CPU0:router# mpls traffic-eng reoptimize p2mp all
```

The following example shows how to immediately reoptimize all P2P TE tunnels:

```
RP/0/RP0/CPU0:router# mpls traffic-eng reoptimize p2p all
```

Related Commands

Command	Description
reoptimize (MPLS-TE), on page 350	Forces immediate re-optimization of all TE tunnels.

mpls traffic-eng router-id (MPLS-TE router)

To specify that the TE router identifier for the node is the IP address associated with a given interface, use the **mpls traffic-eng router-id** command in the appropriate mode. To return to the default behavior, use the **no** form of this command.

mpls traffic-eng router-id *type interface-path-id*

no mpls traffic-eng router-id *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

OSPF configuration
IS-IS address family configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.1	The Usage Guidelines was updated

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 routers identifier acts as a stable IP address for the TE configuration. This IP address is flooded to all nodes. You must set the destination on the destination node TE router identifier for all affected tunnels. This router ID is the address that the TE topology database at the tunnel head uses for its path calculation.



Note

When the **mpls traffic-eng router-id** command is not configured, global router ID is used by MPLS-TE if there is one configured.

We suggest that you configure the **mpls traffic-eng router-id** command explicitly under the IGP; otherwise, TE uses the default algorithm to pick up the TE router-id, which can be the highest IP address of the loopback interfaces or physical interfaces. When TE uses the algorithm to select a TE router-id dynamically, it can be different from what is configured for the static RPF check on the P2MP tunnel tail . If the static RPF check mismatch happens, the P2MP tail does not pass the incoming P2MP traffic to the egress of P2MP tail router.

A TE router-id configuration is highly recommended to ensure that the tunnel head-end picks up the correct source address, and the configured static RPF address at the tail-end matches the tunnel source which avoids unexpected traffic drops.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following examples show how to specify the TE router identifier as the IP address associated with loopback interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router ospf CORE_AS
RP/0/RP0/CPU0:router(config-ospf)# mpls traffic-eng router-id 7.7.7.7

RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# router isis 811
RP/0/RP0/CPU0:router(config-isis)# address-family ipv4 unicast
RP/0/RP0/CPU0:router(config-isis-af)# mpls traffic-eng router-id 8.8.8.8
```

Related Commands

Command	Description
mpls traffic-eng level, on page 292	Configures a router running OSPF MPLS so that it floods TE for the indicated IS-IS level.

mpls traffic-eng repotimize mesh group

To reoptimize all tunnels of a mesh group, use the **mpls traffic-eng repotimize mesh group** command in EXEC mode.

mpls traffic-eng reoptimize auto-tunnel mesh group *group_id*

Syntax Description

<i>group_id</i>	Defines auto-tunnel mesh group ID that is to be reoptimized. Range is 0 to 4294967295.

Command Default

None

Command Modes

MPLS Transport profile configuration

Command History

Release	Modification
Release 4.1.1	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
mpls-te	execute

Examples

This is sample out from the **mpls traffic-eng reoptimize mesh group** command:

```
RP/0/RP0/CPU0:router mpls traffic-eng reoptimize mesh group 10
```


nhop-only (auto-tunnel backup)

To configure only a next-hop automatic backup tunnel with only link protection, use the **nhop-only** command in MPLS-TE auto-tunnel backup interface configuration mode. To return to the default configuration setting for automatic backup tunnels, use the **no** form of this command.

nhop-only

no nhop-only

Syntax Description This command has no arguments or keywords.

Command Default Both NHOP and NNHOP protection are enabled.

Command Modes Auto-tunnel backup 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.

If you configure the **nhop-only** command, you destroy any next-next-hop (NNHOP) tunnel created to provide node protection for tunnels running over the specified interface.

If you unconfigure the **nhop-only** command, you trigger a backup assignment on primary tunnels running over that link. The automatic backup tunnel feature attempts to create NNHOP backup tunnels to provide node protection for the specified tunnels.

Task ID	Task ID	Operation
	mpls-te	read, write

Examples In the following example, NNHOP automatic backup tunnels are destroyed and only NHOP tunnels with link protection is configured:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface pos 0/1/0/1
RP/0/RP0/CPU0:router(config-mpls-te-if)# auto-tunnel backup
RP/0/RP0/CPU0:router(config-mpls-te-if-auto-backup)# nhop-only
```

Related Commands

Command	Description
auto-tunnel backup (MPLS-TE) , on page 183	Builds automatic NHOP and NNHOP backup tunnels.

overflow threshold (MPLS-TE)

To configure the tunnel overflow detection, use the **overflow threshold** command in MPLS-TE automatic bandwidth interface configuration mode. To disable the overflow detection feature, use the **no** form of this command.

overflow threshold *percentage* [**min** *bandwidth*] **limit** *limit*

no overflow threshold

Syntax Description

<i>percentage</i>	Bandwidth change percent to trigger an overflow. The range is from 1 to 100.
min <i>bandwidth</i>	(Optional) Configures the bandwidth change value, in kbps, to trigger an overflow. The range is from 10 to 4294967295. The default is 10.
limit <i>limit</i>	Configures the number of consecutive collection intervals that exceeds the threshold. The bandwidth overflow triggers an early tunnel bandwidth update. The range is from 1 to 10. The default is none.

Command Default

The default value is disabled.

Command Modes

MPLS-TE automatic bandwidth interface configuration

Command History

Release	Modification
Release 3.8.0	This command was introduced.
Release 3.9.0	The Usage Guidelines was updated to describe overflow detection.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 modify the **limit** keyword, the consecutive overflows counter for the tunnel is also reset.

If you enable or modify the minimum value, the current consecutive overflows counter for the tunnel is also reset, which effectively restarts the overflow detection from scratch.

Several number of consecutive bandwidth samples are greater than the overflow threshold (bandwidth percentage) and the minimum bandwidth configured, then a bandwidth application is updated immediately instead of waiting for the end of the application period.

Overflow detection applies only to bandwidth increase. For example, an overflow can not be triggered even if bandwidth decreases by more than the configured overflow threshold.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure the tunnel overflow detection for tunnel-te 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# auto-bw
RP/0/RP0/CPU0:router(config-if-tunte-autobw)# overflow threshold 50 limit 3
```

Related Commands

Command	Description
adjustment-threshold (MPLS-TE), on page 155	Configures the tunnel bandwidth change threshold to trigger an adjustment.
application (MPLS-TE), on page 165	Configures the application frequency in minutes for the applicable tunnel.
auto-bw (MPLS-TE), on page 175	Configures automatic bandwidth on a tunnel interface and enters MPLS-TE automatic bandwidth interface configuration mode.
bw-limit (MPLS-TE), on page 190	Configures the minimum and maximum automatic bandwidth to set on a tunnel.
collect-bw-only (MPLS-TE), on page 208	Enables only the bandwidth collection without adjusting the automatic bandwidth.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

passive (GMPLS)

To configure a passive GMPLS tunnel, use the **passive** command in interface tunnel-gte configuration mode. To return to the default behavior, use the **no** form of this command.

passive

no passive

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes Interface tunnel-gte configuration

Command History	Release	Modification
	Release 3.3.0	This command was introduced.
	Release 3.8.0	GMPLS interfaces were supported under the tunnel-gte interface type.

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

GMPLS interfaces are used under the tunnel-gte interface type.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to configure a passive GMPLS virtual interface tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-gte 99
RP/0/RP0/CPU0:router(config-if)# passive
```

Related Commands

Command	Description
destination (MPLS-TE), on page 210	Configures bidirectional optical tunnels.
interface tunnel-gte, on page 251	Configures an MPLS-TE tunnel interface for GMPLS interfaces.
lmp hello (GMPLS), on page 272	Configures LMP IPCC management hello settings.
match (GMPLS), on page 284	Configures or matches active and passive tunnels.
remote (GMPLS), on page 348	Configures remote TE links.
switching (GMPLS), on page 480	Configures TE-link switching attributes.

path-option (MPLS-TE)

To configure a path option for an MPLS-TE tunnel, use the **path-option** command in tunnel-te interface configuration mode. To return to the default behavior, use the **no** form of this command.

path-option *preference-priority* [**protecting** *number*] {**dynamic** [**pce** [**address** **ipv4** *address*]] | **explicit** {**name** *path-name* | **identifier** *path-number*} [**protected-by** *path-option-level*]} [**attribute-set** *name*] [**isis** *instance-name* **level** *level*] [**lockdown**] [**ospf** *instance-name* **area** {*value* | *address*}] [**verbatim**]

no path-option *preference-priority* {**dynamic** [**pce** [**address** **ipv4** *address*]] | **explicit** {**name** *path-name* | **identifier** *path-number*} [**protected-by** *path-option-level*]} [**isis** *instance-name* **level** *level*] [**lockdown**] [**ospf** *instance-name* **area** {*value* | *address*}] [**verbatim**]

Syntax Description

<i>preference-priority</i>	Path option number. Range is from 1 to 1000.
protecting <i>number</i>	Specifies a path setup option to protect a path. The range is from 1 to 1000.
dynamic	Specifies that label switched paths (LSP) are dynamically calculated.
pce	(Optional) Specifies that the LSP is computed by a Path Computation Element (PCE).
address	(Optional) Configures the address for the PCE.
ipv4 <i>address</i>	Configures the IPv4 address for the PCE.
explicit	Specifies that LSP paths are IP explicit paths.
name <i>path-name</i>	Specifies the path name of the IP explicit path.
identifier <i>path-number</i>	Specifies a path number of the IP explicit path.
protected-by <i>path-option-level</i>	(Optional) Configures path protection for an explicit path that is protected by another explicit path.
isis <i>instance-name</i>	(Optional) Limits CSPF to a single IS-IS instance and area.
attribute-set <i>name</i>	(Optional) Specifies the attribute set for the LSP.
level <i>level</i>	Configures the level for IS-IS. The range is from 1 to 2.
lockdown	(Optional) Specifies that the LSP cannot be reoptimized.
ospf <i>instance-name</i>	(Optional) Limits CSPF to a single OSPF instance and area.
area	Configures the area for OSPF.
<i>value</i>	Decimal value for the OSPF area ID.

<i>address</i>	IP address for the OSPF area ID.
verbatim	(Optional) Bypasses the Topology/CSPF check for explicit paths.

Command Default No default behavior or values

Command Modes Tunnel-te interface configuration

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.3.2	The protecting keyword was added to support GMPLS protection and restoration.
	Release 3.4.1	Both the verbatim and lockdown keywords can be used together.
	Release 3.7.0	An IGP-area was specified with the path-option command. Both the isis and the ospf keywords were added.
	Release 3.8.0	The pce , address , and ipv4 keywords were added. The <i>address</i> argument was added.
	Release 4.2.0	The attribute-set keyword was added.
	Release 4.2.3	The protected-by 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 can configure several path options for a single tunnel. For example, there can be several explicit path options and a dynamic option for one tunnel. The path setup preference is for lower (not higher) numbers, so option 1 is preferred.

When the lower number path option fails, the next path option is used to set up a tunnel automatically (unless using the lockdown option).

The **protecting** keyword specifies that you can configure path-protection for the primary LSP. The **protecting** keyword is available only for tunnel-gte interfaces.

You specify the backup path for the **path-option** command in case of the primary path failure.

CSPF areas are configured on a per-path-option basis.

Any primary explicit path on a path protection enabled tunnel can be configured to be protected by an explicit path option level using **protected-by** keyword. Only one explicit protecting path is supported per path option.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure the tunnel to use a named IPv4 explicit path as verbatim and lockdown options for the tunnel. This tunnel cannot reoptimize when the FRR event goes away, unless you manually reoptimize it:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name test verbatim lockdown
```

The following example shows how to enable path protection on a tunnel to configure an explicit path:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name po4
RP/0/RP0/CPU0:router(config-if)# path-option protecting 1 explicit name po6
```

The following example shows how to limit CSPF to a single OSPF instance and area:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name router1 ospf 3 area 7 verbatim
```

The following example shows how to limit CSPF to a single IS-IS instance and area:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# path-option 1 dynamic isis mtbf level 1 lockdown
```

Related Commands

Command	Description
mpls traffic-eng path-protection switchover gmpls, on page 296	Specifies a switchover for path protection.
show explicit-paths, on page 357	Displays the configured IP explicit paths.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

path-option (P2MP TE)

To configure the primary or fallback path setup option for a Point-to-Multipoint (P2MP) TE tunnel, use the **path-option** command in P2MP destination interface configuration mode. To return to the default behavior, use the **no** form of this command.

path-option *preference-priority* {**dynamic**|**explicit** {**name** *path-name*|**identifier** *path-number*} } [**verbatim**]
[**lockdown**]

no path-option *preference-priority* {**dynamic**|**explicit** {**name** *path-name*|**identifier** *path-number*} }
[**verbatim**] [**lockdown**]

Syntax Description

<i>preference-priority</i>	Path option number. Range is from 1 to 1000.
dynamic	Specifies that label switched paths (LSP) are dynamically calculated.
explicit	Specifies that LSP paths are IP explicit paths.
name <i>path-name</i>	Specifies the path name of the IP explicit path.
identifier <i>path-number</i>	Specifies a path number of the IP explicit path.
verbatim	(Optional) Bypasses the Topology/CSPF check for explicit paths.
lockdown	(Optional) Specifies that the LSP cannot be reoptimized.

Command Default

None

Command Modes

P2MP destination 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.

You can configure several path options for each destination of a P2MP tunnel. For example, for one tunnel, there can be several explicit path options and a dynamic option. The path preference is for lower (not higher) numbers, so option 1 is preferred over higher options.

When the lower number path option fails, the next path option under the destination is attempted.

Several path-options can be configured for each destination under a tunnel.

When configuring multiple path-options under each destination of a P2MP tunnel, the PCALC on the TE tunnel source attempts to generate the P2MP tree starting from the preferred path-options (lower numbers) for each destination. If some destinations use explicit paths that cause remerges with the dynamic generated paths for other destinations in the P2MP tree, the PCALC source modifies the dynamic paths (for example, optimal path); therefore, it follows the explicit path to correct the remerge problem.

The **path-option** command is common for both Point-to-Point (P2P) and P2MP tunnels.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to configure a P2MP tunnel with two destinations and several path-options per destination:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-mte 100
RP/0/RP0/CPU0:router(config-if)# destination 1.1.1.1
RP/0/RP0/CPU0:router(config-if-p2mp-dest)# path-option 1 explicit name po_dest1
RP/0/RP0/CPU0:router(config-if-p2mp-dest)# path-option 2 dynamic
```

This example shows that the fallback path option is dynamic:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-mte 100
RP/0/RP0/CPU0:router(config-if)# destination 2.2.2.2
RP/0/RP0/CPU0:router(config-if-p2mp-dest)# path-option 1 explicit name po_dest2
RP/0/RP0/CPU0:router(config-if-p2mp-dest)# path-option 2 dynamic
```

Related Commands

Command	Description
destination (MPLS-TE), on page 210	Configures the destination address of a TE tunnel.
mpls traffic-eng path-protection switchover gmpls, on page 296	Specifies a switchover for path protection.
show explicit-paths, on page 357	Displays the configured IP explicit paths.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.
show mrrib mpls traffic-eng fast-reroute	Displays information about Multicast Routing Information Base (MRIB) MPLS traffic engineering fast reroute.

path-selection ignore overload (MPLS-TE)

To ignore the Intermediate System-to-Intermediate System (IS-IS) overload bit setting for MPLS-TE, use the **path-selection ignore overload** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

path-selection ignore overload {head | mid | tail}

no path-selection ignore overload {head | mid | tail}

Syntax Description

head	The tunnel stays up if set-overload-bit is set by ISIS on the head router. Ignores overload node during CSPF for the head node.
mid	The tunnel stays up if set-overload-bit is set by ISIS on the mid router. Ignores overload node during CSPF for the mid node.
tail	The tunnel stays up if set-overload-bit is set by ISIS on the tail router. Ignores overload node during CSPF for the tail node.

Command Default

None

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 4.1.0	The head , mid , and tail 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.

Use the **path-selection ignore overload** command to ensure that label switched paths (LSPs) are not broken because of routers that have IS-IS overload bit as enabled.

When the IS-IS overload bit avoidance (OLA) feature is activated, all nodes with the overload bit set, which includes head nodes, mid nodes, and tail nodes, are ignored. This means that they are still available for use with label switched paths (LSPs). This feature allows you to include an overloaded node in constraint-based shortest path first (CSPF).

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to use the **path-selection ignore overload head** command:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection ignore overload
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection ignore overload head
```

path-selection loose-expansion affinity (MPLS-TE)

To specify the affinity value to be used to expand a path to the next loose hop for a tunnel on an area border router, use the **path-selection loose-expansion affinity** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

path-selection loose-expansion affinity *affinity-value* **mask** *affinity-mask* [**class-type** *type*]

no path-selection loose-expansion affinity *affinity-value* **mask** *affinity-mask* [**class-type** *type*]

Syntax Description

<i>affinity-value</i>	Attribute values required for links carrying this tunnel. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute is 0 or 1.
mask <i>affinity-mask</i>	Checks the link attribute, a 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute mask is 0 or 1.
class-type <i>type</i>	(Optional) Requests the class-type of the tunnel bandwidth. Range is 0 to 1.

Command Default

affinity-value : 0X00000000

mask-value : 0xFFFFFFFF

Command Modes

MPLS-TE 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.



Note

The new affinity scheme (based on names) is not supported for loose-hop expansion. New configuration does not affect the already up tunnels.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure affinity 0x55 with mask 0xFFFFFFFF:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection loose-expansion affinity 55 mask
FFFFFFFF
```

Related Commands

Command	Description
path-selection loose-expansion metric (MPLS-TE), on page 322	Configures a metric type to be used to expand a path to the next loose hop for a tunnel on an area border router.
path-selection metric (MPLS-TE), on page 324	Configures the MPLS-TE tunnel path-selection metric.

path-selection loose-expansion metric (MPLS-TE)

To configure a metric type to be used to expand a path to the next loose hop for a tunnel on an area border router, use the **path-selection loose-expansion metric** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

path-selection loose-expansion metric {igp| te} [**class-type** *type*]

no path-selection loose-expansion metric {igp| te} [**class-type** *type*]

Syntax Description

igp	Configures an Interior Gateway Protocol (IGP) metric.
te	Configures a TE metric. This is the default.
class-type <i>type</i>	(Optional) Requests the class type of the tunnel bandwidth. Range is 0 to 1.

Command Default

The default is TE metric.

Command Modes

MPLS-TE 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.



Note

New configurations do not affect tunnels that are already up.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the path-selection metric to use the IGP metric overwriting default:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection loose-expansion metric igp
```

Related Commands

Command	Description
path-selection loose-expansion affinity (MPLS-TE), on page 320	Specifies the affinity value to be used to expand a path to the next loose hop for a tunnel on an area border router.

path-selection metric (MPLS-TE)

To specify the MPLS-TE tunnel path-selection metric, use the **path-selection metric** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

path-selection metric {igp| te}

no path-selection metric {igp| te}

Syntax Description

igp	Configures an Interior Gateway Protocol (IGP) metric.
te	Configures a TE metric.

Command Default

The default is TE metric.

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 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.

The metric type to be used for path calculation for a given tunnel is determined as follows:

- If the **path-selection metric** command was entered to specify a metric type for the tunnel, use that metric type.
- Otherwise, use the default (TE) metric.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the path-selection metric to use the IGP metric overwriting default:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
```

```
RP/0/RP0/CPU0:router(config-mpls-te)# path-selection metric igp
```

Related Commands

Command	Description
path-selection loose-expansion affinity (MPLS-TE), on page 320	Specifies the affinity value to be used to expand a path to the next loose hop for a tunnel on an area border router.

path-selection metric (interface)

To configure an MPLS-TE tunnel path-selection metric type, use the **path-selection metric** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

path-selection metric {igp | te}

no path-selection metric {igp | te}

Syntax Description

igp	Configures Interior Gateway Protocol (IGP) metrics.
te	Configures TE metrics. This is the default.

Command Default

The default is TE metrics.

Command Modes

Interface configuration

Command History

Release	Modification
Release 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.

The metric type to be used for path calculation for a given tunnel is determined as follows:

- If the **path-selection metric** command was entered to either a metric type for the tunnel or only a metric type, use that metric type.
- Otherwise, use the default (TE) metric.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the path-selection metric to use the IGP metric overwriting default:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
```

```
RP/0/RP0/CPU0:router(config-if)# path-selection metric igp
```

Related Commands

Command	Description
show mpls traffic-eng topology, on page 420	Displays the tunnel path used.

pce address (MPLS-TE)

To configure the IPv4 self address for Path Computation Element (PCE), use the **pce address** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

pce address *ipv4 address*

no pce address *ipv4 address*

Syntax Description	ipv4 <i>address</i> Configures the IPv4 address for PCE.					
Command Default	No default behavior or values					
Command Modes	MPLS-TE configuration					
Command History	<table><tr><th>Release</th><th>Modification</th></tr><tr><td>Release 3.5.0</td><td>This command was introduced.</td></tr></table>		Release	Modification	Release 3.5.0	This command was introduced.
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 IP address is used in the TCP communication with the other PCEs or PCCs. In addition, this address is advertised using IGP.					
Task ID	<table><tr><th>Task ID</th><th>Operations</th></tr><tr><td>mpls-te</td><td>read, write</td></tr></table>		Task ID	Operations	mpls-te	read, write
Task ID	Operations					
mpls-te	read, write					

Examples

The following example shows how to configure the IPv4 self address for PCE:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# pce address ipv4 10.10.10.10
```

Related Commands

Command	Description
pce keepalive (MPLS-TE), on page 332	Configures a PCEP keepalive interval.
path-option (MPLS-TE), on page 313	Configures a path option for an MPLS-TE tunnel.
pce peer (MPLS-TE), on page 334	Configures an IPv4 self address for a PCE peer.
pce reoptimize (MPLS-TE), on page 336	Configures a periodic reoptimization timer.
pce request-timeout (MPLS-TE), on page 338	Configures a PCE request-timeout.
pce tolerance keepalive (MPLS-TE), on page 340	Configures a PCE tolerance keepalive (which is the minimum acceptable peer proposed keepalive).

pce deadtimer (MPLS-TE)

To configure a path computation element (PCE) deadtimer, use the **pce deadtimer** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

pce deadtimer *value*

no pce deadtimer *value*

Syntax Description

<i>value</i>	Keepalive dead interval, in seconds. The range is 0 to 255.

Command Default

value: 120

Command Modes

MPLS-TE 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.

When the dead interval is 0, the LSR does not time out a PCEP session to a remote peer.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a PCE deadtimer:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# pce deadtimer 50
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.

Command	Description
path-option (MPLS-TE) , on page 313	Configures a path option for an MPLS-TE tunnel.
pce address (MPLS-TE) , on page 328	Configures the IPv4 self address for a PCE.
pce keepalive (MPLS-TE) , on page 332	Configures a PCEP keepalive interval.
pce peer (MPLS-TE) , on page 334	Configures an IPv4 self address for a PCE peer.
pce reoptimize (MPLS-TE) , on page 336	Configures a periodic reoptimization timer.
pce request-timeout (MPLS-TE) , on page 338	Configures a PCE request-timeout.
pce tolerance keepalive (MPLS-TE) , on page 340	Configures a PCE tolerance keepalive (which is the minimum acceptable peer proposed keepalive).

pce keepalive (MPLS-TE)

To configure a path computation element protocol (PCEP) keepalive interval, use the **pce keepalive** command in MPLS-TE configuration mode. To disable this command, use the **no** form of this command.

pce keepalive *interval*

no pce keepalive *interval*

Syntax Description

<i>interval</i>	Keepalive interval, in seconds. The range is 0 to 255.

Command Default

interval: 30

Command Modes

MPLS-TE 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.

When the keepalive interval is 0, the LSR does not send keepalive messages.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure PCEP keepalive interval for 10 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te) pce keepalive 10
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.

Command	Description
path-option (MPLS-TE) , on page 313	Configures a path option for an MPLS-TE tunnel.
pce address (MPLS-TE) , on page 328	Configures the IPv4 self address for a PCE.
pce deadtimer (MPLS-TE) , on page 330	Configures a PCE deadtimer.
pce peer (MPLS-TE) , on page 334	Configures an IPv4 self address for a PCE peer.
pce reoptimize (MPLS-TE) , on page 336	Configures a periodic reoptimization timer.
pce request-timeout (MPLS-TE) , on page 338	Configures a PCE request-timeout.
pce tolerance keepalive (MPLS-TE) , on page 340	Configures a PCE tolerance keepalive (which is the minimum acceptable peer proposed keepalive).

pce peer (MPLS-TE)

To configure an IPv4 self address for a path computation element (PCE) peer, use the **pce peer** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

pce peer *ipv4 address*

no pce peer *ipv4 address*

Syntax Description	<i>ipv4 address</i>	Configures the IPv4 address for PCE.

Command Default	TE metric

Command Modes	MPLS-TE 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
	mpls-te	read, write

Examples	The following example shows how to configure an IPv4 self address for a PCE peer:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# pce peer ipv4 11.11.11.11
```

Related Commands	Command	Description
	mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.

Command	Description
path-option (MPLS-TE) , on page 313	Configures a path option for an MPLS-TE tunnel.
pce address (MPLS-TE) , on page 328	Configures the IPv4 self address for a PCE.
pce deadtimer (MPLS-TE) , on page 330	Configures a PCE deadtimer.
pce keepalive (MPLS-TE) , on page 332	Configures a PCEP keepalive interval.
pce reoptimize (MPLS-TE) , on page 336	Configures a periodic reoptimization timer.
pce request-timeout (MPLS-TE) , on page 338	Configures a PCE request-timeout.
pce tolerance keepalive (MPLS-TE) , on page 340	Configures a PCE tolerance keepalive (which is the minimum acceptable peer proposed keepalive).

pce reoptimize (MPLS-TE)

To configure a periodic reoptimization timer, use the **pce reoptimize** command in MPLS-TE configuration mode. To disable this feature, use the **no** form of this command.

pce reoptimize *value*

no pce reoptimize *value*

Syntax Description

<i>value</i>	Periodic reoptimization timer value, in seconds. The range is 60 to 604800.

Command Default

value: 3600

Command Modes

MPLS-TE 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.

When the dead interval is 0, the LSR does not time out a path computation element protocol (PCEP) session to a remote peer.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a periodic reoptimization timer for 200 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# pce reoptimize 200
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.
path-option (MPLS-TE) , on page 313	Configures a path option for an MPLS-TE tunnel.
pce address (MPLS-TE) , on page 328	Configures the IPv4 self address for a PCE.
pce deadtimer (MPLS-TE) , on page 330	Configures a PCE deadtimer.
pce keepalive (MPLS-TE) , on page 332	Configures a PCEP keepalive interval.
pce peer (MPLS-TE) , on page 334	Configures an IPv4 self address for a PCE peer.
pce request-timeout (MPLS-TE) , on page 338	Configures a PCE request-timeout.
pce tolerance keepalive (MPLS-TE) , on page 340	Configures a PCE tolerance keepalive (which is the minimum acceptable peer proposed keepalive).

pce request-timeout (MPLS-TE)

To configure a path computation element (PCE) request-timeout, use the **pce request-timeout** command in MPLS-TE configuration mode. To disable this feature, use the **no** form of this command.

pce request-timeout *value*

no pce request-timeout *value*

Syntax Description

<i>value</i>	PCE request-timeout, in seconds. The range is 5 to 100.

Command Default

value: 10

Command Modes

MPLS-TE 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.

PCC or PCE keeps a pending path request only for the request-timeout period.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a PCE request-timeout for 10 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# pce request-timeout 10
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.

Command	Description
path-option (MPLS-TE), on page 313	Configures a path option for an MPLS-TE tunnel.
pce address (MPLS-TE), on page 328	Configures the IPv4 self address for a PCE.
pce deadtimer (MPLS-TE), on page 330	Configures a PCE deadtimer.
pce keepalive (MPLS-TE), on page 332	Configures a PCEP keepalive interval.
pce peer (MPLS-TE), on page 334	Configures an IPv4 self address for a PCE peer
pce reoptimize (MPLS-TE), on page 336	Configures a periodic reoptimization timer.
pce tolerance keepalive (MPLS-TE), on page 340	Configures a PCE tolerance keepalive (which is the minimum acceptable peer proposed keepalive).

pce tolerance keepalive (MPLS-TE)

To configure a path computation element (PCE) tolerance keepalive (which is the minimum acceptable peer proposed keepalive), use the **pce tolerance keepalive** command in MPLS-TE configuration mode. To disable this feature, use the **no** form of this command.

pce tolerance keepalive *value*

no pce tolerance keepalive *value*

Syntax Description

value PCE tolerance keepalive value, in seconds. The range is 0 to 255.

Command Default

value: 10

Command Modes

MPLS-TE 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
mpls-te	read, write

Examples

The following example shows how to configure a PCE tolerance keepalive for 10 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# pce tolerance keepalive 10
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.

Command	Description
path-option (MPLS-TE), on page 313	Configures a path option for an MPLS-TE tunnel.
pce address (MPLS-TE), on page 328	Configures the IPv4 self-address for a PCE.
pce deadtimer (MPLS-TE), on page 330	Configures a PCE deadtimer.
pce keepalive (MPLS-TE), on page 332	Configures a PCEP keepalive interval.
pce peer (MPLS-TE), on page 334	Configures an IPv4 self address for a PCE peer
pce reoptimize (MPLS-TE), on page 336	Configures a periodic reoptimization timer.
pce request-timeout (MPLS-TE), on page 338	Configures a PCE request-timeout.

policy-class

To configure policy-based tunnel selection (PBTS) to direct traffic into specific TE tunnels, use the **policy-class** command in interface configuration mode. To disable this feature, use the **no** form of this command.

policy-class {1 - 7}

no policy-class

Syntax Description

1 - 7	Policy-class attribute to map the correct traffic class to this policy.

Command Default

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.

Use the **policy-class** command to enable policy-based tunnel selection (PBTS). See *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router* for more information on PBTS.

To display the configured PBTS policy-class value, use the **show mpls traffic-eng tunnels** command.

To display information about PBTS configuration, use the **show cef** and **show cef hardware** commands in *Cisco IOS XR IP Addresses and Services Command Reference for the Cisco CRS-1 Router*.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a policy class:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# policy-class 7
```

Related Commands

Command	Description
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.
show cef	Displays the IPv4 or IPv6 Cisco Express Forwarding table.
show cef hardware	Displays Cisco Express Forwarding IPv4 or IPv6 hardware status and configuration information.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

priority (MPLS-TE)

To configure the setup and reservation priority for an MPLS-TE tunnel, use the **priority** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

priority *setup-priority hold-priority*

no priority *setup-priority hold-priority*

Syntax Description

<i>setup-priority</i>	Priority used when signaling a label switched path (LSP) for this tunnel to determine which existing tunnels can be preempted. Range is 0 to 7 (in which a lower number indicates a higher priority). Therefore, an LSP with a setup priority of 0 can preempt any LSP with a non-0 priority.
<i>hold-priority</i>	Priority associated with an LSP for this tunnel to determine if it should be preempted by other LSPs that are being signaled. Range is 0 to 7 (in which a lower number indicates a higher priority).

Command Default

setup-priority: 7

hold-priority: 7

Command Modes

Interface configuration

Command History

Release	Modification
Release 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.

When an LSP is signaled and an interface does not currently have enough bandwidth available for that LSP, the call admission software (if necessary) preempts lower-priority LSPs to admit the new LSP. Accordingly, the new LSP priority is the setup priority and the existing LSP priority is the hold priority. The two priorities make it possible to signal an LSP with a low setup priority (so that the LSP does not preempt other LSPs on setup) and a high hold priority (so that the LSP is not preempted after it is established). Setup priority and hold priority are typically configured to be equal, and setup priority cannot be numerically smaller than the hold priority.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure a tunnel with a setup and hold priority of 1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# priority 1 1
```

Related Commands

Command	Description
interface tunnel-te, on page 255	Configures an MPLS-TE tunnel interface.

record-route

To record the route used by a tunnel, use the **record-route** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

record-route

no record-route

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes Interface configuration

Release	Modification
Release 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 You must configure record-route on TE tunnels that are protected by multiple backup tunnels merging at a single node.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to enable record-route on the TE tunnel:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# record-route
```


Related Commands

Command	Description
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.

remote (GMPLS)

To configure Link Management Protocol (LMP) Neighbor remote Traffic Engineering (TE) links, use the **remote** command in MPLS-TE interface LMP data link adjacency configuration mode. To return to the default behavior, use the **no** form of this command.

remote {**interface-id** *unnum identifier* | **switching capability** | {**fsc** | **lsc** | **pscl**} | **te-link-id** | {**ipv4 address** | *unnum identifier*}}

no remote {**interface-id** *unnum identifier* | **switching capability** | {**fsc** | **lsc** | **pscl**} | **te-link-id** | {**ipv4 address** | *unnum identifier*}}

Syntax Description

interface-id	Configures the LMP neighbor remote interface identifier.
unnum identifier	Configures the unnumbered interface identifier. Range is 1 to 4294967295.
switching-capability	Configures the remote LMP MPLS-TE interface switching capability.
fsc lsc pscl	Configures the capability types: Fiber-Switch Capable, Lambda-Switch Capable, and Packet-Switch Capable.
te-link-id	Configures the remote LMP MPLS-TE link ID address.
ipv4 address	Configures the IPv4 address.
unnum identifier	Configures the unnumbered interface and identifier.

Command Default

No default behavior or values

Command Modes

MPLS-TE interface LMP data link adjacency 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.

**Note**

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure LMP Neighbor remote TE links for unnumber interface-id 1066:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/1/0/0
RP/0/RP0/CPU0:router(config-mpls-te-if)# lmp data-link adjacency
RP/0/RP0/CPU0:router(config-mpls-te-if-adj)# remote interface-id unnum 1066
```

Related Commands

Command	Description
destination (MPLS-TE), on page 210	Configures bidirectional optical tunnels.
lmp hello (GMPLS), on page 272	Configures LMP IPCC management hello settings.
match (GMPLS), on page 284	Configures or matches active and passive tunnels.
passive (GMPLS), on page 311	Configures passive GMPLS tunnels.
switching (GMPLS), on page 480	Configures TE-link switching attributes.

reoptimize (MPLS-TE)

To force the reoptimization interval for all TE tunnels, use the **reoptimize** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

reoptimize *frequency*

no reoptimize *frequency*

Syntax Description

<i>frequency</i>	Timer frequency range, in seconds. Range is from 0 to 604800. Note: - A value of 0 disables periodic reoptimization. - Any value in the range from 1 to 60 results in periodic reoptimization that occurs every 60 seconds.

Command Default

frequency: 3600

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 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	Operations
mpls-te	read, write

Examples

The following example shows how to force the reoptimization interval to 60 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize 60
```

Related Commands

Command	Description
mpls traffic-eng reoptimize (EXEC), on page 302	Triggers the reoptimization interval of all TE tunnels.

reoptimize timers delay (MPLS-TE)

To delay removal or relabeling of the old label switched paths (LSPs) (reoptimized LSP from the forwarding plane) after tunnel reoptimization, use the **reoptimize timers delay** command in MPLS-TE configuration mode. To restore the default value, use the **no** form of this command.

reoptimize timers delay {*after-frr seconds*| *cleanup delay-time*| *installation delay-time*| *path-protection seconds*}

no reoptimize timers delay {*after-frr seconds*| *cleanup delay-time*| *installation delay-time*| *path-protection seconds*}

Syntax Description

after-frr	Delays the LSP reoptimization in the event of the FRR.
<i>seconds</i>	Reoptimization initiation delay time of the tunnel, in seconds, after an FRR event. Range is from 0 to 120.
cleanup	Delays removal of the old LSPs after tunnel reoptimization.
<i>delay-time</i>	Reoptimization delay time, in seconds. A value of 0 disables delay. The valid range is from 0 to 300 for cleanup time.
installation	Delays installation of a new label after tunnel reoptimization.
<i>delay-time</i>	Reoptimization delay time, in seconds. A value of 0 disables delay. The valid range is 0 to 3600 for installation time.
path-protection	Delays the time between path protection switchover event and tunnel reoptimization.
<i>seconds</i>	Time, in seconds, between path protection switchover event and tunnel reoptimization. A value of 0 disables delay. Range is from 0 to 604800.

Command Default

after-frr delay: 0

cleanup delay: 20
delay-time: 20
installation delay: 20
path-protection: 180

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.9.0	The after-frr and path-protection keywords were added.

Usage Guidelines A device with Multiprotocol Label Switching traffic engineering (MPLS-TE) tunnels periodically examines tunnels with established LSPs to discover whether more efficient LSPs (paths) are available. If a better LSP is available, the device signals the more efficient LSP; if the signaling is successful, the device replaces the older LSP with the new, more efficient LSP.

Sometimes the slower router-point nodes may not yet utilize the new label's forwarding plane. In this case, if the headend node replaces the labels quickly, it can result in brief packet loss. By delaying the cleanup of the old LSP using the **reoptimize timers delay cleanup** command, packet loss is avoided.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to set the reoptimization cleanup delay time to 1 minute:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize timers delay cleanup 60
```

The following example shows how to set the reoptimization installation delay time to 40 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize timers delay installation 40
```

The following example shows how to set the reoptimization delay time after the event of the FRR to 50 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize timers delay after-frr 50
```

The following example shows how to set the reoptimization delay time between path protection switchover event and tunnel reoptimization to 80:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# reoptimize timers delay path-protection 80
```

Related Commands

Command	Description
reoptimize (MPLS-TE), on page 350	Reoptimizes all traffic engineering tunnels immediately.
mpls traffic-eng reoptimize (EXEC), on page 302	Configures the reoptimization interval of all TE tunnels.

router-id secondary (MPLS-TE)

To configure a secondary TE router identifier in MPLS-TE to be used locally (not advertised through IGP), use the **router-id secondary** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

router-id secondary *IP address*

no router-id secondary *IP address*

Syntax Description	<i>IP address</i>	IPv4 address to be used as secondary TE router ID.

Command Default	No default behavior or values

Command Modes	MPLS-TE 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.
	Use the router-id secondary command on tail end nodes to terminate verbatim tunnels to secondary TE RIDs as destinations.
	You can configure up to 32 IPv4 addresses as TE secondary router IDs.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples	The following example shows how to configure a secondary TE router identifier in MPLS-TE:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# router-id secondary 1.1.1.1
RP/0/RP0/CPU0:router(config-mpls-te)# router-id secondary 2.2.2.2
```

Related Commands

Command	Description
mpls traffic-eng router-id (MPLS-TE router), on page 304	Specifies that the TE router identifier for the node is the IP address associated with a given interface.

show explicit-paths

To display the configured IP explicit paths, use the **show explicit-paths** command in EXEC mode.

show explicit-paths [*name path-name*| *identifier number*]

Syntax Description

name <i>path-name</i>	(Optional) Displays the name of the explicit path.
identifier <i>number</i>	(Optional) Displays the number of the explicit path. Range is 1 to 65535.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 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.

An IP explicit path is a list of IP addresses that represent a node or link in the explicit path.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following shows a sample output from the **show explicit-paths** command:

```
RP/0/RP0/CPU0:router# show explicit-paths

Path ToR2      status enabled
               0x1: next-address 192.168.1.2
               0x2: next-address 10.20.20.20
Path ToR3      status enabled
               0x1: next-address 192.168.1.2
               0x2: next-address 192.168.2.2
               0x3: next-address 10.30.30.30
Path 100       status enabled
               0x1: next-address 192.168.1.2
```

```

      0x2: next-address 10.20.20.20
Path 200    status enabled
      0x1: next-address 192.168.1.2
      0x2: next-address 192.168.2.2
      0x3: next-address 10.30.30.30

```

This table describes the significant fields shown in the display.

Table 27: show explicit-paths Command Field Descriptions

Field	Description
Path	Pathname or number, followed by the path status.
1: next-address	First IP address in the path.
2: next-address	Second IP address in the path.

The following shows a sample output from the **show explicit-paths** command using a specific path name:

```

RP/0/RP0/CPU0:router# show explicit-paths name ToR3

Path ToR3    status enabled
      0x1:  next-address 192.168.1.2
      0x2:  next-address 192.168.2.2
      0x3:  next-address 10.30.30.30

```

The following shows a sample output from the **show explicit-paths** command using a specific path number:

```

RP/0/RP0/CPU0:router# show explicit-paths identifier 200

Path 200    status enabled
      0x1:  next-address 192.168.1.2
      0x2:  next-address 192.168.2.2
      0x3:  next-address 10.30.30.30

```

Related Commands

Command	Description
index exclude-address, on page 241	Specifies the next IP address to exclude from the explicit path.
index next-address, on page 245	Specifies path entries at a specific index.

show mpls traffic-eng affinity-map

To display the color name-to-value mappings configured on the router, use the **show mpls traffic-eng affinity-map** command in EXEC mode.

show mpls traffic-eng affinity-map

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 3.4.0	This command was introduced.
	Release 3.9.0	The Bit Position field was added to the sample output.

Usage Guidelines To use this command, you must be in a user group associated with a task 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 affinity value of an affinity associated with an affinity constraint is unknown, the **show mpls traffic-eng affinity-map** command output displays: "(refers to undefined affinity name)"

Task ID	Task ID	Operations
	mpls-te	read

Examples The following shows a sample output from the **show mpls traffic-eng affinity-map** command:

RP/0/RP0/CPU0:router# **show mpls traffic-eng affinity-map**

Affinity Name	Bit-position	Affinity Value
bcdefghab	0	1
cd1	1	2
ed2	2	4
ed3	3	8
ed4	4	10
ed5	5	20
ed6	6	40
ed7	7	80

```

red8      8      100
red9      9      200
red10     10     400
red11     11     800
red12     12    1000
red13     13    2000
red14     14    4000
red15     15    8000
red16     16   10000
cdefghabcdefghabcdefghabcdefghab 17   20000
red18     18   40000
red19     19   80000
red20     20  100000
red21     21  200000
red22     22  400000
red23     23  800000
red24     24 1000000
red25     25 2000000
red26     26 4000000
red27     27 8000000
black28   28 10000000
red28     29 20000000
red30     30 40000000
abcdefghabcdefghabcdefghabcdefgh 31 80000000

```

Table 28: show mpls traffic-eng affinity-map Field Descriptions, on page 360 describes the significant fields shown in the display.

Table 28: show mpls traffic-eng affinity-map Field Descriptions

Field	Description
Affinity Name	Affinity name associated with the tunnel affinity constraints.
Bit-position	Bit position set in the 32-bit affinity value
Affinity Value	Affinity value associated with the affinity name.

Related Commands

Command	Description
affinity , on page 159	Configures an affinity (the properties the tunnel requires in its links) for an MPLS-TE tunnel.
affinity-map , on page 163	Assigns a numerical value to each affinity name.

show mpls traffic-eng attribute-set

To display the attribute set for MPLS-TE, use the **show mpls traffic-eng attribute-set** command in EXEC mode.

show mpls traffic-eng attribute-set [**auto-backup**| **auto-mesh**| **path-option**] [*attribute-set-name*]]

Syntax Description

auto-backup	Displays information for the auto-backup attribute type.
auto-mesh	Displays information for the auto-mesh attribute type.
path-option	Displays information for the path-option attribute type.
<i>attribute-set-name</i>	Specifies the name of the attribute set to be displayed.

Command Default

Displays information about all types of attribute sets.

Command Modes

EXEC mode

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.

To use this command, first enable the MPLS-TE application.

Task ID

Task ID	Operation
mpls-te	read

Examples

The following command shows the attribute set for auto-backup attribute type.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng attribute-set auto-backup autol
```

```
Attribute Set Name: autol (Type: auto-backup)
  Affinity: 0x0/0xffff (Default)
  Priority: 7 7 (Default)
  Record-route: Enabled
  Policy-class: 0 (Not configured)
  Logging: None
  List of protected interfaces (count 0)
  List of tunnel IDs (count 0)
```

The following command shows the attribute set for auto-mesh attribute type.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng attribute-set auto-mesh mesh1
```

```
Attribute Set Name: mesh1 (Type: auto-mesh)
  Bandwidth: 0 kbps (CT0) (Default)
  Affinity: 0x0/0xffff (Default)
  Priority: 7 7 (Default)
  Interface Bandwidth: 0 kbps (Default)
  AutoRoute Announce: Disabled
  Auto-bw: Disabled
  Soft Preemption: Disabled
  Fast Reroute: Disabled, Protection Desired: None
  Record-route: Disabled
  Policy-class: 0 (Not configured)
  Logging: None
  List of Mesh Groups (count 0)
```

The following command shows the attribute set for path-option attribute type.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng attribute-set path-option path1
```

```
Attribute Set Name: path1 (Type: path option)
  Bandwidth: 0 kbps (CT0) (Default)
  Affinity: 0x0/0xffff (Default)
  List of tunnel IDs (count 0)
```


show mpls traffic-eng autoroute

To display tunnels that are announced to the Interior Gateway Protocol (IGP), including information about next hop and destinations, use the **show mpls traffic-eng autoroute** command in EXEC mode.

show mpls traffic-eng autoroute [*IP-address*]

Syntax Description	<i>IP-address</i> (Optional) Tunnel leading to this address.

Command Default	No default behavior or values

Command Modes	EXEC

Command History	Release	Modification
	Release 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.

The enhanced shortest path first (SPF) calculation of the IGP has been modified so that it uses traffic-engineering tunnels. The **show mpls traffic-eng autoroute** command displays those tunnels IGP is currently using in its enhanced SPF calculation (that is, which tunnels are up and have autoroute configured).

Tunnels are organized by destination. All tunnels to a destination carry a share of the traffic tunneled to that destination.

Task ID	Task ID	Operations
	mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng autoroute** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng autoroute
Destination 103.0.0.3 has 2 tunnels in OSPF 0 area 0
tunnel-te1 (traffic share 1, nexthop 103.0.0.3)
tunnel-te2 (traffic share 1, nexthop 103.0.0.3)
```

This table describes the significant fields shown in the display.

Table 29: show mpls traffic-eng autoroute Command Field Descriptions

Field	Description
Destination	Multiprotocol Label Switching (MPLS) TE tail-end router ID.
traffic share	A factor based on bandwidth, indicating how much traffic this tunnel should carry, relative to other tunnels, to the same destination. If two tunnels go to a single destination, one with a traffic share of 200 and the other with a traffic share of 100, the first tunnel carries two-thirds of the traffic.
Nexthop	Next-hop router ID of the MPLS-TE tunnel.
absolute metric	Metric with mode absolute for the MPLS-TE tunnel.
relative metric	Metric with mode relative for the MPLS-TE tunnel.

Related Commands

Command	Description
autoroute metric, on page 181	Specifies the MPLS-TE tunnel metric that the IGP-enhanced SPF calculation will use.
show mpls traffic-eng tunnels, on page 430	Displays information about MPLS-TE tunnels.
topology holddown sigerr (MPLS-TE), on page 491	Specifies the time that a router should ignore a link in its TE topology database in tunnel path CSPF computations following a TE tunnel signalling error on the link.

show mpls traffic-eng auto-tunnel backup

To display information about automatically build MPLS-TE backup tunnels, use the **show mpls traffic-eng auto-tunnel backup** command in EXEC mode.

show mpls traffic-eng auto-tunnel {backup [private| summary| unused]}

Syntax Description	backup	Displays information about auto-tunnel backup.
	private	(Optional) Displays private information about the automatically build MPLS-TE backup tunnels.
	summary	(Optional) Displays the automatically build MPLS-TE backup tunnels summary information.
	unused	(Optional) Displays only unused MPLS-TE backup tunnels.

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	Operation
	mpls-te	read

Examples	This is sample output from the show mpls traffic-eng auto-tunnel backup command:

```
AutoTunnel Backup Configuration:
  Interfaces count: 4
  Unused removal timeout: 1h 0m 0s
  Configured tunnel number range: 2000-2500
```

```

AutoTunnel Backup Summary:
  AutoTunnel Backups:
    1 created, 1 up, 0 down, 0 unused
    1 NHOP, 0 NNHOP, 0 SRLG strict, 0 SRLG preferred
  Protected LSPs:
    1 NHOP, 0 NHOP+SRLG
    0 NNHOP, 0 NNHOP+SRLG
  Protected S2L Sharing Families:
    0 NHOP, 0 NHOP+SRLG
    0 NNHOP, 0 NNHOP+SRLG
  Protected S2Ls:
    0 NHOP, 0 NHOP+SRLG
    0 NNHOP, 0 NNHOP+SRLG

Cumulative Counters (last cleared 05:17:19 ago):
      Total  NHOP  NNHOP
Created:      1      1      0
Connected:    1      1      0
Removed (down): 0      0      0
Removed (unused): 0      0      0
Removed (in use): 0      0      0
Range exceeded: 0      0      0

AutoTunnel Backups:
      Tunnel      State      Protection      Prot.      Protected      Protected
      Name              Offered    Flows*      Interface      Node
-----
tunnel-te2000      up NHOP              1      Gi0/2/0/2      N/A

*Prot. Flows = Total Protected LSPs, S2Ls and S2L Sharing Families

This is sample output from the show mpls traffic-eng auto-tunnel mesh command:

RP/0/RP0/CPU0:router#show mpls traffic-eng auto-tunnel mesh

Auto-tunnel Mesh Global Configuration:
  Unused removal timeout: 2h
  Configured tunnel number range: 10000-12000

Auto-tunnel Mesh Groups Summary:
  Mesh Groups count: 5
  Mesh Groups Destinations count: 50

Mesh Group 40 (2 Destinations, 1 Up, 1 Down):
  Destination-list: dl-40
  Attribute-set: ta_name
  Destination: 40.40.40.40, tunnel-id: 10000, State: Up
  Destination: 10.10.10.10, tunnel-id: 10001, State: Down
Mesh Group 41 (3 Destinations, 2 Up, 1 Down):
  Destination-list: dl-40
  Attribute-set: ta_name
  Destination: 4.4.4.4, tunnel-id: 10005, State: Up
  Destination: 3.3.3.3, tunnel-id: 10006, State: Up
  Destination: 1.1.1.1, tunnel-id: 10007, State: Down
Mesh Group 51 (0 Destinations, 0 Up, 0 Down):
  Destination-list: Not configured
  Attribute-set: Not configured
Mesh Group 52 (0 Destinations, 0 Up, 0 Down):
  Destination-list: NAME1 (Not defined)
  Attribute-set: NAME2 (Not defined)
Mesh Group 53 (2 Destinations, 1 Up, 1 Down):
  Destination-list: dl-53
  Attribute-set: Not configured
  Destination: 40.40.40.40, tunnel-id: 10000, State: Up
  Destination: 10.10.10.10, tunnel-id: 10001, State: Down

Cumulative Counters (last cleared 7h ago):
      Total
Created:      100
Connected:    50
Removed (unused): 50

```

```
Removed (in use):      0
Range exceeded:        0
```

This is sample output from the **show mpls traffic-eng auto-tunnel private** command:

```
Auto-tunnel Mesh Private Information:
ID allocator overall maximum ID: 4096
ID allocator last allocated ID: 50999
ID allocator number IDs allocated: 1000
```

show mpls traffic-eng auto-tunnel mesh

To display information about automatically built MPLS-TE mesh tunnels, use the **show mpls traffic-eng auto-tunnel mesh** command in EXEC mode.

show mpls traffic-eng auto-tunnel mesh {*mesh-value*| **unused**| **summary**| **attribute-set** *name*| **destination** *address*| **destination-list** *name*| **down**| **up**| **tunnel** {**created**| **not-created**}}

Syntax Description

mesh <i>mesh-value</i>	Displays the tunnels that belong to the specified auto-tunnel mesh group. The range of mesh group ID is from 0 to 4294967295.
attribute-set <i>name</i>	Displays mesh-groups configured with a specific attribute set.
destination <i>address</i>	Displays only the destinations with a specified address.
destination-list <i>name</i>	Displays mesh-groups configured with a specified prefix-list.
down	Displays only those tunnels that are down.
up	Displays only those tunnels that are up.
summary	Displays auto-tunnel mesh summary information.
unused	Displays only the down tunnels with no destination in the topology.
tunnel created not-created	Specifies either created destinations with tunnels, or not-created destinations without tunnels.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 4.1.1	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	Operation
MPLS-TE	read

Examples

This is sample output from the **show mpls traffic-eng auto-tunnel mesh** command:

```
RP/0/RP0/CPU0:router show mpls traffic-eng auto-tunnel mesh
```

```
Auto-tunnel Mesh Global Configuration:
  Unused removal timeout: 1h 0m 0s
  Configured tunnel number range: 1000-1200
```

```
Auto-tunnel Mesh Groups Summary:
  Mesh Groups count: 1
  Mesh Groups Destinations count: 3
  Mesh Groups Tunnels count:
    3 created, 0 up, 3 down, 0 FRR enabled
```

```
Mesh Group: 65 (3 Destinations)
  Status: Enabled
  Attribute-set: am-65
  Destination-list: dl-65 (Not a prefix-list)
  Recreate timer: Not running
  -----
  Destination      Tunnel ID      State      Unused timer
  -----
    192.168.0.2      1000         up      Not running
    192.168.0.3      1001         up      Not running
    192.168.0.4      1002         up      Not running
  Displayed 3 tunnels, 0 up, 3 down, 0 FRR enabled
```

```
Auto-mesh Cumulative Counters:
  Last cleared: Wed Nov  9 12:56:37 2011 (02:39:07 ago)
  Total
  Created:          3
  Connected:        0
  Removed (unused): 0
  Removed (in use): 0
  Range exceeded:   0
```

This shows how to configure the **auto-tunnel mesh** command with **destination-list** and **attribute-set** keywords:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel mesh
RP/0/RP0/CPU0:router(config-te-auto-mesh)# group 65
RP/0/RP0/CPU0:router(config-te-mesh-group)# disable
RP/0/RP0/CPU0:router(config-te-mesh-group)# destination-list dl-65
RP/0/RP0/CPU0:router(config-te-mesh-group)# attribute-set am-65
```



Note

This **attribute-set** is an optional configuration. Without this configuration, all tunnels use default tunnel attribute values. If you configure an non-existent attribute-set, this mesh group does not create any tunnel.



Note

This **destination-list** configuration is mandatory. If there is no IPv4 prefix-list by this name on the this mesh group create tunnels with all routers in the network.

show mpls traffic-eng collaborator-timers

To display the current status of the MPLS-TE collaborator timers, use the **show mpls traffic-eng collaborator-timers** command in EXEC mode.

show mpls traffic-eng collaborator-timers

Syntax Description This command has no arguments or keywords.

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 MPLS-TE process maintains the timers for all of the collaborators such as RSVP, LSD, and so forth. The **show mpls traffic-eng collaborator-timers** command shows the status of these timers.

Task ID	Task ID	Operations
	mpls-te	read

Examples The following sample output shows the current status of the collaborator timers:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng collaborator-timers
```

```
Collaborator Timers
-----
```

```
Timer Name: [LMRIB Restart] Index:[0]
  Duration: [60] Is running: NO
  Last start time: 02/09/2009 11:57:59
  Last stop time: 02/09/2009 11:58:00
  Last expiry time: Never expired
Timer Name: [LMRIB Recovery] Index:[1]
  Duration: [60] Is running: YES
  Last start time: 02/09/2009 11:58:00
  Last stop time: Never Stopped
  Last expiry time: 19/08/2009 17:45:24
Timer Name: [RSVP Restart] Index:[2]
```



```

Duration: [180] Is running: NO
Last start time: 26/08/2009 18:59:18
Last stop time: 26/08/2009 18:59:20
Last expiry time: Never expired
Timer Name: [RSVP Recovery] Index:[3]
Duration: [1800] Is running: NO
Last start time: 26/08/2009 18:59:20
Last stop time: 26/08/2009 19:03:19
Last expiry time: 19/08/2009 18:12:39
Timer Name: [LSD Restart] Index:[4]
Duration: [60] Is running: NO
Last start time: 19/08/2009 17:44:26
Last stop time: 19/08/2009 17:44:26
Last expiry time: Never expired
Timer Name: [LSD Recovery] Index:[5]
Duration: [600] Is running: NO
Last start time: 19/08/2009 17:44:26
Last stop time: Never Stopped
Last expiry time: 19/08/2009 17:53:44
Timer Name: [Clearing in progress BW for the whole topology] Index:[6]
Duration: [60] Is running: YES
Last start time: 02/09/2009 11:57:50
Last stop time: Never Stopped
Last expiry time: 02/09/2009 11:57:50

```

This table describes the significant fields shown in the display.

Table 30: show mpls traffic-eng collaborator-timers Command Field Descriptions

Field	Description
Timer Name	Timer name that is associated to a collaborator.
Index	Identification number of the timer.
Duration	Expiry delay of the timer, in seconds. For example, the duration indicates the timer interval.
Is running	Timer is running low or not.
Last start time	Last time that the collaborator process for MPLS LSD was restarted.
Last stop time	Time TE was able to reconnect to the MPLS LSD process.
Last expiry time	Time that timer expired.

show mpls traffic-eng counters signaling

To display tunnel signaling statistics, use the **show mpls traffic-eng counters signaling** command in EXEC mode.

show mpls traffic-eng counters {signaling| soft-preemption} {*tunnel -number*| all} [**heads** | **mids** | **tails**]|
name *tunnel-name*| **summary**}

Syntax Description

signaling	Displays signaling counters.
soft-preemption	Displays the statistics for the soft-preemption.
<i>tunnel-number</i>	Statistics for the input tunnel number. The range is from 0 to 65535.
all	Displays statistics for all tunnels.
heads	(Optional) Displays statistics for all tunnel heads.
mids	(Optional) Displays statistics for all tunnel midpoints.
tails	(Optional) Displays statistics for all tunnel tails.
name	Displays statistics for a specified tunnel.
<i>tunnel-name</i>	Name of the specified tunnel.
summary	Displays a summary of signaling statistics.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.

Release	Modification
Release 3.5.0	Support was added for the middles keyword.
Release 3.8.0	The <i>tunnel-name</i> argument was added and the middles keyword was replaced with the mids keyword.
Release 3.9.0	The sample output for the all keyword was modified to display the tunnel signaling statistics for all tunnels that includes the tunnel-mte interface.
Release 4.2.0	The soft-preemption 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
mpls-te	read

Examples

This is a sample output from the **show mpls traffic-eng counters signaling** command, using the **all** keyword, which displays tunnel signaling statistics for all tunnels:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters signaling all
```

```
Tunnel Head: tunnel-te100
Cumulative Tunnel Counters:
  Signalling Events      Recv      Xmit      ResvCreate      Recv      Xmit
    PathCreate           1         1      ResvCreate       1         0
    PathChange           0         0      ResvChange       0         0
    PathError            0         0      ResvError        0         0
    PathTear             0        18      ResvTear         0         0
    BackupAssign         0         1      BackupError      0         0
    PathQuery            0         0      Unknown         0         0

Destination 100.0.0.4
Cumulative counters
  Signalling Events      Recv      Xmit      ResvCreate      Recv      Xmit
    PathCreate           1         1      ResvCreate       1         0
    PathChange           0         0      ResvChange       0         0
    PathError            0         0      ResvError        0         0
    PathTear             0        18      ResvTear         0         0
    BackupAssign         0         1      BackupError      0         0
    PathQuery            0         0      Unknown         0         0

S2L LSP ID: 2 Sub-Grp ID: 0 Destination: 100.0.0.4
  Signalling Events      Recv      Xmit      ResvCreate      Recv      Xmit
    PathCreate           1         1      ResvCreate       1         0
    PathChange           0         0      ResvChange       0         0
    PathError            0         0      ResvError        0         0
    PathTear             0         0      ResvTear         0         0
    BackupAssign         0         1      BackupError      0         0
    PathQuery            0         0      Unknown         0         0

Tunnel Head: tunnel-mte200
```

show mpls traffic-eng counters signaling

Cumulative Tunnel Counters:

Signalling Events	Recv	Xmit		Recv	Xmit
PathCreate	2	2	ResvCreate	2	0
PathChange	0	0	ResvChange	0	0
PathError	0	0	ResvError	0	0
PathTear	0	20	ResvTear	0	0
BackupAssign	0	2	BackupError	0	0
PathQuery	0	0	Unknown	0	0

Destination 100.0.0.4

Cumulative counters

Signalling Events	Recv	Xmit		Recv	Xmit
PathCreate	2	2	ResvCreate	2	0
PathChange	0	0	ResvChange	0	0
PathError	0	0	ResvError	0	0
PathTear	0	20	ResvTear	0	0
BackupAssign	0	2	BackupError	0	0
PathQuery	0	0	Unknown	0	0

S2L LSP ID: 10021 Sub-Grp ID: 1 Destination: 100.0.0.4

Signalling Events	Recv	Xmit		Recv	Xmit
PathCreate	1	1	ResvCreate	1	0
PathChange	0	0	ResvChange	0	0
PathError	0	0	ResvError	0	0
PathTear	0	0	ResvTear	0	0
BackupAssign	0	1	BackupError	0	0
PathQuery	0	0	Unknown	0	0

Tunnel Mid/Tail: router Source: 100.0.0.1 P2MP ID: 1677721603 Tunnel ID: 1 LSP ID: 21

Cumulative LSP Counters:

Signalling Events	Recv	Xmit		Recv	Xmit
PathCreate	2	1	ResvCreate	2	1
PathChange	0	0	ResvChange	0	0
PathError	0	0	ResvError	0	0
PathTear	0	0	ResvTear	0	0
BackupAssign	0	0	BackupError	0	0
PathQuery	0	0	Unknown	0	0

S2L LSP ID: 21 Sub-Grp ID: 0 Destination: 100.0.0.3

Signalling Events	Recv	Xmit		Recv	Xmit
PathCreate	2	1	ResvCreate	2	1
PathChange	0	0	ResvChange	0	0
PathError	0	0	ResvError	0	0
PathTear	0	0	ResvTear	0	0
BackupAssign	0	0	BackupError	0	0
PathQuery	0	0	Unknown	0	0

Tunnel Mid/Tail: router Source: 100.0.0.1 P2MP ID: 1677721603 Tunnel ID: 2 LSP ID: 21

Cumulative LSP Counters:

Signalling Events	Recv	Xmit		Recv	Xmit
PathCreate	2	1	ResvCreate	2	1
PathChange	0	0	ResvChange	0	0
PathError	0	0	ResvError	0	0
PathTear	0	0	ResvTear	0	0
BackupAssign	0	0	BackupError	0	0
PathQuery	0	0	Unknown	0	0

S2L LSP ID: 21 Sub-Grp ID: 0 Destination: 100.0.0.3

Signalling Events	Recv	Xmit		Recv	Xmit
PathCreate	2	1	ResvCreate	2	1
PathChange	0	0	ResvChange	0	0
PathError	0	0	ResvError	0	0
PathTear	0	0	ResvTear	0	0
BackupAssign	0	0	BackupError	0	0
PathQuery	0	0	Unknown	0	0

Tunnel Mid/Tail: router-1_t3 Source: 100.0.0.1 P2MP ID: 1677721603 Tunnel ID: 3 LSP ID:

18

Cumulative LSP Counters:

Signalling Events	Recv	Xmit		Recv	Xmit
PathCreate	2	1	ResvCreate	2	1
PathChange	0	0	ResvChange	0	0
PathError	0	0	ResvError	0	0
PathTear	0	0	ResvTear	0	0
BackupAssign	0	0	BackupError	0	0
PathQuery	0	0	Unknown	0	0

```

S2L LSP ID: 18 Sub-Grp ID: 0 Destination: 100.0.0.3
  Signalling Events      Recv      Xmit
    PathCreate           2          1    ResvCreate           2          1
    PathChange           0          0    ResvChange           0          0
    PathError            0          0    ResvError            0          0
    PathTear             0          0    ResvTear             0          0
    BackupAssign         0          0    BackupError          0          0
    PathQuery            0          0    Unknown              0          0

Tunnel Mid/Tail: router-3_t33 Source: 100.0.0.3 P2MP ID: 1677721605 Tunnel ID: 33 LSP ID:
2
Cumulative LSP Counters:
  Signalling Events      Recv      Xmit
    PathCreate           2          1    ResvCreate           2          1
    PathChange           0          0    ResvChange           0          0
    PathError            0          0    ResvError            0          0
    PathTear             0          0    ResvTear             0          0
    BackupAssign         0          0    BackupError          0          0
    PathQuery            0          0    Unknown              0          0

S2L LSP ID: 2 Sub-Grp ID: 0 Destination: 100.0.0.5
  Signalling Events      Recv      Xmit
    PathCreate           2          1    ResvCreate           2          1
    PathChange           0          0    ResvChange           0          0
    PathError            0          0    ResvError            0          0
    PathTear             0          0    ResvTear             0          0
    BackupAssign         0          0    BackupError          0          0
    PathQuery            0          0    Unknown              0          0

Signaling Counter Summary:
  Signalling Events      Recv      Xmit
    PathCreate          11          7    ResvCreate          11          4
    PathChange           0          0    ResvChange           0          0
    PathError            0          0    ResvError            0          0
    PathTear             0          38   ResvTear             0          0
    BackupAssign         0          3    BackupError          0          0
    PathQuery            0          0    Unknown              0          0

```

This is a sample output from the **show mpls traffic-eng counters signaling** command using the *tunnel number* argument, which displays statistics for the input tunnel number:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng counters signaling 200
```

```

Tunnel Head: tunnel-te200
Cumulative Tunnel Counters:
  Signalling Events      Recv      Xmit
    PathCreate           4          4    ResvCreate           4          0
    PathChange           0          0    ResvChange           0          0
    PathError            0          0    ResvError            0          0
    PathTear             0          1    ResvTear             0          0
    BackupAssign         0          4    BackupError          0          0
    PathQuery            0          0    Unknown              0          0

Destination 3.3.3.3
Cumulative counters
  Signalling Events      Recv      Xmit
    PathCreate           4          4    ResvCreate           4          0
    PathChange           0          0    ResvChange           0          0
    PathError            0          0    ResvError            0          0
    PathTear             0          1    ResvTear             0          0
    BackupAssign         0          4    BackupError          0          0
    PathQuery            0          0    Unknown              0          0

S2L LSP ID: 3 Sub-Grp ID: 0 Destination: 3.3.3.3
  Signalling Events      Recv      Xmit
    PathCreate           3          3    ResvCreate           3          0
    PathChange           0          0    ResvChange           0          0
    PathError            0          0    ResvError            0          0
    PathTear             0          0    ResvTear             0          0
    BackupAssign         0          3    BackupError          0          0
    PathQuery            0          0    Unknown              0          0

```

This table describes the significant fields shown in the display.

Table 31: show mpls traffic-eng counters signaling Command Field Descriptions

Field	Description
Tunnel Head	Tunnel head identifier.
Match Resv Create	Number of RSVP Reservation create messages received.
Sender Create	Number of Sender Create messages sent by TE to RSVP.
Path Error	Number of RSVP Path Error messages received.
Match Resv Change	Number of RSVP Reservation change messages received.
Sender Modify	Number of Sender Modify messages sent by TE to RSVP.
Path Change	Number of RSVP Path Change messages received.
Match Resv Delete	Number of RSVP Reservation delete messages received.
Sender Delete	Number of Sender Delete messages sent by TE to RSVP.
Path Delete	Number of RSVP Path Delete messages received.
Total	Total signaling messages received from RSVP.
Unknown	Unknown messages include fast reroute events and internal messages related to process restart.

This is sample output from the **show mpls traffic-eng counters soft-preemption** command, which displays statistics for the soft preempted LSPs:

```
RP/0/RP0/CPU0:routershow mpls traffic-eng counters soft-preemption
```

```
Soft Preemption Global Counters:
  Last Cleared: Never
  Preemption Node Stats:
    Number of soft preemption events: 1
    Number of soft preempted LSPs: 1
    Number of soft preempted LSPs that timed out: 0
    Number of soft preempted LSPs that were torn down: 0
    Number of soft preempted LSPs that were fast rerouted: 0
    Minimum Time in Soft Preemption Pending State (sec): 0
    Maximum Time in Soft Preemption Pending State (sec): 0
    Average Time in Soft Preemption Pending State (sec): 0
  Headend Stats:
    Number of soft preempted LSPs: 1
    Number of reoptimized soft preempted headend-LSPs: 0
```

```
Number of path protected switchover soft preempted headend-LSPs: 0
Number of torn down soft preempted headend-LSPs: 0
```

Related Commands

Command	Description
clear mpls traffic-eng counters signaling, on page 201	Clears the counters for MPLS-TE tunnels.
clear mpls traffic-eng fast-reroute log, on page 205	Clears the counters for MPLS-TE tunnels.
soft-preemption	Enables soft-preemption on a head-end for the MPLS TE tunnel.

show mpls traffic-eng ds-te te-class

To display the Diff-Serv TE-class map in use, use the **show mpls traffic-eng ds-te te-class** command in EXEC mode.

show show mpls traffic-eng ds-te te-class

Syntax Description This command has no arguments or keywords.

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.



Note TE-class is used only in IETF DS-TE mode.

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following shows a sample output from the **show mpls traffic-eng ds-te te-class** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng ds-te te-class

te-class 0: class-type 0 priority 7 status default
te-class 1: class-type 1 priority 7 status default
te-class 2: unused
te-class 3: unused
te-class 4: class-type 0 priority 0 status default
te-class 5: class-type 1 priority 0 status default
te-class 6: unused
te-class 7: unused
```


This table describes the significant fields shown in the display.

Table 32: show mpls traffic-eng ds-te te-class Command Field Descriptions

Field	Description
te-class	TE-class map, pair of class-type, and priority.
class-type	class-type of the tunnel.
status	Source of the TE-class map, either default or user configured.

show mpls traffic-eng forwarding

To display forwarding information on tunnels that were admitted locally, use the **show mpls traffic-eng forwarding** command in EXEC mode.

show mpls traffic-eng forwarding [**backup-name** *tunnel-name*] [**signalled-name** *tunnel-name*] [**source** *source-address*][**tunnel-id** *tunnel-id*] [**interface** {**in** | **inout** | **out**} *type interface-path-id*][**p2mp** | **p2p**] [**detail**]

Syntax Description

backup-name <i>tunnel-name</i>	(Optional) Restricts tunnels with this backup tunnel name.
signalled-name <i>tunnel-name</i>	(Optional) Restricts tunnels with this signalled tunnel name.
source <i>source-address</i>	(Optional) Restricts tunnels for this specified tunnel source IPv4 address.
tunnel-id <i>tunnel-id</i>	(Optional) Restricts tunnels for this tunnel identifier. Range for the <i>tunnel-id</i> argument is from 0 to 65535.
interface	(Optional) Displays information on the specified interface.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
in	Displays information for the input interface.
inout	Displays information for either the input or output interface.
out	Displays information for the output interface.
p2mp	(Optional) Displays only Point-to-Multipoint (P2MP) information.
p2p	(Optional) Displays only Point-to-Point (P2P) information.

detail	(Optional) Displays detailed forwarding information.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.2	This command was supported.
	Release 3.8.0	The following keywords were added: • detail • p2p
	Release 3.9.0	The following keywords and arguments were added: • backup-name keyword and <i>tunnel-name</i> argument. • signalled-name keyword and <i>tunnel-name</i> argument. • source keyword and <i>source-address</i> argument. • tunnel-id keyword and <i>tunnel-id</i> argument. • in keyword. • inout keyword. • out keyword. The following modifications were made to support the P2MP TE feature: • The sample output was updated to show local label sharing and output label rewrites. • The p2mp 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
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng forwarding** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng forwarding
```

```
Tue Sep 15 14:22:39.609 UTC P2P tunnels
```

Tunnel ID	Ingress IF	Egress IF	In lbl	Out lbl	Backup tunnel
2.2.2.2 2_2	Gi0/0/0/3	Gi0/0/0/4	16004	16020	unknown
6.6.6.6 1_23	-	Gi0/0/0/3	16000	3	tt1300
6.6.6.6 1100_9	-	Gi0/0/0/3	16002	16001	unknown
6.6.6.6 1200_9	-	Gi0/0/0/3	16001	16000	unknown
6.6.6.6 1300_2	-	Gi0/0/0/4	16005	16021	unknown
6.6.6.6 1400_9	-	Gi0/0/0/3	16003	16002	unknown

The following sample output shows how to share the local label and label replication:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng forwarding
```

```
P2MP tunnels:
```

Tunnel ID	Ingress IF	Egress IF	In lbl	Out lbl	Backup tunnel
6.6.6.6 4_10021	-	Gi0/0/0/4	16006	16022	tt1400

```
P2MP tunnel rewrites:
```

Tunnel	Label	IF Handle	LSP ID	C Type
tunnel-mte4	16006	0x00083FF0	10021	13

Displayed 5 tunnel heads, 1 label P2P rewrites Displayed 1 tunnel heads, 1 label P2MP rewrites

This table describes the significant fields shown in the display.

Table 33: show mpls traffic-eng forwarding Field Descriptions

Field	Description
TUNNEL ID	Tunnel identification.
Ingress IF	Ingress interface of the tunnel.
Egress IF	Egress interface of the tunnel.
In lbl	Incoming label associated with the tunnel.
Out lbl	Outgoing label associated with the tunnel.
Backup tunnel	Fast Reroute backup tunnel

Field	Description
P2MP Tunnel rewrites	Table of rewrites that correspond to P2MP tunnels.
P2MP tunnels	Table of point-to-multipoint tunnels.
Label	Label for this rewrite.
IF Handle	Interface handle.
LSP ID	LSP identifier for the tunnel to which this rewrite corresponds.
C Type	RSVP Class Type for the tunnel to which this rewrite corresponds.

show mpls traffic-eng forwarding-adjacency

To display forwarding-adjacency information for an IPv4 address, use the **show mpls traffic-eng forwarding-adjacency** command in EXEC mode.

show mpls traffic-eng forwarding-adjacency [*IP-address*]

Syntax Description

IP-address (Optional) Destination IPv4 address for forwarding adjacency.

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
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng forwarding-adjacency** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng forwarding-adjacency

destination 3.3.3.3 has 1 tunnels
tunnel-tel      (traffic share 0, next-hop 3.3.3.3)
(Adjacency Announced: yes, holdtime 0)
```

Related Commands

Command	Description
forwarding-adjacency , on page 239	Configures an MPLS-TE forwarding adjacency.

show mpls traffic-eng igp-areas

To display MPLS-TE internal area storage, use the **show mpls traffic-eng igp-areas** command in EXEC mode.

show mpls traffic-eng igp-areas [detail]

Syntax Description	detail (Optional) Displays detailed information about the configured MPLS-TE igp-areas and communication statistics with IGPs.

Command Default	No default behavior or values

Command Modes	EXEC

Command History	Release	Modification
	Release 3.4.0	This command was introduced.
	Release 3.7.0	Sample output was modified so that the tunnels and links are not displayed in each area.
	Release 3.9.0	The detail keyword was added. Sample output was modified to support the P2MP TE feature.

Usage Guidelines	To use this command, you must be in a user group associated with a task 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
	mpls-te	read

Examples	The following shows a sample output from the show mpls traffic-eng igp-areas command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng igp-areas

MPLS-TE IGP Areas

Global router-id:          10.144.144.144
Global optical router-id:  Not available
```

```

IS-IS 100

  IGP ID: 0000.0000.0044
  TE router ID configured: 10.144.144.144
                        in use: 10.144.144.144
  Link connection: up
  Topology/tunnel connection: up

  level 2
    TE index: 1
    IGP config for TE: complete
    Local links flooded in this IGP level: 1
    Flooding beacon sent and received
    P2P tunnel heads running over this IGP level: 1
      1 AA, 0 FA
    P2MP destinations running over this IGP level: 0
    Tunnel loose-hops expanded over this IGP level: 0

OSPF 100

  IGP ID: 10.144.144.144
  TE router ID configured: 10.144.144.144
                        in use: 10.144.144.144
  Link connection: up
  Topology/tunnel connection: up

  area 0
    TE index: 0
    IGP config for TE: complete
    Local links flooded in this IGP area: 2
    Flooding beacon sent and received
    P2P tunnel heads running over this IGP area: 3
      1 AA, 0 FA
    P2MP destinations running over this IGP area: 0
    Tunnel loose-hops expanded over this IGP area: 0

```

This table describes the significant fields shown in the display.

Table 34: show mpls traffic-eng igp-areas Command Field Descriptions

Field	Description
Global router-id	Global router ID on this node.
IGP ID	IGP System ID.
area	IGP area.
TE index	Internal index in the IGP area table.
IGP config for TE	Whether the IGP configuration is complete or missing.

show mpls traffic-eng link-management admission-control

To display which tunnels were admitted locally and their parameters, use the **show mpls traffic-eng link-management admission-control** command in EXEC mode.

show mpls traffic-eng link-management admission-control [*interface type interface-path-id*]

Syntax Description

interface	(Optional) Displays information on the specified interface.
<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 possible 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 2.0	This command was introduced.
Release 3.4.0	Support was added for the Name-Based Affinity Constraint scheme.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management admission-control** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management admission-control

S System Information:
  Tunnels Count      : 2
  Tunnels Selected   : 2
Bandwidth descriptor legend:
  B0 = bw from pool 0, B1 = bw from pool 1, R = bw locked, H = bw held

TUNNEL ID          UP IF      DOWN IF      PRI STATE      BW (kbits/sec)
-----
10.10.10.10 1_34    -            PO0/2/0/1    7/7 Resv Admitted 100      RB0
10.10.10.10 15_2    -            PO0/2/0/2    7/7 Resv Admitted 0        B0
```

This table describes the significant fields shown in the display.

Table 35: show mpls traffic-eng link-management admission-control Command Field Descriptions

Field	Description
Tunnels Count	Total number of tunnels admitted.
Tunnels Selected	Number of tunnels displayed.
Bandwidth descriptor legend	BW pool type and status displayed with the tunnel entry. Shown as RG (Locked BW in global pool) in the preceding sample output.
TUNNEL ID	Tunnel identification.
UP IF	Upstream interface used by the tunnel.
DOWN IF	Downstream interface used by the tunnel.
PRI	Tunnel setup priority and hold priority.
STATE	Tunnel admission status.
BW (kbps)	Tunnel bandwidth in kilobits per second. If an R follows the bandwidth number, the bandwidth is reserved. If an H follows the bandwidth number, the bandwidth is temporarily being held for a Path message. If a G follows the bandwidth number, the bandwidth is from the global pool. If an S follows the bandwidth number the bandwidth is from the sub-pool.

The following shows a sample output from the **show mpls traffic-eng link-management interface** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management interface pos 0/2/0/1
```

```

System Information::
  Links Count      : 1

Link ID:: POS0/2/0/1 (35.0.0.5)
  Local Intf ID: 7
  Link Status:

    Link Label Type      : PSC (inactive)
    Physical BW          : 155520 kbits/sec
    BCID                 : RDM
    Max Reservable BW    : 0 kbits/sec (reserved: 100% in, 100% out)
    BC0 (Res. Global BW) : 0 kbits/sec (reserved: 100% in, 100% out)
    BC1 (Res. Sub BW)    : 0 kbits/sec (reserved: 100% in, 100% out)
    MPLS-TE Link State   : MPLS-TE on, RSVP on
    Inbound Admission    : allow-all
    Outbound Admission   : allow-if-room
    IGP Neighbor Count   : 0
    Max Res BW (RDM)     : 0 kbits/sec
    BC0 (RDM)            : 0 kbits/sec
    BC1 (RDM)            : 0 kbits/sec
    Max Res BW (MAM)     : 0 kbits/sec
    BC0 (MAM)            : 0 kbits/sec
    BC1 (MAM)            : 0 kbits/sec
    Admin Weight         : 1 (OSPF), 10 (ISIS)
    Attributes           : 0x5 (name-based)
    Flooding Status: (1 area)
      IGP Area[1]: ospf 100 area 0, not flooded
                  (Reason: Interface has been administratively disabled)

```

This table describes the significant fields shown in the display.

Table 36: show mpls traffic-eng link-management interface Command Field Descriptions

Field	Description
Links Count	Number of links configured for MPLS-TE.
Link ID	Index of the link described.
Local Intf ID	Local interface ID.
Link Label Type	Label type of the link, for instance: PSC ¹⁸ , TDM ¹⁹ , FSC ²⁰ .
Physical BW	Link bandwidth capacity (in kilobits per second).
BCID	Bandwidth constraint model ID (RDM or MAM).
Max Reservable BW	Maximum reservable bandwidth on this link.
BC0 (Res. Global BW)	Bandwidth constraint value for class-type 0.
BC1 (Res. Sub BW)	Bandwidth constraint value for class-type 1.
MPLS-TE Link State	Status of the link MPLS-TE-related functions.
Inbound Admission	Link admission policy for incoming tunnels.
Outbound Admission	Link admission policy for outgoing tunnels.

Field	Description
IGP Neighbor Count	IGP neighbors directly reachable over this link.
Max Res BW (RDM)	Maximum reservable bandwidth on this link for RDM.
BC0 (RDM)	Bandwidth constraint value for RDM.
BC1 (RDM)	Bandwidth constraint value for RDM.
Admin Weight	Administrative weight associated with this link.
Attributes	Interface attributes referring to one or more affinity names.
IGP Area[1]	IGP type and area and level used for TE flooding.

¹⁸ PSC = Packet switch capable.

¹⁹ TDM = Time-division multiplexing.

²⁰ FSC = Fiber switch capable.

show mpls traffic-eng link-management advertisements

To display local link information that MPLS-TE link management is currently flooding into the global TE topology, use the **show mpls traffic-eng link-management advertisements** command in EXEC mode.

show mpls traffic-eng link-management advertisements

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.8.0	This command was modified to include information specific to MPLS Shared Risk Link Groups (SRLG).
	Release 3.9.0	Sample output was modified to display the Attribute Names field.

Usage Guidelines To use this command, you must be in a user group associated with a task 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 mpls traffic-eng link-management advertisements** command has two output formats depending on the Diff-Serv TE Mode: one for prestandard mode and one for IETF mode.

The SRLG values are advertised for the link.

Task ID	Task ID	Operations
	mpls-te	read

Examples The following shows a sample output from the **show mpls traffic-eng link-management advertisements** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management advertisements
Link ID:: 0 (GigabitEthernet0/2/0/1)
          Link IP Address      : 12.9.0.1
```

show mpls traffic-eng link-management advertisements

```

O/G Intf ID      : 28
Designated Router : 12.9.0.2
TE Metric        : 1
IGP Metric        : 1
Physical BW       : 1000000 kbits/sec
BCID             : RDM
Max Reservable BW : 10000 kbits/sec
Res Global BW     : 10000 kbits/sec
Res Sub BW        : 0 kbits/sec
SRLGs            : 10, 20

Downstream::
Global Pool      Sub Pool
-----
Reservable BW[0]:      10000      0 kbits/sec
Reservable BW[1]:      10000      0 kbits/sec
Reservable BW[2]:       9800      0 kbits/sec
Reservable BW[3]:       9800      0 kbits/sec
Reservable BW[4]:       9800      0 kbits/sec
Reservable BW[5]:       9800      0 kbits/sec
Reservable BW[6]:       9800      0 kbits/sec
Reservable BW[7]:       9800      0 kbits/sec

Attribute Flags: 0x00000004
Attribute Names: red2

Link ID:: 1 (GigabitEthernet0/2/0/2)
Link IP Address   : 14.9.0.1
O/G Intf ID      : 29
Designated Router : 14.9.0.4
TE Metric        : 1
IGP Metric        : 1
Physical BW       : 1000000 kbits/sec
BCID             : RDM
Max Reservable BW : 750000 kbits/sec
Res Global BW     : 750000 kbits/sec
Res Sub BW        : 0 kbits/sec

Downstream::
Global Pool      Sub Pool
-----
Reservable BW[0]:      750000      0 kbits/sec
Reservable BW[1]:      750000      0 kbits/sec
Reservable BW[2]:      750000      0 kbits/sec
Reservable BW[3]:      750000      0 kbits/sec
Reservable BW[4]:      750000      0 kbits/sec
Reservable BW[5]:      750000      0 kbits/sec
Reservable BW[6]:      750000      0 kbits/sec
Reservable BW[7]:      750000      0 kbits/sec

Attribute Flags: 0x00000000
Attribute Names:

```

This table describes the significant fields shown in the display.

Table 37: show mpls traffic-eng link-management advertisements Command Field Descriptions

Field	Description
Link ID	Index of the link described.
Link IP Address	Local IP address of the link.
TE Metric	Metric value for the TE link configured under MPLS-TE.

Field	Description
IGP Metric	Metric value for the TE link configured under IGP.
Physical BW	Link bandwidth capacity (in kilobits per second).
BCID	Bandwidth constraint model ID (RDM or MAM).
Max Reservable BW	Maximum reservable bandwidth on this link.
Res Global BW	Maximum reservable of global pool/BC0 bandwidth on this link.
Res Sub BW	Reservable sub-bandwidth for sub-pool /BC1 bandwidth on this link.
SRLGs ²¹	Links that share a common fiber or a common physical attribute. If one link fails, other links in the group may also fail. Links in the group have a shared risk.
Downstream	Direction of the LSP path message.
Reservable BW[x]	Bandwidth available for reservations in the global TE topology and subpools.
Attribute Flags	Link attribute flags being flooded.
Attribute Names	Name of the affinity attribute of a link.
BC0	Bandwidth constraint value for class-type 0
BC1	Bandwidth constraint value for class-type 1
TE-class [index]	TE-class configured on this router at given index (mapping of class-type and priority), shows available bandwidth in that class.

²¹ SRLGs = Shared Risk Link Groups.

show mpls traffic-eng link-management bandwidth-allocation

To display current local link information, use the **show mpls traffic-eng link-management bandwidth-allocation** command in EXEC mode.

show mpls traffic-eng link-management bandwidth-allocation [*interface type interface-path-id*]

Syntax Description

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

Advertised and current information may differ depending on how flooding is configured.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management bandwidth-allocation** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link bandwidth-allocation interface POS 0/2/0/1
```

```
System Information::
  Links Count          : 4
  Bandwidth Hold time  : 15 seconds

Link ID:: POS0/2/0/1 (7.2.2.1)
Local Intf ID: 4
Link Status:
  Link Label Type      : PSC
  Physical BW          : 155520 kbits/sec
  BCID                 : MAM
  Max Reservable BW    : 1000 kbits/sec (reserved: 0% in, 0% out)
  BC0                  : 600 kbits/sec (reserved: 2% in, 2% out)
  BC1                  : 400 kbits/sec (reserved: 0% in, 0% out)
  MPLS-TE Link State   : MPLS-TE on, RSVP on, admin-up, flooded
  Inbound Admission    : allow-all
  Outbound Admission   : allow-if-room
  IGP Neighbor Count   : 2
  BW Descriptors       : 1 (including 0 BC1 descriptors)
  Admin Weight         : 1 (OSPF), 10 (ISIS)
Up Thresholds         : 15 30 45 60 75 80 85 90 95 96 97 98 99 100 (default)
Down Thresholds       : 100 99 98 97 96 95 90 85 80 75 60 45 30 15 (default)
```

Bandwidth Information::

Downstream BC0 (kbits/sec):

KEEP	PRIORITY	BW HELD	BW TOTAL HELD	BW LOCKED	BW TOTAL LOCKED
0		0		0	0
1		0		0	0
2		0		0	0
3		0		0	0
4		0		0	0
5		0		0	0
6		0		0	0
7		0		10	10

Downstream BC1 (kbits/sec):

KEEP	PRIORITY	BW HELD	BW TOTAL HELD	BW LOCKED	BW TOTAL LOCKED
0		0		0	0
1		0		0	0
2		0		0	0
3		0		0	0
4		0		0	0
5		0		0	0
6		0		0	0

This table describes the significant fields shown in the display.

Table 38: show mpls traffic-eng link-management bandwidth-allocation Command Field Descriptions

Field	Description
Links Count	Number of links configured for MPLS-TE.
Bandwidth Hold Time	Time, in seconds, that bandwidth can be held.

Field	Description
Link ID	Interface name and IP address of the link.
Link Label type	Label type of the link, for example: • PSC²² • TDM²³ • FSC²⁴
Physical BW	Link bandwidth capacity (in bits per second).
BCID	Bandwidth constraint model ID (RDM or MAM).
Max Reservable BW	Maximum reservable bandwidth on this link.
BC0	Maximum RSVP bandwidth in BC0.
BC1	Maximum RSVP bandwidth in BC1.
BW Descriptors	Number of bandwidth allocations on this link.
MPLS-TE Link State	Status of the link MPLS-TE-related functions.
Inbound Admission	Link admission policy for incoming tunnels.
Outbound Admission	Link admission policy for outgoing tunnels.
IGP Neighbor Count	IGP neighbors directly reachable over this link.
BW Descriptors	Internal bandwidth descriptors created when tunnels are admitted.
Admin Weight	Administrative weight associated with this link.
Up Thresholds	Threshold values used to determine link advertisement when available bandwidth increases.
Down Thresholds	Threshold values used to determine link advertisement when available bandwidth decreases.

²² PSC = Packet switch capable.

²³ TDM = Time-division multiplexing.

²⁴ FSC = Fiber switch capable.

show mpls traffic-eng link-management bfd-neighbors

To display TE-enabled Bidirectional Forwarding Detection (BFD) neighbors, use the **show mpls traffic-eng link-management bfd-neighbors** command in EXEC mode.

show mpls traffic-eng link-management bfd-neighbors [*interface type interface-path-id*]

Syntax Description

interface	(Optional) Displays information about the specified interface.
<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 possible 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 3.2	This command was introduced.
Release 3.8.0	The interface 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
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management bfd-neighbors** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management bfd-neighbors

Link ID:: POS0/6/0/0
BFD Neighbor Address: 7.3.3.1, State: Up
Link ID:: POS0/6/0/1
No BFD Neighbor
Link ID:: POS0/6/0/2
BFD Neighbor Address: 7.4.4.1, State: Down
```

This table describes the significant fields shown in the display.

Table 39: show mpls traffic-eng link-management bfd Command Field Descriptions

Field	Description
Link ID	Link by which the neighbor is reached.
BFD Neighbor Address	Neighbor address and Up/Down state.

Related Commands

Command	Description
bfd fast-detect (MPLS-TE)	Enables BFD for communication failure detection.
bfd minimum-interval (MPLS-TE)	Sets the BFD interval.
bfd multiplier (MPLS-TE)	Sets the BFD multiplier.

show mpls traffic-eng link-management igp-neighbors

To display Interior Gateway Protocol (IGP) neighbors, use the **show mpls traffic-eng link-management igp-neighbors** command in EXEC mode.

show mpls traffic-eng link-management igp-neighbors [**igp-id** {**isis** *isis-address*| **ospf** *ospf-id*} [**interface** *type interface-path-id*| *IP-address*]]

Syntax Description

igp-id	(Optional) Displays the IGP neighbors that are using a specified IGP identification.
isis <i>isis-address</i>	Displays the specified Intermediate System-to-Intermediate System (IS-IS) neighbor system ID when neighbors are displayed by IGP ID.
ospf <i>ospf-id</i>	Displays the specified Open Shortest Path first (OSPF) neighbor OSPF router ID when neighbors are displayed by IGP ID.
interface	(Optional) Displays information on the specified interface.
<i>type</i>	Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
<i>IP-address</i>	(Optional) IGP neighbors that are using a specified IGP IP address.

Command Modes

EXEC

Command History

Release	Modification
Release 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	Operations
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management igp-neighbors** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link igp-neighbors
  Link ID: POS0/7/0/0
    No Neighbors

  Link ID: POS0/7/0/1
    Neighbor ID: 10.90.90.90 (area: ospf   area 0, IP: 10.15.12.2)
```

This table describes the significant fields shown in the display.

Table 40: show mpls traffic-eng link-management igp-neighbors Command Field Descriptions

Field	Description
Link ID	Link by which the neighbor is reached.
Neighbor ID	IGP identification information for the neighbor.

show mpls traffic-eng link-management interfaces

To display interface resources, or a summary of link management information, use the **show mpls traffic-eng link-management interfaces** command in EXEC mode.

show mpls traffic-eng link-management interfaces [*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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 2.0	This command was introduced .
Release 3.4.1	No more than 100 links can be configured under MPLS-TE/fast reroute (FRR).
Release 3.8.0	This command was modified to include information specific to Multiprotocol Label Switching (MPLS) Shared Risk Link Groups (SRLG).
Release 3.9.0	The following modifications are included: • Sample output was modified to add the Attribute Names field. • More than 250 links can be configured under MPLS-TE.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 cannot configure more than 250 links under MPLS-TE.

SRLG values can be configured for the link.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following sample output is from the **show mpls traffic-eng link-management interfaces** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management interfaces GigabitEthernet0/2/0/1
```

```
System Information::
  Links Count          : 7 (Maximum Links Supported 250)

Link ID:: GigabitEthernet0/2/0/1 (12.9.0.1)
Local Intf ID: 28
Link Status:

  Link Label Type      : PSC
  Physical BW          : 1000000 kbits/sec
  BCID                 : RDM
  Max Reservable BW    : 10000 kbits/sec (reserved: 2% in, 2% out)
  BC0 (Res. Global BW) : 10000 kbits/sec (reserved: 2% in, 2% out)
  BC1 (Res. Sub BW)    : 0 kbits/sec (reserved: 100% in, 100% out)
  MPLS TE Link State   : MPLS TE on, RSVP on, admin-up
  Inbound Admission    : reject-huge
  Outbound Admission   : allow-if-room
  IGP Neighbor Count   : 1
  Max Res BW (RDM)     : 10000 kbits/sec
  BC0 (RDM)            : 10000 kbits/sec
  BC1 (RDM)            : 0 kbits/sec
  Max Res BW (MAM)     : 0 kbits/sec
  BC0 (MAM)            : 0 kbits/sec
  BC1 (MAM)            : 0 kbits/sec
  Attributes           : 0x4
  Attribute Names      : red2
  Flooding Status: (1 area)
    IGP Area[1]: OSPF 100 area 0, flooded
      Nbr: ID 12.9.0.2, IP 0.0.0.0 (Up)
      Admin weight: not set (TE), 1 (IGP)
```

This table describes the significant fields shown in the display.

Table 41: show mpls traffic-eng link-management interfaces Command Field Descriptions

Field	Description
Links Count	Number of links configured for MPLS-TE. Maximum number of links supported is 100.
Link ID	Link identification index.
Link Label Type	Label type assigned to the link.
Physical Bandwidth	Link bandwidth capacity (in kilobits per second).
BCID	Bandwidth constraint model ID (RDM or MAM).

Field	Description
Max Reservable BW	Maximum reservable bandwidth on this link.
BC0	Reservable bandwidth (in kbps) on this link in BC0.
BC1	Reservable bandwidth (in kbps) on this link in BC1.
Attributes	TE link attribute in hexadecimal.
Attribute Names	Name of the affinity attribute of a link.
SRLGs ²⁵ .	Links that share a common fiber or a common physical attribute. If one link fails, other links in the group may also fail. Links in the group have a shared risk.
MPLS-TE Link State	Status of the MPLS link.
Inbound Admission	Link admission policy for inbound tunnels.
Outbound Admission	Link admission policy for outbound tunnels.
IGP Neighbor Count	IGP ²⁶ neighbors directly reachable over this link.
Admin. Weight	Administrative weight associated with this link.
Flooding Status	Status for each configured area or Flooding status for the configured area.
IGP Area	IGP type and area and level used for TE flooding.

²⁵ SRLGs = Shared Risk Link Groups.

²⁶ IGP = Interior Gateway Protocol .

show mpls traffic-eng link-management statistics

To display interface resources or a summary of link management information, use the **show mpls traffic-eng link-management statistics** command in EXEC mode.

show mpls traffic-eng link-management statistics [**summary** | **interface** *type interface-path-id*]

Syntax Description

summary	(Optional) Displays the statistics summary.
interface	(Optional) Displays the interface for which information is requested.
<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 possible 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 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.

The **show mpls traffic-eng link-management statistics** command displays resource and configuration information for all configured interfaces.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following shows a sample output from the **show mpls traffic-eng link-management statistics** command using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management statistics summary
```

LSP Admission Statistics:

	Setup Requests	Setup Admits	Setup Rejects	Setup Errors	Tear Requests	Tear Preempts	Tear Errors
Path	13	12	1	0	10	0	0
Resv	8	8	0	0	5	0	0

Table 42: [show mpls traffic-eng link-management statistics summary Command Field Descriptions](#), on page 405 describes the significant fields shown in the display.

Table 42: show mpls traffic-eng link-management statistics summary Command Field Descriptions

Field	Description
Path	Path information.
Resv	Reservation information.
Setup Requests	Number of requests for a setup.
Setup Admits	Number of admitted setups.
Setup Rejects	Number of rejected setups.
Setup Errors	Number of setup errors.
Tear Requests	Number of tear requests.
Tear Preempts	Number of paths torn down due to preemption.
Tear Errors	Number of tear errors.

show mpls traffic-eng link-management summary

To display a summary of link management information, use the **show mpls traffic-eng link-management summary** command in EXEC mode.

show mpls traffic-eng link-management summary

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.4.1	No more than 100 links can be configured for MPLS-TE fast reroute (FRR).
	Release 3.9.0	No more than 250 links can be configured under MPLS-TE.

Usage Guidelines To use this command, you must be in a user group associated with a task 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 cannot configure more than 250 links for MPLS-TE/FRR.

Task ID	Task ID	Operations
	mpls-te	read

Examples The following sample output is from the **show mpls traffic-eng link-management summary** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management summary

System Information::
  Links Count          : 6 (Maximum Links Supported 100)
  Flooding System      : enabled
  IGP Areas Count      : 2

  IGP Areas
  -----
```

```

IGP Area[1]:: isis    level-2
Flooding Protocol    : ISIS
Flooding Status      : flooded
Periodic Flooding    : enabled (every 180 seconds)
Flooded Links        : 4
IGP System ID        : 0000.0000.0002.00
MPLS-TE Router ID    : 20.20.20.20
IGP Neighbors        : 8

IGP Area[2]:: ospf    area 0
Flooding Protocol    : OSPF
Flooding Status      : flooded
Periodic Flooding    : enabled (every 180 seconds)
Flooded Links        : 4
IGP System ID        : 20.20.20.20
MPLS-TE Router ID    : 20.20.20.20
IGP Neighbors        : 8

```

This table describes the significant fields shown in the display.

Table 43: show mpls traffic-eng link-management summary Command Field Descriptions

Field	Description
Links Count	Number of links configured for MPLS-TE. Maximum number of links supported is 100.
Flooding System	Enable status of the MPLS-TE flooding system.
IGP Areas Count	Number of IGP ²⁷ areas described.
IGP Area	IGP type and area and level used for TE flooding.
Flooding Protocol	IGP flooding information for this area.
Flooding Status	Status of flooding for this area.
Periodic Flooding	Status of periodic flooding for this area.
Flooded Links	Links that were flooded.
IGP System ID	IGP for the node associated with this area.
MPLS-TE Router ID	MPLS-TE router ID for this node.
IGP Neighbors	Number of reachable IGP neighbors associated with this area.

²⁷ IGP = Interior Gateway Protocol.

show mpls traffic-eng lmp

To display operation details about the status of the Link Management Protocol (LMP) instance and neighbor, IPCC, and MPLS-TE links, use the **show mpls traffic-eng lmp** command in EXEC mode.

show mpls traffic-eng lmp [*interface type interface-path-id*] **ipcc** | **neighbor** [*name*] | **statistics**

Syntax Description

interface	(Optional) Displays information on the specified interface.
<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.
ipcc	(Optional) Displays information for LMP Internet Protocol Control Channel (IPCC).
neighbor [<i>name</i>]	(Optional) Displays information for the LMP neighbor.
statistics	(Optional) Displays information for the statistics.

Command Default

No default behavior or values

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.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following sample output shows summary information for the local LMP protocol. One remote LMP neighbor named gmpls4 with the node ID 44.44.44.44. The neighbor has one MPLS-TE link (GigabitEthernet0/5/0/1) that has a local MPLS-TE link ID of 10.5.1.4, and data link ID of 21. The data link LMP state is "Up Allocated", which means that the LMP state is up and is being used by the GMPLS protocol as part of an optical tunnel.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng lmp
```

```
MPLS TE LMP Node ID: 11.11.11.11
```

```
LMP Neighbor
Name: gmpls4, IP: 44.44.44.44, Owner: MPLS TE
LMP: Enabled
LMP Hellos: Enabled by configuration
IPCC ID: 1, State Up
LMP UDP port: 701
  Known via      : Configuration
  Type           : Routed
  Destination IP  : 44.44.44.44
  Source IP      : 11.11.11.11
```

Data Link I/F	Lcl Data Link ID	Lcl TE Link ID	Data Link LMP state
GigabitEthernet0/5/0/1	21	10.5.1.4	Up Allocated

The following sample output shows that one routed IPCC to LMP neighbor, gmpls4, is in the up state and has ID of 1:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng lmp ipcc
```

IPCC ID	Type	IP	Neighbor Status	Name
1	Routed	44.44.44.44	Up	gmpls4

The following sample output shows the IPCC and MPLS-TE link information for all the configured LMP neighbors:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng lmp neighbor
```

```
LMP Neighbor
Name: gmpls4, IP: 44.44.44.44, Owner: MPLS TE
LMP: Enabled
LMP Hellos: Enabled by configuration
IPCC ID: 1, State Up
LMP UDP port: 701
  Known via      : Configuration
  Type           : Routed
  Destination IP  : 44.44.44.44
  Source IP      : 11.11.11.11
```

Data Link I/F	Lcl Data Link ID	Lcl TE Link ID	Data Link LMP state
GigabitEthernet0/5/0/1	21	10.5.1.4	Up Allocated

The following sample output shows IPCC and MPLS-TE link information for a specified LMP neighbor, gmpls4:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng lmp neighbor gmpls4

LMP Neighbor
Name: gmpls4, IP: 44.44.44.44, Owner: MPLS TE
LMP: Enabled
LMP Hellos: Enabled by configuration
IPCC ID: 1, State Up
LMP UDP port: 701
  Known via      : Configuration
  Type           : Routed
  Destination IP  : 44.44.44.44
  Source IP       : 11.11.11.11

Data Link I/F      | Lcl Data Link ID | Lcl TE Link ID | Data Link LMP state
-----+-----+-----+-----
GigabitEthernet0/5/0/1 | 21              | 10.5.1.4       | Up Allocated
```

The following sample output shows detailed information for MPLS-TE, data link, and IPCC properties for a specified local interface that is configured as an LMP MPLS-TE link:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng lmp interface gigabitEthernet 0/5/0/1

Interface: GigabitEthernet0/5/0/1
  Owner: MPLS TE
  LMP for TE Link: Enabled
  LMP Link Summary Last Error(s): None
  Local data link ID type: Unnumbered
  Local data link ID: Dec = 21, Hex = 0x15
  Local TE link ID type: IPv4
  Local TE link ID: 10.5.1.4
  Local TE link switching capability: Packet-Switch Capable-1 (PSC-1)
  Remote neighbor name: gmpls4
  Remote neighbor node ID: 44.44.44.44
  Remote TE link ID type: IPv4
  Remote TE link ID: 10.5.1.1
  Remote data link ID type: Unnumbered
  Remote data link ID: Dec = 13, Hex = 0xd
  Remote TE link switching capability: Packet-Switch Capable-1 (PSC-1)
  Data link I/F state: Up
  Data link LMP state: Up/Allocated
  TE link LMP state: Up
  Data link allocation status: Allocated
  IPCC ID: 1
  IPCC type: Routed
  IPCC destination IP address: 44.44.44.44
  Local Min Reservable Bandwidth: 125000000 bytes/sec
  Local Max Reservable Bandwidth: 125000000 bytes/sec
  Nbr Min Reservable Bandwidth: 125000000 bytes/sec
  Nbr Max Reservable Bandwidth: 125000000 bytes/sec
  Local Link Encoding Type: Ethernet
  Nbr Link Encoding Type: Ethernet
  VRF ID: Default [0x60000000] (Supported)
```

The following sample output shows detailed LMP protocol signaling statistics per neighbor and for all MPLS-TE links if LMP is running in nonstatic mode:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng lmp statistics

LMP Neighbor
Name: gmpls4, IP: 44.44.44.44, Owner: MPLS TE
  Transmit Msg Id: 33
  Receive Msg Id: 33
  Link Summ msgs Transmitted: 32
  Link Summ msgs Received: 33
```



```

IPCC ID: 1, State Up
Hello Interval: 2000 (msec)
Minimum Acceptable Hello Interval: 100 (msec)
Maximum Acceptable Hello Interval: 21845 (msec)
Hello Dead Interval: 6000 (msec)
Minimum Acceptable Hello Dead Interval: 300 (msec)
Maximum Acceptable Hello Dead Interval: 65535 (msec)
No. of packets transmitted: 380
No. of packets Received: 377
Tx Seq No.: 374
Rx Seq No.: 374
Transmit Msg Id: 1
Receive Msg Id: 1
Link Summ msgs Transmitted: 32
Link Summ msgs Received: 33

```

Data Link I/F	Lcl Data Link ID	Lcl TE Link ID	Rcvd_Msg_Id	Xmt_Msg_Id
GigabitEthernet0/5/0/1	21	10.5.1.4	33	33

Related Commands

Command	Description
ipcc interface (MPLS-TE), on page 257	Configures an IPCC.
lmp neighbor (MPLS-TE), on page 274	Configure or updates a LMP neighbor and its associated parameters and enters MPLS-TE neighbor configuration mode.

show mpls traffic-eng maximum tunnels

To display the maximum number of MPLS-TE tunnels that you can configure, use the **show mpls traffic-eng maximum tunnels** command in EXEC mode.

show mpls traffic-eng maximum tunnels

Syntax Description This command has no keywords or arguments.

Command Default None

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.8.0	Sample output was modified.
	Release 3.9.0	Sample output was modified to support the Point-to-Multipoint (P2MP) feature.
	Release 4.0.0	Sample output was modified to support the maximum number of allowed automatic backup tunnels.
	Release 4.1.1	Sample output was modified to support the maximum number of allowed automatic mesh tunnels.

Usage Guidelines To use this command, you must be in a user group associated with a task 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
	mpls-te	read

Examples This is sample output from the **show mpls traffic-eng maximum tunnels** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng maximum tunnels
Maximum Global Tunnel Count:
```

Maximum	Current Count
-----	-----
4096	2

Maximum P2MP Tunnel Count:

Maximum	Current Count
-----	-----
500	

Maximum Global Destination Count:

Maximum	Current Count
-----	-----
4096	2

Maximum AutoTunnel Backup Count:

Maximum	Current Count
-----	-----
200	122

This is sample output of the automatic mesh tunnels from the **show mpls traffic-eng maximum tunnels** command:

RP/0/RP0/CPU0:router# **show mpls traffic-eng maximum tunnels**

Maximum Global Tunnel Count:

Maximum	Current Count
-----	-----
4096	12

Maximum Static Tunnel Count:

Maximum	Current Count
-----	-----
4096	8

Maximum Auto-tunnel Mesh Count:

Maximum	Current Count
-----	-----
201	3

Maximum P2MP Tunnel Count:

Maximum	Current Count
-----	-----
500	1

Maximum Global Destination Count:

Maximum	Current Count
-----	-----
4096	13

Maximum GMPLS-UNI Tunnel Count:

Maximum	Current Count
-----	-----
500	39

Table 44: [show mpls traffic-eng maximum tunnels Command Field Descriptions](#), on page 414 describes the significant fields shown in the display.

Table 44: show mpls traffic-eng maximum tunnels Command Field Descriptions

Field	Description
Maximum Global Tunnel Count	Maximum number of tunnel interfaces (all TE tunnel types, tunnel-te, tunnel-mte, and tunnel-gte) that can be configured.
Maximum P2MP Tunnel Count	Maximum number of P2MP tunnels that can be configured.
Maximum Global Destination Count	Maximum number of tunnel destinations that can be configured.
Maximum	Table heading for the maximum number in each category.
Current Count	Table heading for the current count in each category.
Maximum AutoTunnel Backup Count	Maximum number of automatic backup tunnels that can be configured.
Maximum GMPLS UNI Tunnel Count	Maximum number of Generalized Multiprotocol Label Switching (GMPLS) User-Network Interface (UNI) tunnels that can be configured and the current tunnel count.
Maximum AutoTunnel Mesh Count	Maximum number of automatic mesh tunnels that can be configured.

Related Commands

Command	Description
maxabs (MPLS-TE) , on page 286	Specifies the maximum number of tunnel TE interfaces that can be configured.
tunnel-id (auto-tunnel backup) , on page 493	Configures the range of tunnel interface numbers used for automatic backup tunnels.

show mpls traffic-eng pce peer

To display the status of the path computation element (PCE) peer address and state, use the **show mpls traffic-eng pce peer** command in EXEC mode.

show mpls traffic-eng pce peer [*address* | **all**]

Syntax Description

<i>address</i>	(Optional) IPv4 peer address for the PCE.
all	(Optional) Displays all the peers for the PCE.

Command Default

No default behavior or values

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.

Task ID

Task ID	Operations
mpls-te	read

Examples

The following sample output shows the status of both the PCE peer and state:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng pce peer
```

```
PCE Address 202.202.88.8
State Up
  PCEP has been up for: 04:18:31
Learned through:
  OSPF 1
Sending KA every 30 s
Time out peer if no KA received for 120 s
Tolerance: Minimum KA 10 s
KA messages rxed 518 txed 517
PCEReq messages rxed 0, txed 0
PCERep messages rxed 0, txed 0
```

```

PCEErr messages rxed 0, txed 0
  Last error received: None
  Last error sent: None
PCE OPEN messages: rxed 1, txed 2
PCEP session ID: local 0, remote 0

Average reply time from peer: 0 ms
Minimum reply time from peer: 0 ms
Maximum reply time from peer: 0 ms
0 requests timed out with this peer
Transmit TCP buffer: Current 0, Maximum 12
Receive TCP buffer: Current 0, Maximum 12

```

This table describes the significant fields shown in the display.

Table 45: show mpls traffic-eng pce peer Field Descriptions

Field	Description
KA	PCEP keepalive.
Learned through	Learned through is how the peer was learned which is either through a static configuration or an IGP.
Average reply time from peer	Average reply time for the peer to respond to PCEReq request messages with PCERep response messages.
Minimum reply time from peer	Minimum reply time for the peer to respond to PCEReq request messages with PCERep response messages.
Maximum reply time from peer	Maximum reply for the peer to respond to PCEReq request messages with PCERep response messages.
Transmit TCP buffer Receive TCP Buffer	Number of messages that are in the TCP buffer with the peer waiting to be sent or processed locally.
0 requests timed out with this peer	Number of PCEReq messages that timed out waiting for a response from this peer.

Related Commands

Command	Description
clear mpls traffic-eng pce , on page 207	Clears the PCE statistics.
pce address (MPLS-TE) , on page 328	Configures the IPv4 self address for a PCE.
pce peer (MPLS-TE) , on page 334	Configures an IPv4 self address for a PCE peer.

show mpls traffic-eng pce tunnels

To display the status of the path computation element (PCE) tunnels, use the **show mpls traffic-eng pce tunnels** command in EXEC mode.

show mpls traffic-eng pce tunnels [*tunnel-id*]

Syntax Description	<i>tunnel-id</i> (Optional) Tunnel identifier. The range is 0 to 4294967295.

Command Default	No default behavior or values

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.

Task ID	Task ID	Operations
	mpls-te	read

Examples	The following sample output shows the status of the PCE tunnels:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng pce tunnels
```

```
Tunnel : tunnel-te10
  Destination : 205.205.10.10
  State : down, PCE failed to find path

Tunnel : tunnel-te30
  Destination : 3.3.3.3
  State : up
  Current path option: 10, path obtained from dynamically learned PCE 1.2.3.4
  Admin weight : 15
  Hop Count : 3
```

This table describes the significant fields shown in the display.

Table 46: show mpls traffic-eng pce tunnels Command Field Descriptions

Field	Description
Tunnel	Tunnel number for the MPLS-TE tunnel interface.
Destination	IP address of the destination of the tunnel.
State	State of the tunnel. Values are up, down, or admin-down.
Admin weight	Administrative weight (cost) of the link.

Related Commands

Command	Description
pce address (MPLS-TE), on page 328	Configures the IPv4 self address for a PCE.

show mpls traffic-eng preemption log

To display the log of preemption events, use the **show mpls traffic-eng preemption log** command in EXEC mode.

show mpls traffic-eng preemption log

Syntax Description	log	Displays a log of preemption events.

Command Default None

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
	mpls-te	read

Examples This is sample output from the **show mpls traffic-eng preemption log** command displaying the log of preemption events:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng preemption log
Bandwidth Change on GigabitEthernet0/0/0/0
Old BW (BC0/BC1): 200000/100000, New BW (BC0/BC1): 1000/500 kbps
BW Overshoot (BC0/BC1): 1000/0 kbps
Preempted BW (BC0/BC1): 35000/0 kbps; Soft 30000/0 kbps; Hard 5000/0 kbps;
Preempted 2 tunnels; Soft 1 tunnel; Hard 1 tunnel
```

TunID	LSP ID	Source	Destination	Preempt Type	Pri S/H	Bandwidth (in kbps)	BW Type
1	10002	192.168.0.1	1.0.0.0	Hard	7/7	5000	BC0
1	2	192.168.0.1	192.168.0.4	Soft	7/7	30000	BC0

show mpls traffic-eng topology

To display the current MPLS-TE network topology for the node, use the **show mpls traffic-eng topology** command in EXEC mode.

show mpls traffic-eng topology [*IP-address*] [**affinity**] [**brief**] [**link-only**] [**bandwidth** *number*] [**exclude-srlg** *exclude-srlg-interface-address*] [**explicit-path** {**identifier** *explicit-path-id-number* | **name** *explicit-path-name*}] [**priority** *level*] [**isis** *nsap-address*] [**ospf** *ospf-address*] [**path** { **destination** *IP-address* | **tunnel** *P2P-tunnel-number* }] [**p2mp** *P2MP tunnel-number*]]] {**router** | **network**}} [**model-type** {**rdm** | **mam**}]

Syntax Description

<i>IP-address</i>	(Optional) Node IP address (router identifier to interface address).
destination <i>IP-address</i>	Displays the LSP destination IPv4 address.
exclude-srlg	Specifies an IP address to get SRLG values from for exclusion.
explicit-path	Displays the explicit LSP path.
tunnel	Displays the topology path that is based on the Point-to-Point (P2P) tunnel number.
<i>P2P -tunnel-number</i>	P2P tunnel number. Range is 0 to 65535.
affinity	(Optional) Displays the attribute values that are required for links carrying this tunnel. A 32-bit decimal number. Range is 0x0 to 0xFFFFFFFF, representing 32 attributes (bits), where the value of an attribute is 0 or 1.
bandwidth <i>number</i>	(Optional) Displays the bandwidth value that is required by this label switched path (LSP).
priority <i>level</i>	(Optional) Displays the priority used when signaling a LSP for this tunnel, to determine which existing tunnels can be preempted.
isis <i>nsap-address</i>	(Optional) Displays the node router identification, if Intermediate System-to-Intermediate System (IS-IS) is enabled.

ospf <i>ospf-address</i>	(Optional) Displays the node router identifier, if Open Shortest Path First (OSPF) is enabled.
path	(Optional) Displays the path to a destination from this router.
router	Displays the given OSPF address type of the router node.
network	Displays the given OSPF address type of the network node.
brief	(Optional) Displays the brief form of the output that provides a less detailed version of the topology.
link-only	(Optional) Displays the MPLS-TE topology that is filtered by the given neighbor address.
model-type { rdm mam }	(Optional) Displays the bandwidth constraints model type, RDM or MAM.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.8.0	This command was modified to include information specific to MPLS Shared Risk Link Groups (SRLG).
	Release 3.9.0	These enhancements are listed: • The tunnel keyword and <i>P2P tunnel-number</i> argument were added. • The p2mp keyword and <i>P2MP tunnel-number</i> argument were added. • The destination keyword and <i>IP-address</i> argument were added. • The link-only keyword was added. • The affinity keyword was modified. • Sample output was modified to display the Attribute Names field.

Release	Modification
Release 4.0.0	These enhancements are listed: • The exclude-srlg keyword and <i>exclude-srlg-interface-address</i> argument were added. • explicit-path keyword and <i>explicit-path-id-number</i> argument were added. • Sample output was added to support the additional keywords and arguments. • Sample output was added to show the SRLG 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
mpls-te	read, write

Examples

The following shows a sample output from the **show mpls traffic-eng topology** command specifying the tunnel number in brief form:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology path tunnel 160

Tunnel160 Path Setup to 10.10.10.10: FULL_PATH
bw 100 (CT0), min_bw 0, metric: 10
setup_pri 7, hold_pri 7
affinity_bits 0x0, affinity_mask 0xffff
Hop0:10.2.2.1
Hop1:10.10.10.10
```

The following shows a sample output from the **show mpls traffic-eng topology** command specifying the topology path for the P2MP tunnel number:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology path tunnel p2mp 4 destination 5.5.5.5

Tue Sep 15 14:55:19.556 UTC
Tunnel4 Path Setup to 5.5.5.5:
bw 0 (CT0), min_bw 1, metric: 1
setup_pri 7, hold_pri 7
affinity_bits 0x0, affinity_mask 0xffff
Hop0:56.0.0.5
Hop1:5.5.5.5
```

The following shows a sample output from the **show mpls traffic-eng topology** command specifying the destination IP address:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology path destination 10.10.10.10

Path Setup to 10.10.10.10:
```

```

bw 0 (CT0), min_bw 999900, metric: 10
setup_pri 7, hold_pri 7
affinity_bits 0x0, affinity_mask 0xffffffff
Hop0:10.2.2.1
Hop1:10.10.10.10

```

The following sample output shows the MPLS-TE network topology with the name of the affinity attribute of the link:

RP/0/RP0/CPU0:router# **show mpls traffic-eng topology**

```

Link[1]:Point-to-Point, Nbr IGP Id:3.3.3.3, Nbr Node Id:9, gen:23
Frag Id:25, Intf Address:13.9.1.1, Intf Id:0
Nbr Intf Address:13.9.1.3, Nbr Intf Id:0
TE Metric:1, IGP Metric:1, Attribute Flags:0x0
Attribute Names:
Switching Capability:, Encoding:
BC Model ID:RDM
Physical BW:155520 (kbps), Max Reservable BW Global:116640 (kbps)
Max Reservable BW Sub:0 (kbps)

```

	Total Allocated BW (kbps)	Global Pool Reservable BW (kbps)	Sub Pool Reservable BW (kbps)
	-----	-----	-----
bw[0]:	0	116640	0
bw[1]:	0	116640	0
bw[2]:	0	116640	0
bw[3]:	0	116640	0
bw[4]:	0	116640	0
bw[5]:	0	116640	0
bw[6]:	0	116640	0
bw[7]:	0	116640	0

```

Link[2]:Broadcast, DR:12.9.0.2, Nbr Node Id:1, gen:23
Frag Id:28, Intf Address:12.9.0.1, Intf Id:0
Nbr Intf Address:0.0.0.0, Nbr Intf Id:0
TE Metric:1, IGP Metric:1, Attribute Flags:0x4
Attribute Names: red2
Switching Capability:, Encoding:
BC Model ID:RDM
Physical BW:1000000 (kbps), Max Reservable BW Global:10000 (kbps)
Max Reservable BW Sub:0 (kbps)

```

	Total Allocated BW (kbps)	Global Pool Reservable BW (kbps)	Sub Pool Reservable BW (kbps)
	-----	-----	-----
bw[0]:	0	10000	0
bw[1]:	0	10000	0
bw[2]:	0	10000	0
bw[3]:	0	10000	0
bw[4]:	0	10000	0
bw[5]:	0	10000	0
bw[6]:	0	10000	0
bw[7]:	0	10000	0

The following shows a sample output from the **show mpls traffic-eng topology** command in detail form in prestandard DS-TE mode:

RP/0/RP0/CPU0:router# **show mpls traffic-eng topology**

```

My_System_id: 0000.0000.0002.00 (isis level-2)
My_System_id: 20.20.20.20 (ospf area 0)
My_BC_Model_Type: RDM

```

```

Signalling error holddown: 10 sec Global Link Generation 36

```

```

IGP Id: 0000.0000.0002.00, MPLS-TE Id: 20.20.20.20 Router Node (isis level-2)

```

```

Link[0]:Point-to-Point, Nbr IGP Id:0000.0000.0003.00, Nbr Node Id:3, gen:36
Frag Id:0, Intf Address:7.3.3.1, Intf Id:0

```

show mpls traffic-eng topology

```

    Nbr Intf Address:7.3.3.2, Nbr Intf Id:0
    TE Metric:10, IGP Metric:10, Attribute Flags:0x0
    SRLGs: 10, 20
    Switching Capability:, Encoding:
    BC Model ID:RDM
    Physical BW:155520 (kbps), Max Reservable BW Global:100000 (kbps)
    Max Reservable BW Sub:50000 (kbps)

```

	Total Allocated BW (kbps)	Global Pool Reservable BW (kbps)	Sub Pool Reservable BW (kbps)
	-----	-----	-----
bw[0]:	0	100000	50000
bw[1]:	0	100000	50000
bw[2]:	0	100000	50000
bw[3]:	0	100000	50000
bw[4]:	0	100000	50000
bw[5]:	0	100000	50000
bw[6]:	0	100000	50000
bw[7]:	0	100000	50000

The following shows a sample output from the **show mpls traffic-eng topology** command in detail form in IETF DS-TE mode.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology
```

```

My_System_id: 0000.0000.0001.00 (isis 1 level-2)
My_System_id: 10.10.10.10 (ospf 100 area 0)
My_BC_Model_Type: MAM

Signalling error holddown: 10 sec Global Link Generation 84

IGP Id: 0000.0000.0001.00, MPLS-TE Id: 10.10.10.10 Router Node (isis 1 level-2)

Link[0]:Point-to-Point, Nbr IGP Id:0000.0000.0002.00, Nbr Node Id:6, gen:84
  Frag Id:0, Intf Address:7.2.2.1, Intf Id:0
    Nbr Intf Address:7.2.2.2, Nbr Intf Id:0
    TE Metric:10, IGP Metric:10, Attribute Flags:0x0
    SRLGs: 10, 20
    Switching Capability:, Encoding:
    BC Model ID:MAM
    Physical BW:155520 (kbps), Max Reservable BW:1000 (kbps)
    BC0:600 (kbps) BC1:400 (kbps)

```

	Total Allocated BW (kbps)	Reservable BW (kbps)
	-----	-----
TE-class[0]:	10	590
TE-class[1]:	0	400
TE-class[2]:	0	0
TE-class[3]:	0	0
TE-class[4]:	0	600
TE-class[5]:	0	400

```

Link[1]:Point-to-Point, Nbr IGP Id:0000.0000.0002.00, Nbr Node Id:6, gen:84
  Frag Id:0, Intf Address:7.1.1.1, Intf Id:0
    Nbr Intf Address:7.1.1.2, Nbr Intf Id:0
    TE Metric:10, IGP Metric:10, Attribute Flags:0x0
    SRLGs: 10, 20
    Switching Capability:, Encoding:
    BC Model ID:MAM
    Physical BW:155520 (kbps), Max Reservable BW:1000 (kbps) BC0:600 (kbps) BC1:400
(kbps)

```

	Total Allocated BW (kbps)	Reservable BW (kbps)
	-----	-----
TE-class[0]:	10	590
TE-class[1]:	0	400
TE-class[2]:	0	0
TE-class[3]:	0	0
TE-class[4]:	0	600
TE-class[5]:	0	400
TE-class[6]:	0	0

```
TE-class[7]:          0          0
```

The following shows a sample output for the **show mpls traffic-eng topology** command in brief form:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology 192.168.0.145 brief

IGP Id: 0000.0000.0010.00, MPLS TE Id: 192.168.0.145 Router Node (ISIS test level-1)
Link[0]:Point-to-Point, Nbr IGP Id:0000.0000.0234.00, Nbr Node Id:4, gen:5
  Frag Id:0, Intf Address:10.3.11.145, Intf Id:0
  Nbr Intf Address:10.3.11.143, Nbr Intf Id:0
  TE Metric:10, IGP Metric:10, Attribute Flags:0x0
  SRLGs: 10, 20
  Attribute Names: red2
  Switching Capability:, Encoding:
  BC Model ID:RDM
  Physical BW:155520 (kbps), Max Reservable BW Global:0 (kbps)
  Max Reservable BW Sub:0 (kbps)
```

The following sample output shows a brief topology for the affinity attributes:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology affinity

affinity
Mon Mar 23 13:25:47.236 EST EST
My_System_id: 1.1.1.1 (OSPF 100 area 0)
My_System_id: 0000.0000.0001.00 (IS-IS 100 level-2)
My_BC_Model_Type: RDM

Signalling error holddown: 10 sec Global Link Generation 233

IGP Id: 0000.0000.0001.00, MPLS TE Id: 11.11.1.1 Router Node (IS-IS 100 level-2)

IGP Id: 1.1.1.1, MPLS TE Id: 1.1.1.1 Router Node (OSPF 100 area 0)
Link[0]:      Intf Address: 12.9.1.1, Nbr Intf Address: 12.9.1.2
  Attribute Flags: 0x0
  Attribute Names:
Link[1]:      Intf Address: 13.9.1.1, Nbr Intf Address: 13.9.1.3
  Attribute Flags: 0x0
  Attribute Names:
Link[2]:      Intf Address: 12.9.0.1, DR: 12.9.0.2
  Attribute Flags: 0x4
  Attribute Names: red2
Link[3]:      Intf Address: 14.9.0.1, DR: 14.9.0.4
  Attribute Flags: 0x0
  Attribute Names:
Link[4]:      Intf Address: 13.9.0.1, DR: 13.9.0.3
  Attribute Flags: 0x0
  Attribute Names:

IGP Id: 4.4.4.4, MPLS TE Id: 4.4.4.4 Router Node (OSPF 100 area 0)
Link[0]:      Intf Address: 34.9.1.4, Nbr Intf Address: 34.9.1.3
  Attribute Flags: 0x0
  Attribute Names:
Link[1]:      Intf Address: 14.9.0.4, DR: 14.9.0.4
  Attribute Flags: 0x1e
  Attribute Names: red1 red2 red3 red4
Link[2]:      Intf Address: 24.9.0.4, DR: 24.9.0.4
  Attribute Flags: 0x0
  Attribute Names:
Link[3]:      Intf Address: 34.9.0.4, DR: 34.9.0.3
  Attribute Flags: 0x0
  Attribute Names:
Link[4]:      Intf Address: 24.9.1.4, Nbr Intf Address: 24.9.1.2
  Attribute Flags: 0x0
  Attribute Names:
```

The following sample output for the **show mpls traffic-eng topology** command that shows the output to a single link:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology 12.9.1.1 link-only

Wed Sep  2 13:24:48.821 EST

IGP Id: 0000.0000.0002.00, MPLS TE Id: 2.2.2.2 Router Node  (IS-IS 100 level-2)

Link[0]:Point-to-Point, Nbr IGP Id:0000.0000.0001.00, Nbr Node Id:-1, gen:277740
Frag Id:0, Intf Address:12.9.1.2, Intf Id:0
Nbr Intf Address:12.9.1.1, Nbr Intf Id:0
TE Metric:10, IGP Metric:10, Attribute Flags:0x0
Attribute Names:
Switching Capability:, Encoding:
BC Model ID:RDM
Physical BW:155520 (kbps), Max Reservable BW Global:116640 (kbps)
Max Reservable BW Sub:0 (kbps)

```

	Total Allocated BW (kbps)	Global Pool Reservable BW (kbps)	Sub Pool Reservable BW (kbps)
	-----	-----	-----
bw[0]:	0	116640	0
bw[1]:	0	116640	0
bw[2]:	0	116640	0
bw[3]:	0	116640	0
bw[4]:	0	116640	0
bw[5]:	0	116640	0
bw[6]:	0	116640	0
bw[7]:	0	116640	0

```

IGP Id: 2.2.2.2, MPLS TE Id: 2.2.2.2 Router Node  (OSPF 100 area 0)

Link[3]:Point-to-Point, Nbr IGP Id:1.1.1.1, Nbr Node Id:-1, gen:277737
Frag Id:29, Intf Address:12.9.1.2, Intf Id:0
Nbr Intf Address:12.9.1.1, Nbr Intf Id:0
TE Metric:1, IGP Metric:1, Attribute Flags:0x0
Attribute Names:
Switching Capability:, Encoding:
BC Model ID:RDM
Physical BW:155520 (kbps), Max Reservable BW Global:116640 (kbps)
Max Reservable BW Sub:0 (kbps)

```

	Total Allocated BW (kbps)	Global Pool Reservable BW (kbps)	Sub Pool Reservable BW (kbps)
	-----	-----	-----
bw[0]:	0	116640	0
bw[1]:	0	116640	0
bw[2]:	0	116640	0
bw[3]:	0	116640	0
bw[4]:	0	116640	0
bw[5]:	0	116640	0
bw[6]:	0	116640	0
bw[7]:	0	116640	0

The following shows a sample output for the **show mpls traffic-eng topology model-type mam** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng topology model-type mam

IGP Id: 0000.0000.0001.00, MPLS-TE Id: 10.10.10.10 Router Node  (isis 1 level-2)
Link[0]:      Intf Address:7.2.2.1, Nbr Intf Address:7.2.2.2
Link[1]:      Intf Address:7.1.1.1, Nbr Intf Address:7.1.1.2

IGP Id: 0000.0000.0002.00, MPLS-TE Id: 20.20.20.20 Router Node  (isis 1 level-2)
Link[0]:      Intf Address:7.2.2.2, Nbr Intf Address:7.2.2.1
Link[1]:      Intf Address:7.1.1.2, Nbr Intf Address:7.1.1.1
Link[2]:      Intf Address:7.3.3.1, Nbr Intf Address:7.3.3.2

IGP Id: 0000.0000.0003.00, MPLS-TE Id: 30.30.30.30 Router Node  (isis 1 level-2)
```


Link[0]: Intf Address:7.3.3.2, Nbr Intf Address:7.3.3.1

The following shows a sample output from the **show mpls traffic-eng topology** command specifying the topology for the SRLG interfaces:

RP/0/RP0/CPU0:router# **show mpls traffic-eng topology srlg**

Tue Oct 6 13:10:30.342 UTC

My_System_id: 0000.0000.0005.00 (IS-IS 1 level-2)

SRLG	Interface Addr	TE Router ID	IGP Area ID
1	51.1.2.1	100.0.0.1	IS-IS 1 level-2
2	51.1.2.1	100.0.0.1	IS-IS 1 level-2
3	51.1.2.1	100.0.0.1	IS-IS 1 level-2
4	51.1.2.1	100.0.0.1	IS-IS 1 level-2
5	51.1.2.1	100.0.0.1	IS-IS 1 level-2
6	51.1.2.1	100.0.0.1	IS-IS 1 level-2
7	51.1.2.1	100.0.0.1	IS-IS 1 level-2
8	51.1.2.1	100.0.0.1	IS-IS 1 level-2
10	50.4.5.5	100.0.0.5	IS-IS 1 level-2
30	50.4.5.5	100.0.0.5	IS-IS 1 level-2
77	50.4.5.5	100.0.0.5	IS-IS 1 level-2
88	50.4.5.5	100.0.0.5	IS-IS 1 level-2
1500	50.4.5.5	100.0.0.5	IS-IS 1 level-2
10000000	50.4.5.5	100.0.0.5	IS-IS 1 level-2
4294967290	50.4.5.5	100.0.0.5	IS-IS 1 level-2
4294967295	50.4.5.5	100.0.0.5	IS-IS 1 level-2

The following shows a sample output from the **show mpls traffic-eng topology path destination** command specifying the topological path with SRLG exclusion:

RP/0/RP0/CPU0:router# **show mpls traffic-eng topology path destination 100.0.0.2 exclude-srlg 50.4.5.5 isis 1 level 2**

Tue Oct 6 13:13:44.053 UTC

Path Setup to 100.0.0.2:

bw 0 (CT0), min_bw 0, metric: 20

setup_pri 7, hold_pri 7

affinity_bits 0x0, affinity_mask 0xffff

Exclude SRLG Intf Addr : 50.4.5.5

SRLGs Excluded: 10, 30, 77, 88, 1500, 10000000

4294967290, 4294967295

Hop0:50.5.1.5

Hop1:50.5.1.1

Hop2:51.1.2.1

Hop3:51.1.2.2

Hop4:100.0.0.2

The following shows a sample output from the **show mpls traffic-eng topology path destination** command specifying the topological path based on a given explicit path:

RP/0/RP0/CPU0:router# **show mpls traffic-eng topology path destination 100.0.0.2 explicit-path name exclude-srlg isis 1 level 2**

Tue Oct 6 13:16:44.233 UTC

Path Setup to 100.0.0.2:

bw 0 (CT0), min_bw 0, metric: 20

setup_pri 7, hold_pri 7

affinity_bits 0x0, affinity_mask 0xffff

SRLGs Excluded: 10, 30, 77, 88, 1500, 10000000

4294967290, 4294967295, 1, 2, 3, 4

5, 6, 7, 8

Hop0:50.5.1.5

Hop1:50.5.1.1

Hop2:50.1.2.1

Hop3:50.1.2.2

Hop4:100.0.0.2

This table describes the significant fields shown in the display.

Table 47: show mpls traffic-eng topology Field Descriptions

Field	Description
My_System_id	IGP ²⁸ system or IGP router ID.
Signalling error holddown	Link hold-down timer configured to handle path error events to exclude link from topology.
IGP Id	Identification of the advertising router.
Link	MPLS-TE link.
Frag Id	GP LSA ²⁹ fragment identifier.
Nbr Intf Address	Neighbor Interface address of this link.
TE Metric	TE cost of link.
SRLGs	SRLG ³⁰ values that are flooded by IGPs to TE.
Switching Capability	Switching capability: packet, optical, lambda.
Physical BW	Physical line rate.
BC Model ID	Bandwidth constraint model ID (RDM or MAM).
Max Reservable BW	Maximum bandwidth (in kilobits per second) that you can reserve on a link.
Max Reservable BW Global	Maximum bandwidth (in kilobits per second) that you can reserve on a link in global-pool (prestandard and RDM).
Max Reservable BW Sub	Maximum bandwidth (in kilobits per second) that you can reserve on a link in subpool (prestandard and RDM).
BC0	Maximum bandwidth (in kilobits per second) that you can reserve on a link in BC0.
BC1	Maximum bandwidth (in kilobits per second) that you can reserve on a link in BC1.
TE-class[index]	Available bandwidth in TE-class (map of class-type and priority) at given index.
Total Allocated BW	Bandwidth (in Kbps) allocated at that priority.

Field	Description
Global Pool Reservable BW	Available bandwidth (in kbps) reservable at that priority in global pool (prestandard RDM).
Sub Pool Reservable BW	Available bandwidth (in kbps) reservable at that priority in sub-pool (prestandard RDM).
Attribute Names	Brief topology and the associated affinity attributes. The names of the affinity attribute of the link are displayed.

²⁸ IGP = Interior Gateway Protocol.

²⁹ LSA = link-state advertisement.

³⁰ SRLG = shared-risk link group.

Related Commands

Command	Description
show mpls traffic-eng tunnels , on page 430	Displays information about MPLS-TE tunnels.
interface (SRLG) , on page 249	Enables SRLG on an interface and enters SRLG interface configuration mode.
srlg , on page 478	Configures an MPLS traffic engineering SRLG values for a link on an interface.
show srlg , on page 467	Displays the SRLG interface and configuration information.

show mpls traffic-eng tunnels

To display information about MPLS-TE tunnels, use the **show mpls traffic-eng tunnels** command in EXEC mode.

```
show mpls traffic-eng tunnels [ tunnel-number ] [affinity] [all] [auto-bw] [attribute-set {auto-backup |
auto-mesh} {all| tunnel-name}] [auto-tunnel] [backup [tunnel-number | auto-tunnel [mesh ] mesh-value]
[ name tunnel-name]] [promotion-timer promotion-timer] [protected-interface type interface-path-id |
{static| auto}] [brief] [destination destination-address] [detail] [down] [gmpls] [interface {in | out | inout}
type interface-path-id] [name tunnel-name] [p2mp [concise]] [p2p] [property { backup-tunnel |
fast-reroute}] [protection [unused]] [reoptimized within-last interval][role {all | head | tail | middle}]
[soft-preemption {desired| triggered}][source source-address] [suboptimal constraints {current | max
| none}] [summary] [tabular] [unused][up] [class-type ct] [igp {isis | ospf}] [within-last interval]
```

Syntax Description

<i>tunnel-number</i>	(Optional) Number of the tunnel. Range is from 0 to 65535.
attribute-set	(Optional) Restricts the display of tunnels with an attribute set.
auto-backup	Restricts the display of specific or all tunnels that are using auto-backup type of attribute-set.
auto-mesh	Restricts the display of specific or all tunnels that are using auto-mesh type of attribute-set.
affinity	(Optional) Displays the affinity attributes for all outgoing links. The links, which are used by the tunnel, display color information.
all	(Optional) Displays all MPLS-TE tunnels.
auto-bw	(Optional) Restricts the display to tunnels when the automatic bandwidth is enabled.
auto-tunnel	(Optional) Restricts the display of automatically created tunnels.
mesh <i>mesh-value</i>	Displays the tunnels that belong to the specified auto-tunnel mesh group.
backup	(Optional) Displays FRR³¹ backup tunnels information. The information includes the physical interface protected by the tunnel, the number of TE LSPs³² protected, and the bandwidth protected. (Optional) Displays backup information for automatic tunnels and FRR tunnels.

name <i>tunnel-name</i>	(Optional) Displays the tunnel with given name.
promotion-timer <i>promotion-timer</i>	(Optional) Displays the configured FRR backup tunnel promotion timer value, in seconds.
protected-interface	(Optional) Displays FRR protected interfaces.
static	(Optional) Displays static backup tunnels.
auto-tunnel	(Optional) Displays protected automatic backup tunnels.
brief	(Optional) Displays the brief form of this command.
destination <i>destination-address</i>	(Optional) Restricts the display to tunnels destined for the specified IP address.
detail	(Optional) Displays detail information about headend tunnels.
down	(Optional) Displays tunnels that are down.
gmpls	(Optional) Restricts the display to GMPLS tunnels.
interface in	(Optional) Displays tunnels that use the specified input interface.
interface out	(Optional) Displays tunnels that use the specified output interface.
interface inout	(Optional) Displays tunnels that use the specified interface as an input or output interface.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
p2mp	(Optional) Displays only the P2MP tunnels and the subLSPs.
concise	(Optional) Displays a summary of the P2MP tunnels and the subLSPs. This option is available only for P2MP tunnels.

p2p	(Optional) Displays only P2P tunnels.
property backup-tunnel	(Optional) Displays tunnels with property of backup tunnel. Selects MPLS-TE tunnels used to protect physical interfaces on this router. A tunnel configured to protect a link against failure is a backup tunnel and has the backup tunnel property.
property fast-reroute	(Optional) Displays tunnels with property of fast-reroute configured. Selects FRR-protected MPLS-TE tunnels originating on (head), transmitting (router), or terminating (tail) on this router.
protection	(Optional) Displays all protected tunnels (configured as fast-reroutable). Displays information about the protection provided to each tunnel selected by other options specified with this command. The information includes whether protection is configured for the tunnel, the protection (if any) provided to the tunnel by this router, and the tunnel bandwidth protected.
reoptimized within-last <i>interval</i>	(Optional) Displays tunnels reoptimized within the last given time interval.
role all	(Optional) Displays all tunnels.
role head	(Optional) Displays tunnels with their heads at this router.
role middle	(Optional) Displays tunnels at the middle of this router.
role tail	(Optional) Displays tunnels with their tails at this router.
soft-preemption	Displays tunnels on which the soft-preemption feature is enabled.
source <i>source-address</i>	(Optional) Restricts the display to tunnels with a matching source IP address.
suboptimal constraints current	(Optional) Displays tunnels whose path metric is greater than the current shortest path constrained by the tunnel's configured options.
suboptimal constraints max	(Optional) Displays tunnels whose path metric is greater than the current shortest path, constrained by the configured options for the tunnel, and taking into consideration only the network capacity.

suboptimal constraints none	(Optional) Displays tunnels whose path metric is greater than the shortest unconstrained path.
summary	(Optional) Displays summary of configured tunnels.
tabular	(Optional) Displays a table showing TE LSPs, with one entry per line.
unused	(Optional) Displays only unused backup tunnels.
up	(Optional) Displays tunnels when the tunnel interface is up.
class-type <i>ct</i>	(Optional) Displays tunnels using the given class-type value configuration.
igp <i>isis</i>	(Optional) Displays tunnels with the path calculated as the IS-IS type for IGP.
igp <i>ospf</i>	(Optional) Displays tunnels with the path calculated as the OSPF type for IGP.
within-last <i>interval</i>	(Optional) Displays tunnels that has come up within the last given time interval.

³¹ FRR = Fast Reroute.

³² LSPs = Label Switched Paths.

Command Default None

Command Modes EXEC

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.3.0	The tabular keyword was added.
	Release 3.5.0	The command output was updated to support unequal load-balancing parameters.
	Release 3.7.0	If specified, sample output was modified to display the area on its own line after the existing path-option information.

Release	Modification
Release 3.8.0	These items were added: • To support the Automatic Bandwidth feature: ◦ The auto-bw keyword was added. ◦ Sample output and automatic bandwidth fields were added. • The <i>tunnel-number</i> argument, gmpls keyword, and p2p keyword were added.
Release 3.9.0	These items were added to support the P2MP feature: • The p2mp and concise keywords were added. • Sample output was added to display the label and rewrite information concisely. • Sample output was modified to show the various P2MP tunnel types for the protection keyword. • Sample output was modified to support the reoptimization install timer and clean up timer values for the <i>tunnel-number</i> argument and detail keyword.
Release 4.0.0	These items were added to support the MPLS-TE automatic backup tunnel feature: • The auto-tunnel keyword was added. • The unused keyword was added.
Release 4.1.1	The mesh keyword was added.
Release 4.2.0	The soft-preemption and attribute-set keywords were added. Sample output was modified to display only tunnels on which the soft-preemption feature is enabled.
Release 4.2.1	The auto-backup and auto-mesh keywords were added. Sample output was modified to display tunnels that are using auto-backup or auto-mesh type of attribute-set.
Release 4.2.3	Sample output was modified to display P2MP-TE inter-area related configuration details.

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.

Use the **brief** form of the **show mpls traffic-eng tunnels** command to display information specific to a tunnel interface. Use the command without the **brief** keyword to display information that includes the destination address, source ID, role, name, suboptimal constraints, and interface.

The **affinity** keyword is available for only the source router.

Selected tunnels would have a shorter path if they were reoptimized immediately.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This sample output is not changed when no area is specified for the active path-option. If the area is specified, it is added on a line of its own after the existing path-option information.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 20 detail
```

Signalling Summary:

```

    LSP Tunnels Process:  running
      RSVP Process:      running
        Forwarding:      enabled
    Periodic reoptimization: every 3600 seconds, next in 2400 seconds
    Periodic FRR Promotion:  every 300 seconds, next in 16 seconds
    Auto-bw enabled tunnels: 6
```

Name: tunnel-te20 Destination: 130.130.130.130

Status:

```
Admin:   up Oper:   up Path:  valid Signalling: connected
```

```

path option 1, type explicit rlr2r3gig_path (Basis for Setup, path weight 200)
G-PID: 0x0800 (derived from egress interface properties)
Bandwidth Requested: 113 kbps CT0
```

Config Parameters:

```

Bandwidth:      100 kbps (CT0) Priority:  7  7 Affinity: 0x0/0xffff
Metric Type: TE (interface)
AutoRoute: enabled LockDown: disabled Policy class: not set
Forwarding-Adjacency: disabled
Loadshare:      0 equal loadshares
Auto-bw: enabled
  Last BW Applied: 113 kbps CT0 BW Applications: 1
  Last Application Trigger: Periodic Application
  Bandwidth Min/Max: 0-4294967295 kbps
  Application Frequency: 5 min Jitter: 0s Time Left: 4m 19s
  Collection Frequency: 1 min
  Samples Collected: 0 Next: 14s
  Highest BW: 0 kbps Underflow BW: 0 kbps
  Adjustment Threshold: 10% 10 kbps
  Overflow Detection disabled
  Underflow Detection disabled
Fast Reroute: Disabled, Protection Desired: None
Path Protection: Not Enabled
```

History:

```

Tunnel has been up for: 00:18:54 (since Sun Mar 14 23:48:23 UTC 2010)
Current LSP:
  Uptime: 00:05:41 (since Mon Mar 15 00:01:36 UTC 2010)
Prior LSP:
  ID: path option 1 [3]
  Removal Trigger: reoptimization completed
Current LSP Info:
  Instance: 4, Signaling Area: IS-IS 1 level-2
  Uptime: 00:05:41 (since Mon Mar 15 00:01:36 UTC 2010)
  Outgoing Interface: GigabitEthernet0/5/0/21, Outgoing Label: 16009
```

show mpls traffic-eng tunnels

```

Router-IDs: local      110.110.110.110
            downstream 120.120.120.120
Path Info:
  Outgoing:
    Explicit Route:
      Strict, 61.10.1.2
      Strict, 61.15.1.1
      Strict, 61.15.1.2
      Strict, 130.130.130.130
    Record Route: Disabled
    Tspec: avg rate=113 kbits, burst=1000 bytes, peak rate=113 kbits
    Session Attributes: Local Prot: Not Set, Node Prot: Not Set, BW Prot: Not Set
  Resv Info: None
    Record Route: Disabled
    Fspec: avg rate=113 kbits, burst=1000 bytes, peak rate=113 kbits
  Displayed 1 (of 6) heads, 0 (of 0) midpoints, 0 (of 0) tails
  Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This is a sample output from the **show mpls traffic-eng tunnels** command using the **property** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels property backup interface out pos 0/6/0/0
```

```

Signalling Summary:
  LSP Tunnels Process: running, not registered with RSVP
  RSVP Process:       not running
  Forwarding:         enabled
  Periodic reoptimization: every 3600 seconds, next in 3595 seconds
  Periodic FRR Promotion: every 300 seconds, next in 295 seconds
  Periodic auto-bw collection: disabled

Name: tunnel-tel  Destination: 1.1.1.1
Status:
  Admin:    up Oper:  up  Path:  valid  Signalling: connected

  path option 1, type dynamic (Basis for Setup, path weight 1)
  G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
  Bandwidth:      1000 kbps (CT0) Priority:  7  7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled
  Loadshare:      10000 bandwidth-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested:      0
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned
  Backup FRR EXP Demotion: 1 ' 7, 2 ' 1
  Class-Attributes: 1, 2, 7
  Bandwidth-Policer: off

History:
  Tunnel has been up for: 00:00:08
  Current LSP:
    Uptime: 00:00:08

  Path info (ospf 0 area 0):
    Hop0: 10.0.0.2
    Hop1: 102.0.0.2
  Displayed 1 (of 1) heads, 0 (of 0) midpoints, 0 (of 0) tails
  Displayed 0 up, 1 down, 0 recovering, 0 recovered heads

```

This table describes the significant fields shown in the display.

Table 48: show mpls traffic-eng tunnels Command Field Descriptions

Field	Description
LSP Tunnels Process	Status of the LSP ³³ tunnels process.
RSVP Process	Status of the RSVP process.
Forwarding	Status of forwarding (enabled or disabled).
Periodic reoptimization	Time, in seconds, until the next periodic reoptimization.
Periodic FRR Promotion	Time, in seconds, till the next periodic FRR ³⁴ promotion.
Periodic auto-bw collection	Time, in seconds, till the next periodic auto-bw collection.
Name	Interface configured at the tunnel head.
Destination	Tail-end router identifier.
Admin/STATUS	Configured up or down.
Oper/STATE	Operationally up or down.
Signalling	Signaling connected or down or proceeding.
Config Parameters	Configuration parameters provided by tunnel mode MPLS traffic-eng, including those specific to unequal load-balancing functionality (bandwidth, load-share, backup FRR EXP demotion, class-attributes, and bandwidth-policer).
History: Current LSP: Uptime	Time LSP has been up.
Path Info	Hop list of current LSP.

³³ LSP = Link-State Packet.³⁴ FRR = Fast Reroute.

This sample output shows the link attributes of links that are traversed by the tunnel (color information):

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 11 affinity
```

```
  Signalling Summary:
```

```
      LSP Tunnels Process:  running
      RSVP Process:       running
      Forwarding:         enabled
      Periodic reoptimization: every 3600 seconds, next in 2710 seconds
      Periodic FRR Promotion: every 300 seconds, next in 27 seconds
```

show mpls traffic-eng tunnels

```

Auto-bw enabled tunnels: 0 (disabled)

Name: tunnel-te11 Destination: 3.3.3.3
Status:
  Admin:      up Oper:      up Path:  valid Signalling: connected

  path option 1, type explicit gige_1_2_3 (Basis for Setup, path weight 2)
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 200 kbps CT0

Config Parameters:
  Bandwidth:      200 kbps (CT0) Priority:  2  2
  Number of affinity constraints: 1
    Include bit map      : 0x4
    Include name         : red2

  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare:      0 equal loadshares
  Auto-bw: disabled
  Fast Reroute: Enabled, Protection Desired: Any
  Path Protection: Not Enabled
History:
  Tunnel has been up for: 02:55:27
  Current LSP:
    Uptime: 02:02:19
  Prior LSP:
    ID: path option 1 [8]
    Removal Trigger: reoptimization completed

Path info (OSPF 100 area 0):
  Link0: 12.9.0.1
    Attribute flags: 0x4
    Attribute names: red2
  Link1: 23.9.0.2
    Attribute flags: 0x4
    Attribute names: red2

Displayed 1 (of 8) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This sample output shows the brief summary of the tunnel status and configuration:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels brief
```

```

Signalling Summary:
  LSP Tunnels Process: running
  RSVP Process: running
  Forwarding: enabled
  Periodic reoptimization: every 3600 seconds, next in 2538 seconds
  Periodic FRR Promotion: every 300 seconds, next in 38 seconds
  Auto-bw enabled tunnels: 0 (disabled)

  TUNNEL NAME      DESTINATION      STATUS STATE
  tunnel-mte100    2.2.2.2          up   up
  tunnel-mte300    60.60.60.60      up   up
  tunnel-te1060    10.6.6.6         up   up
  PE6_C12406_t607  10.7.7.7         up   up
  PE6_C12406_t608  10.8.8.8         up   up
  PE6_C12406_t609  10.9.9.9         up   up
  PE6_C12406_t610  10.10.10.10      up   up
  PE6_C12406_t621  10.21.21.21      up   up
  PE7_C12406_t706  10.6.6.6         up   up
  PE7_C12406_t721  10.21.21.21      up   up
  Tunnel_PE8-PE6   10.6.6.6         up   up
  Tunnel_PE8-PE21  10.21.21.21      up   up
  Tunnel_PE9-PE6   10.6.6.6         up   up
  Tunnel_PE9-PE21  10.21.21.21      up   up
  Tunnel_PE10-PE6  10.6.6.6         up   up
  Tunnel_PE10-PE21 10.21.21.21      up   up
  PE21_C12406_t2106 10.6.6.6         up   up

```

```

PE21_C12406_t2107          10.7.7.7          up up
PE21_C12406_t2108          10.8.8.8          up up
PE21_C12406_t2109          10.9.9.9          up up
PE21_C12406_t2110          10.10.10.10         up up
PE6_C12406_t6070           10.7.7.7          up up
PE7_C12406_t7060           10.6.6.6          up up
tunnel-te1                  200.0.0.3          up up
OUNI POS0/1/0/1            100.0.0.1          up up
OUNI POS0/1/0/2            200.0.0.1          up up

```

Displayed 1 (of 1) heads, 20 (of 20) midpoints, 0 (of 0) tails
 Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

This section shows a sample output that results when automatic backup tunnels are created:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels brief
```

```

.
.
.
TUNNEL NAME      DESTINATION      STATUS  STATE
      tunnel-te0      200.0.0.3      up up
      tunnel-te1      200.0.0.3      up up
      tunnel-te2      200.0.0.3      up up
      *tunnel-te50     200.0.0.3      up up
      *tunnel-te60     200.0.0.3      up up
      *tunnel-te70     200.0.0.3      up up
      *tunnel-te80     200.0.0.3      up up
.
.
.

```

* = automatically created backup tunnel

This is sample output that shows a summary of configured tunnels by using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels summary
```

```

LSP Tunnels Process: not running, disabled
                    RSVP Process: running
                    Forwarding: enabled
                    Periodic reoptimization: every 3600 seconds, next in 2706 seconds
                    Periodic FRR Promotion: every 300 seconds, next in 81 seconds
                    Periodic auto-bw collection: disabled

```

```

Signalling Summary:
  Head: 1 interfaces, 1 active signalling attempts, 1 established
        0 explicit, 1 dynamic
        1 activations, 0 deactivations
        0 recovering, 0 recovered
  Mids: 0
  Tails: 0

```

```

Fast ReRoute Summary:
  Head: 0 FRR tunnels, 0 protected, 0 rerouted
  Mid: 0 FRR tunnels, 0 protected, 0 rerouted
  Summary: 0 protected, 0 link protected, 0 node protected, 0 bw protected

```

```

P2MP Summary:
  Tunnel Head: 1 total, 1 connected
  Destination Head: 2 total, 2 connected
  S2L Head: 2 established, 0 proceeding
  S2L Mid: 0 established, 0 proceeding
  S2L Tail: 1 established

```

```

P2MP Fast ReRoute Summary:
  Tunnel Head: 0 FRR enabled
  S2L Head: 0 FRR, 0 protected, 0 rerouted
  S2L Mid: 0 FRR, 0 protected, 0 rerouted

```

Summary: 0 protected, 0 link protected, 0 node protected, 0 bw protected

AutoTunnel Backup Summary:

```
AutoTunnel Backups:
    50 created, 50 up, 0 down, 8 unused
    25 NHOP, 25 NNHOP, 10 SRLG strict, 10 SRLG pref
Protected LSPs:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG
Protected S2L Sharing Families:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG
Protected S2Ls:
    10 NHOP, 20 NHOP+SRLG
    15 NNHOP, 5 NNHOP+SRLG
```

This sample output shows the various P2MP tunnels by using the **protection** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels protection

haa-2_t20 Tunnel Id: 20
  LSP Head, Admin: up, Oper: up
  Src: 2.2.2.2, Dest: 3.3.3.3, Instance: 2
  Fast Reroute Protection: None

haa-2_t20 Tunnel Id: 20
  LSP Head, Admin: up, Oper: up
  Src: 2.2.2.2, Dest: 3.3.3.3, Instance: 3
  Fast Reroute Protection: None

haa-2_t21 Tunnel Id: 21
  LSP Head, Admin: up, Oper: up
  Src: 2.2.2.2, Dest: 3.3.3.3, Instance: 2
  Fast Reroute Protection: Requested
  Outbound: FRR Ready
  Backup tunnel-te200 to LSP nhop
    tunnel-te200: out I/f: GigabitEthernet0/2/0/3
  LSP signalling info:
    Original: out I/f: POS0/3/0/3, label: 3, nhop: 23.9.1.3
    With FRR: out I/f: tunnel-te200, label: 3
  LSP bw: 0 kbps, Backup level: any-class unlimited, type: CT0

haa-2_t200 Tunnel Id: 200
  LSP Head, Admin: up, Oper: up
  Src: 2.2.2.2, Dest: 3.3.3.3, Instance: 3
  Fast Reroute Protection: None
```

This table describes the significant fields shown in the display.

Table 49: show mpls traffic-eng tunnels protection Command Field Descriptions

Field	Description
Tunnel#	Number of the MPLS-TE backup tunnel.
LSP Head/router	Node is either head or router for this LSP ³⁵ .
Instance	LSP ID.
Backup tunnel	Backup tunnel protection for NHOP/NNHOP.
out if	Backup tunnel's outgoing interface

Field	Description
Original	Outgoing interface, label, and next-hop of the LSP when not using backup.
With FRR	Outgoing interface and label when using backup tunnel.
LSP BW	Signaled bandwidth of the LSP.
Backup level	Type of bandwidth protection provided—pool type and limited/unlimited bandwidth.
LSP Tunnels Process	Status of the TE process 36 .

³⁵ LSP = Link-State Packet.

³⁶ LSP = Label Switched Path

This sample output shows information about sharing label and rewrite information concisely for P2MP tunnels:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels p2mp concise

Tunnel: 100 P2MP 100 LSP 1 Src 60.60.60.60 Role Head
  Subgroup 1 Dst 2.2.2.2 State connected FRR Inact (--unknown--)
    InIF none OutIF GigabitEthernet0_2_0_1 Local Label 16000 Out Label 16000
Tunnel: 300 P2MP 300 LSP 1 Src 2.2.2.2 Role Tail
  Subgroup 1 Dst 60.60.60.60 State connected FRR Inact (--unknown--)
    InIF GigabitEthernet0_2_0_1 OutIF none Local Label 16001 Out Label 0
```

This is sample output from the **show mpls traffic-eng tunnels** command using the **backup** keyword. This command selects every MPLS-TE tunnel known to the router, and displays information about the FRR protection that each selected tunnel provides for interfaces on this route. The command does not generate output for tunnels that do not provide FRR protection of interfaces on this router:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels backup

tunnel160
Admin: up, Oper: up
Src: 10.20.20.20, Dest: 10.10.10.10, Instance: 28
Fast Reroute Backup Provided:
Protected I/fs: POS0/7/0/0
Protected lsps: 0
Backup BW: any-class unlimited, Inuse: 0 kbps
```

This table describes the significant fields shown in the display.

Table 50: show mpls traffic-eng tunnels backup Command Field Descriptions

Field	Description
Tunnel#	MPLS-TE backup tunnel number.
Dest	IP address of backup tunnel destination.

Field	Description
State	State of the backup tunnel. Values are up, down, or admin-down.
Instance	LSP ID of the tunnel.
Protected I/fs	List of interfaces protected by the backup tunnel.
Protected lsps	Number of LSPs currently protected by the backup tunnel.
Backup BW	Configured backup bandwidth type and amount. Pool from which bandwidth is acquired. Values are any-class, CT0, and CT1. Amount is either unlimited or a configured limit in kbps.
Inuse	Backup bandwidth currently in use on the backup tunnel.

This shows a sample output from the **show mpls traffic-eng tunnels** command using the **backup** and **protected-interface** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels backup protected-interface

Interface: POS0/5/0/1
Tunnel100  UNUSED : out I/f:                               Admin: down Oper: down

Interface: POS0/7/0/0
Tunnel160   NHOP : out I/f: POS0/6/0/0  Admin:   up Oper:   up
```

This table describes the significant fields shown in the display.

Table 51: show mpls traffic-eng tunnels backup protected-interface Command Field Descriptions

Field	Description
Interface	MPLS-TE-enabled FRR protected interface.
Tunnel#	FRR protected tunnel on the interface.
NHOP/NNHOP/UNUSED	State of Protected tunnel. Values are unused, next hop, next-next hop.
out I/f	Outgoing interface of the backup tunnel providing the protection.

This shows a sample output from the **show mpls traffic-eng tunnels up** command using the **igp ospf** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels up igp ospf
```



```

Signalling Summary:
    LSP Tunnels Process: running
    RSVP Process: running
    Forwarding: enabled
    Periodic reoptimization: every 3600 seconds, next in 3381 seconds
    Periodic FRR Promotion: every 300 seconds, next in 81 seconds
    Periodic auto-bw collection: disabled

Name: tunnel-tell Destination: 30.30.30.30
Status:
    Admin: up Oper: up Path: valid Signalling: connected

    path option 1, type explicit back (Basis for Setup, path weight 1)
G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
    Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
    Number of configured name based affinities: 2
    Name based affinity constraints in use:
        Include bit map : 0x4 (refers to undefined affinity name)
        Include-strict bit map: 0x4

    Metric Type: TE (default)
    AutoRoute: disabled LockDown: disabled Loadshare: 0 bw-based
    Auto-bw: disabled(0/0) 0 Bandwidth Requested: 0
    Direction: unidirectional
    Endpoint switching capability: unknown, encoding type: unassigned
    Transit switching capability: unknown, encoding type: unassigned

History:
    Tunnel has been up for: 00:00:21
    Current LSP:
        Uptime: 00:00:21
    Prior LSP:
        ID: path option 1 [4]
        Removal Trigger: tunnel shutdown

    Path info (ospf area 0):
        Hop0: 7.4.4.2
        Hop1: 30.30.30.30

    Displayed 1 (of 3) heads, 0 (of 0) midpoints, 0 (of 0) tails
    Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This shows a sample output from the **show mpls traffic-eng tunnels** command using the **up within-last** keywords:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels up within-last 200

Signalling Summary:
    LSP Tunnels Process: running
    RSVP Process: running
    Forwarding: enabled
    Periodic reoptimization: every 3600 seconds, next in 3381 seconds
    Periodic FRR Promotion: every 300 seconds, next in 81 seconds
    Periodic auto-bw collection: disabled

Name: tunnel-tell Destination: 30.30.30.30
Status:
    Admin: up Oper: up Path: valid Signalling: connected

    path option 1, type explicit back (Basis for Setup, path weight 1)
G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
    Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
    Number of configured name based affinities: 2
    Name based affinity constraints in use:
        Include bit map : 0x4 (refers to undefined affinity name)
        Include-strict bit map: 0x4

```

show mpls traffic-eng tunnels

```

Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Loadshare: 0 bw-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested: 0
  Direction: unidirectional
Endpoint switching capability: unknown, encoding type: unassigned
Transit switching capability: unknown, encoding type: unassigned

History:
  Tunnel has been up for: 00:00:21
  Current LSP:
    Uptime: 00:00:21
  Prior LSP:
    ID: path option 1 [4]
    Removal Trigger: tunnel shutdown

Path info (ospf area 0):
  Hop0: 7.4.4.2
  Hop1: 30.30.30.30

Displayed 1 (of 3) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This shows a sample output from the **show mpls traffic-eng tunnels** command using the **reoptimized within-last** keywords:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels reoptimized within-last 600

Signalling Summary:
  LSP Tunnels Process: running
  RSVP Process: running
  Forwarding: enabled
  Periodic reoptimization: every 60000 seconds, next in 41137 seconds
  Periodic FRR Promotion: every 300 seconds, next in 37 seconds
  Periodic auto-bw collection: disabled

Name: tunnel-te1 Destination: 30.30.30.30
Status:
  Admin: up Oper: up Path: valid Signalling: connected

  path option 1, type explicit prot1 (Basis for Setup, path weight 1)
  G-PID: 0x0800 (derived from egress interface properties)

Config Parameters:
  Bandwidth: 66 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: IGP (global)
  AutoRoute: enabled LockDown: disabled Loadshare: 66 bw-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested: 66
  Direction: unidirectional
Endpoint switching capability: unknown, encoding type: unassigned
Transit switching capability: unknown, encoding type: unassigned

History:
  Tunnel has been up for: 00:14:04
  Current LSP:
    Uptime: 00:03:52
    Selection: reoptimization
  Prior LSP:
    ID: path option 1 [2013]
    Removal Trigger: reoptimization completed

Path info (ospf area 0):
  Hop0: 7.2.2.2
  Hop1: 7.3.3.2
  Hop2: 30.30.30.30
Displayed 1 (of 1) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```

This is a sample output that shows the reoptimization install timer and cleanup timer values for the tunnel-mte100 interface:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 100
```

```

Signalling Summary:
    LSP Tunnels Process: running
    RSVP Process: running
    Forwarding: enabled
    Periodic reoptimization: every 3600 seconds, next in 1505 seconds
    Periodic FRR Promotion: every 300 seconds, next in 79 seconds
    Auto-bw enabled tunnels: 0 (disabled)

Name: tunnel-mte100
Status:
    Admin: up Oper: up (Up for 02:33:21)

Config Parameters:
    Bandwidth: 10 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
    Metric Type: TE (default)
    Fast Reroute: Not Enabled, Protection Desired: None
    Record Route: Not Enabled

Destination summary: (1 up, 0 down, 0 disabled) Affinity: 0x0/0xffff
Auto-bw: disabled
Destination: 20.20.20.20
State: Up for 02:33:21
Path options:
    path-option 10 dynamic [active]

Current LSP:
    lsp-id: 10005 p2mp-id: 100 tun-id: 100 src: 10.10.10.10 extid: 10.10.10.10
    LSP up for: 00:02:27
    Reopt Trigger: Bandwidth CLI Change, Reopt Reason: applying bandwidth change
    Reroute Pending: No
    Inuse Bandwidth: 10 kbps (CT0)
    Number of S2Ls: 1 connected, 0 signaling proceeding, 0 down

    S2L Sub LSP: Destination 20.20.20.20 Signaling Status: connected
        S2L up for: 00:02:27
        Sub Group ID: 1 Sub Group Originator ID: 10.10.10.10
        Path option path-option 10 dynamic (path weight 10)
        Path info (IS-IS 1 level-1)
            7.2.2.2
            20.20.20.20

Reoptimized LSP (Install Timer Remaining 0 Seconds):
    None
Cleaned LSP (Cleanup Timer Remaining 0 Seconds):
    None

```

This is a sample output from the **show mpls traffic-eng tunnels** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 100 detail
```

```

Name: tunnel-tel Destination: 24.24.24.24
Status:
    Admin: up Oper: up

    Working Path: valid Signalling: connected
    Protecting Path: valid Protect Signalling: connected
    Working LSP is carrying traffic

    path option 1, type explicit po4 (Basis for Setup, path weight 1)
    (Basis for Standby, path weight 2)
    G-PID: 0x001d (derived from egress interface properties)
    Path protect LSP is present.

    path option 1, type explicit po6 (Basis for Setup, path weight 1)

```

```

Config Parameters:
  Bandwidth:      10 kbps (CT0) Priority:  7  7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute:      enabled LockDown: disabled Loadshare:      10 bw-based
  Auto-bw: disabled(0/0) 0 Bandwidth Requested:      10
  Direction: unidirectional
  Endpoint switching capability: unknown, encoding type: unassigned
  Transit switching capability: unknown, encoding type: unassigned

History:
  Tunnel has been up for: 00:04:06
  Current LSP:
    Uptime: 00:04:06
  Prior LSP:
    ID: path option 1 [5452]
    Removal Trigger: path verification failed
Current LSP Info:
  Instance: 71, Signaling Area: ospf optical area 0
  Uptime: 00:10:41
  Incoming Label: explicit-null
  Outgoing Interface: POS0/4/0/0, Outgoing Label: implicit-null
  Path Info:
    Explicit Route:
      Strict, 100.0.0.3
      Strict, 24.24.24.24
    Record Route: None
  Tspec: avg rate=2488320 kbits, burst=1000 bytes, peak rate=2488320 kbits
Resv Info:
  Record Route:
    IPv4 100.0.0.3, flags 0x0
  Fspec: avg rate=2488320 kbits, burst=1000 bytes, peak rate=2488320 kbits
Protecting LSP Info:
  Instance: 72, Signaling Area: ospf optical area 0
  Incoming Label: explicit-null
  Outgoing Interface: POS0/6/0/0, Outgoing Label: implicit-null
  Path Info:
    Explicit Route:
      Strict, 101.0.0.3
      Strict, 24.24.24.24
    Record Route: None
  Tspec: avg rate=2488320 kbits, burst=1000 bytes, peak rate=2488320 kbits
Resv Info:
  Record Route:
    IPv4 101.0.0.3, flags 0x0
  Fspec: avg rate=2488320 kbits, burst=1000 bytes, peak rate=2488320 kbits
Reoptimized LSP Info (Install Timer Remaining 11 Seconds):
Cleaned LSP Info (Cleanup Timer Remaining 19 Seconds):

```

This is a sample output from the **show mpls traffic-eng tunnels** command using the **role mid** keyword:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels role mid

Signalling Summary:
  LSP Tunnels Process: running
  RSVP Process: running
  Forwarding: enabled
  Periodic reoptimization: every 3600 seconds, next in 1166 seconds
  Periodic FRR Promotion: every 300 seconds, next in 90 seconds
  Periodic auto-bw collection: disabled
LSP Tunnel 10.10.10.10 1 [5508] is signalled, connection is up
  Tunnel Name: FRR1_t1 Tunnel Role: Mid
  InLabel: POS0/2/0/1, 33
  OutLabel: POS0/3/0/0, implicit-null
  Signalling Info:
    Src 10.10.10.10 Dst 30.30.30.30, Tunnel ID 1, Tunnel Instance 5508
  Path Info:1
    Incoming Address: 7.3.3.1
Incoming Explicit Route:
  Strict, 7.3.3.1
  Loose, 30.30.30.30
ERO Expansion Info:
  ospf 100 area 0, Metric 1 (TE), Affinity 0x0, Mask 0xffff, Queries 0

```

```

Outgoing      Explicit Route:
  Strict, 7.2.2.1
  Strict, 30.30.30.30
Record Route: None
  Tspec: avg rate=10 kbits, burst=1000 bytes, peak rate=10 kbits
Resv Info:
  Record Route:
    IPv4 30.30.30.30, flags 0x20
    Label 3, flags 0x1
    IPv4 7.3.3.2, flags 0x0
    Label 3, flags 0x1
  Fspec: avg rate=10 kbits, burst=1000 bytes, peak rate=10 kbits
Displayed 0 (of 1) heads, 1 (of 1) midpoints, 0 (of 1) tails
Displayed 0 up, 0 down, 0 recovering, 0 recovered heads

```

This sample output shows a tabular table for TE LSPs by using the **tabular** keyword:

RP/0/RP0/CPU0:router# **show mpls traffic-eng tunnels tabular**

Tunnel Name	LSP ID	Destination Address	Source Address	Tun State	FRR State	LSP Role
tunnel-mte100	1	2.2.2.2	60.60.60.60	up	Inact	Head
tunnel-mte300	1	60.60.60.60	2.2.2.2	up	Inact	Tail
tunnel-tel060	2	10.6.6.6	10.1.1.1	up	Inact	Head
PE6_C12406_t607	2	10.7.7.7	10.6.6.6	up	Inact	Mid
PE6_C12406_t608	2	10.8.8.8	10.6.6.6	up	Inact	Mid
PE6_C12406_t609	2	10.9.9.9	10.6.6.6	up	Inact	Mid
PE6_C12406_t610	2	10.10.10.10	10.6.6.6	up	Inact	Mid
PE6_C12406_t621	2	10.21.21.21	10.6.6.6	up	Inact	Mid
PE7_C12406_t706	835	10.6.6.6	10.7.7.7	up	Inact	Mid
PE7_C12406_t721	603	10.21.21.21	10.7.7.7	up	Inact	Mid
Tunnel PE8-PE6	4062	10.6.6.6	10.8.8.8	up	Inact	Mid
Tunnel PE8-PE21	6798	10.21.21.21	10.8.8.8	up	Inact	Mid
Tunnel PE9-PE6	4062	10.6.6.6	10.9.9.9	up	Inact	Mid
Tunnel PE9-PE21	6795	10.21.21.21	10.9.9.9	up	Inact	Mid
Tunnel PE10-PE6	4091	10.6.6.6	10.10.10.10	up	Inact	Mid
Tunnel PE10-PE21	6821	10.21.21.21	10.10.10.10	up	Inact	Mid
PE21_C12406_t2106	2	10.6.6.6	10.21.21.21	up	Ready	Mid
PE21_C12406_t2107	2	10.7.7.7	10.21.21.21	up	Inact	Mid
PE21_C12406_t2108	2	10.8.8.8	10.21.21.21	up	Inact	Mid
PE21_C12406_t2109	2	10.9.9.9	10.21.21.21	up	Inact	Mid
PE21_C12406_t2110	2	10.10.10.10	10.21.21.21	up	Inact	Mid
PE6_C12406_t6070	2	10.7.7.7	10.6.6.6	up	Inact	Mid
PE7_C12406_t7060	626	10.6.6.6	10.7.7.7	up	Inact	Mid
tunnel-tel	1	200.0.0.3	200.0.0.1	up	Inact	Head InAct
tunnel-tel00	1	200.0.0.3	200.0.0.1	up	Ready	Head InAct
OUNI POS0/1/0/1	2	100.0.0.1	200.0.0.1	up	Inact	Head InAct
OUNI POS0/1/0/2	6	200.0.0.1	100.0.0.1	up	Inact	Tail InAct

This sample output shows a tabular table indicating automatic backup tunnels when using the **tabular** keyword:

RP/0/RP0/CPU0:router# **show mpls traffic-eng tunnels tabular**

Tunnel Name	LSP ID	Destination Address	Source Address	State	FRR State	LSP Role	Path Prot
tunnel-te0	549	200.0.0.3	200.0.0.1	up	Inact	Head	InAct
tunnel-tel	546	200.0.0.3	200.0.0.1	up	Inact	Head	InAct
tunnel-te2	6	200.0.0.3	200.0.0.1	up	Inact	Head	InAct
*tunnel-te50	6	200.0.0.3	200.0.0.1	up	Active	Head	InAct
*tunnel-te60	4	200.0.0.3	200.0.0.1	up	Active	Head	InAct
*tunnel-te70	4	200.0.0.3	200.0.0.1	up	Active	Head	InAct
*tunnel-te80	3	200.0.0.3	200.0.0.1	up	Active	Head	InAct

* = automatically created backup tunnel

This table describes the significant fields shown in the display.

Table 52: show mpls traffic-eng tunnels tabular Command Field Descriptions

Field	Description
Tunnel Name	MPLS-TE tunnel name.
LSP ID	LSP ID of the tunnel.
Destination Address	Destination address of the TE tunnel (identified in Tunnel Name).
Source Address	Source address for the filtered tunnels.
Tunnel State	State of the tunnel. Values are up, down, or admin-down.
FRR State	FRR state identifier.
LSP Role	Role identifier. Values are All, Head, or Tail.

This sample output shows the MPLS-TE tunnel information only for tunnels in which the automatic bandwidth is enabled using the **auto-bw** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels auto-bw
```

```

  Signalling Summary:
    LSP Tunnels Process: running
    RSVP Process: running
    Forwarding: enabled
    Periodic reoptimization: every 3600 seconds, next in 636 seconds
    Periodic FRR Promotion: every 300 seconds, next in 276 seconds
    Auto-bw enabled tunnels: 1

  Name: tunnel-te1 Destination: 0.0.0.0
  Status:
    Admin: up Oper: down Path: not valid Signalling: Down
    G-PID: 0x0800 (internally specified)
    Bandwidth Requested: 0 kbps CT0

  Config Parameters:
    Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
    Metric Type: TE (default)
    AutoRoute: disabled LockDown: disabled Policy class: not set
    Loadshare: 0 equal loadshares
  Auto-bw: (collect bw only)
    Last BW Applied: 500 kbps (CT0) BW Applications: 25
    Last Application Trigger: Periodic Application
    Bandwidth Min/Max: 10-10900 kbps
    Application Frequency: 10 min (Cfg: 10 min) Time Left: 5m 34s
    Collection Frequency: 2 min
    Samples Collected: 2 Highest BW: 450 kbps Next: 1m 34s
    Adjustment Threshold: 5%
    Overflow Threshold: 15% Limit: 1/4 Early BW Applications: 0
    Direction: unidirectional
    Endpoint switching capability: unknown, encoding type: unassigned
    Transit switching capability: unknown, encoding type: unassigned
    Fast Reroute: Disabled, Protection Desired: None

  Reason for the tunnel being down: No destination is configured
  History:
  Displayed 1 (of 1) heads, 0 (of 0) midpoints, 0 (of 0) tails

```

Displayed 0 up, 1 down, 0 recovering, 0 recovered heads

This table describes the significant fields shown in the display.

Table 53: show mpls traffic-eng tunnels auto-bw Command Field Descriptions

Field	Description
collect bw only	Field is displayed only if the bandwidth collection is configured in the tunnel automatic bandwidth configuration.
Last BW Applied	Last bandwidth change that is requested by the automatic bandwidth for the tunnel. In addition, this field indicates which pool is used for the bandwidth.
BW Applications	Total number of bandwidth applications that is requested by the automatic bandwidth, which includes the applications triggered by an overflow condition.
Last Application Trigger	These last application options are displayed: • Periodic Application • Overflow Detected • Manual Application
Bandwidth Min/Max	Bandwidth configured is either minimum or maximum.
Application Frequency	Configured application frequency. The Time Left field indicates the time left before the next application executes.
Collection Frequency	Globally configured collection frequency, which is the same value for all the tunnels.
Samples Collected	Number of samples that are collected during the current application period. This field is replaced by the Collection Disabled field if Collection Frequency is not currently configured.
Highest BW	Highest bandwidth that is collected for the application period.
Next	Time left before the next collection event.
Overflow Threshold	Overflow threshold that is configured. The Overflow field appears only if the overflow detection is configured in the tunnel automatic bandwidth configuration.

Field	Description
Limit	Consecutive overflow detected or configured limit.
Early BW Applications	Number of early bandwidth applications that are triggered by an overflow condition.

This is sample output from the **show mpls traffic-eng tunnels** command after the NNHOP SRLG preferred automatic backup tunnel is configured:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 1
```

Signalling Summary:

```

    LSP Tunnels Process:  running
    RSVP Process:        running
    Forwarding:           enabled
    Periodic reoptimization: every 3600 seconds, next in 2524 seconds
    Periodic FRR Promotion: every 300 seconds, next in 49 seconds
    Auto-bw enabled tunnels: 1

```

Name: tunnel-tel Destination: 200.0.0.3 (auto backup)

Status:

```
Admin:    up Oper:    up Path:  valid Signalling: connected
```

path option 10, type explicit (autob_nnhop_srlg_tunnel1) (Basis for Setup, path weight 11)

```

path option 20, type explicit (autob_nnhop_tunnel1)
G-PID: 0x0800 (derived from egress interface properties)
Bandwidth Requested: 0 kbps CT0
Creation Time: Fri Jul 10 01:53:25.581 PST (1h 25m 17s ago)

```

Config Parameters:

```

Bandwidth:      0 kbps (CT0) Priority:  7 7 Affinity: 0x0/0xffff
Metric Type: TE (default)
AutoRoute: disabled LockDown: disabled Policy class: not set
Forwarding-Adjacency: disabled

```

Loadshare: 0 equal loadshares

```

Auto-bw: disabled
Fast Reroute: Disabled, Protection Desired: None
Path Protection: Not Enabled

```

Auto Backup:

```

Protected LSPs: 4
Protected S2L Sharing Families: 0
Protected S2Ls: 0
Protected i/f: Gi0/1/0/0 Protected node: 20.0.0.2
Protection: NNHOP+SRLG
Unused removal timeout: not running

```

History:

```

Tunnel has been up for: 00:00:08
Current LSP:
Uptime: 00:00:08
Prior LSP:
ID: path option 1 [545]
Removal Trigger: configuration changed

```

Path info (OSPF 0 area 0):

```

Hop0: 10.0.0.2
Hop1: 100.0.0.2
Hop2: 100.0.0.3
Hop3: 200.0.0.3

```

This table describes the significant fields shown in the display.

Table 54: show mpls traffic-eng tunnels Command Field Descriptions

Field	Description
Auto Backup	Auto backup section header.
Creation Time	Time when the tunnel was created and for what period was the tunnel created.
Protected LSPs	Number of ready and active LSPs protected by this backup.
Protected S2L Sharing Families	Number of ready and active sharing families protected by this backup.
Protected S2Ls	Number of ready and active primary tunnels protected by this backup.
Protected i/f Protected node	Interface and NNHOP node protected by this backup.
Protection: NNHOP+SRLG	Type of protection provided by this backup. Note Protection can be different when a preferred SRLG is configured and an SRLG path is not found.
Example when backup is in use: Unused removal timeout: not running Example when backup is unused: Unused removal timeout: 1h26m	Amount of time left before the unused removal timeout expires. This timer only runs when the backup is in the unused state. After the timer expires, the automatic backup tunnel is removed.

This is sample output from the **show mpls traffic-eng tunnels** command using the **detail** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels 999 detail
Name: tunnel-te999 Destination: 1.1.1.1
Status:
  Admin:    up Oper:    up Path:  valid Signalling: connected
  path option 1, type dynamic (Basis for Setup, path weight 2)
  Path-option attribute: po
    Number of affinity constraints: 2
      Include bit map      : 0x4
      Include name         : blue
      Exclude bit map      : 0x2
      Exclude name         : red
    Bandwidth: 300 (CT0)
    G-PID: 0x0800 (derived from egress interface properties)
    Bandwidth Requested: 300 kbps CT0
    Creation Time: Tue Aug 14 23:35:58 2012 (00:00:42 ago)
  Config Parameters:
    Bandwidth: 100 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
    Metric Type: TE (default)
    Hop-limit: disabled
```

show mpls traffic-eng tunnels

```

AutoRoute: disabled  LockDown: disabled  Policy class: not set
Forwarding-Adjacency: disabled
Loadshare:           0 equal loadshares
Auto-bw: disabled
Fast Reroute: Enabled, Protection Desired: Any
Path Protection: Not Enabled
Soft Preemption: Disabled
SNMP Index: 42
History:
  Tunnel has been up for: 00:00:30 (since Tue Aug 14 23:36:10 EST 2012)
  Current LSP:
    Uptime: 00:00:30 (since Tue Aug 14 23:36:10 EST 2012)
  Current LSP Info:
    Instance: 2, Signaling Area: OSPF 100 area 16909060
    Uptime: 00:00:30 (since Tue Aug 14 23:36:10 EST 2012)
    Outgoing Interface: GigabitEthernet0/2/0/2, Outgoing Label: 16005
    Router-IDs: local      3.3.3.3
                  downstream 2.2.2.2
    Soft Preemption: None
    Path Info:
      Outgoing:
        Explicit Route:
          Strict, 23.9.0.2
          Strict, 12.9.0.2
          Strict, 12.9.0.1
          Strict, 1.1.1.1

      Record Route: Disabled
      Tspecc: avg rate=300 kbits, burst=1000 bytes, peak rate=300 kbits
      Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                        Soft Preemption Desired: Not Set

  Resv Info:
    Record Route:
      IPv4 2.2.2.2, flags 0x20
      Label 16005, flags 0x1
      IPv4 23.9.0.2, flags 0x0
      Label 16005, flags 0x1
      IPv4 1.1.1.1, flags 0x20
      Label 3, flags 0x1
      IPv4 12.9.0.1, flags 0x0
      Label 3, flags 0x1
    Fspec: avg rate=300 kbits, burst=1000 bytes, peak rate=300 kbits Displayed 1 (of 8)
heads, 0 (of 3) midpoints, 0 (of 0) tails Displayed 1 up, 0 down, 0 recovering, 0 recovered
heads

```

This is sample output from the **show mpls traffic-eng tunnels** command using the **auto-tunnel backup** keywords:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels auto-tunnel backup
```

```

AutoTunnel Backup Configuration:
  Interfaces count: 30
  Unused removal timeout: 2h
  Configured tunnel number range: 0-100
AutoTunnel Backup Summary:
  50 created, 50 up, 0 down, 8 unused
  25 NHOP, 25 NNHOP, 10 SRLG strict, 10 SRLG pref
Protected LSPs:
  10 NHOP, 20 NHOP+SRLG
  15 NNHOP, 5 NNHOP+SRLG
Protected S2L Sharing Families:
  10 NHOP, 20 NHOP+SRLG
  15 NNHOP, 5 NNHOP+SRLG
Protected S2Ls:
  10 NHOP, 20 NHOP+SRLG
  15 NNHOP, 5 NNHOP+SRLG

Cumulative Counters (last cleared 1h ago):
      Total      NHOP      NNHOP
Created:         550        300        250
Connected:       500        250        250
Removed (down):    0         0         0

```

```

Removed (unused):    200      100      100
Removed (in use):    0        0        0
Range exceeded:      0        0        0

```

This table describes the significant fields shown in the display.

Table 55: show mpls traffic-eng tunnels auto-tunnel backup Command Field Descriptions

Field	Description
AutoTunnel Backup Configuration	Header for the automatic tunnel backup configuration.
Interfaces count	Number of interfaces that have automatic tunnel backup enabled.
Unused removal timeout	Configured value and time left before expiration of the unused removal timeout attribute.
Configured tunnel number range	Configured tunnel number range.
AutoTunnel Backup Summary	Header for the automatic tunnel backup summary information.
50 created	Number of automatic backup tunnels created.
50 up	Number of automatic backup tunnels in the up state.
0 down	Number of automatic backup tunnels in the down state.
8 unused	Number of automatic backup tunnels in the unused state.
25 NHOP	Number of automatic backup tunnels created for NHOP protection.
25 NNHOP	Number of automatic backup tunnels created for NNHOP protection.
10 SRLG strict	Number of automatic backup tunnels created with the SRLG preferred attribute.
10 SRLG pref	Number of automatic backup tunnels created with the SRLG preferred attribute.
Protected LSPs Protected S2L Sharing Families Protected S2Ls	Headings for summary information showing current status of LSPs, S2L Sharing Families, and S2Ls that are protected by the automatic tunnel backups. Numbers include primary tunnels in FRR ready and active state.
10 NHOP	Number of automatic backup tunnels that are link protected.

Field	Description
20 NHOP+SRLG	Number of automatic backup tunnels that are link protected and using an SRLG diverse backup path.
15 NNHOP	Number of automatic backup tunnels that are node protected.
20 NNHOP+SRLG	Number of automatic backup tunnels that are node protected and use an SRLG diverse backup path.
Cumulative Counters (last cleared 1h ago):	Cumulative counters for automatic backup tunnels.
Headers: Total, NHOP, NNHOP	Total number of counters and breakdown of NHOP and NNHOP counters.
Created:	Cumulative number of created automatic backup tunnels since the last counter was cleared.
Connected:	Cumulative number of the connected automatic backup tunnels since the last counter was cleared. Note Counter increments only the first time that a tunnel connects.
Removed (down/unused/in use)	Number of automatic backup tunnels that are removed based on state.
Range exceeded	Number of automatic backup tunnels attempted and later rejected when the total number exceeds the configured range.

This is sample output from the **show mpls traffic-eng tunnels name tunnel-te1 detail** command, which displays the soft preemption information for the tunnel-te1 tunnel:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels name tunnel-te1 detail
Name: tunnel-te1 Destination: 192.168.0.4
Status:
  Admin:      up Oper:      up Path: valid Signalling: connected

  path option 1, type explicit ABC1 (Basis for Setup, path weight 2)
  Last PCALC Error [Reopt]: Thu Oct 13 16:40:24 2011
  Info: Can't reach 10.10.10.2 on 192.168.0.2, from node 192.168.0.1 (bw)
  Last Signalled Error: Thu Oct 13 16:38:53 2011
  Info: [2] PathErr(34,1)-(reroute, flow soft-preempted) at 10.10.10.1
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 30000 kbps CT0
  Creation Time: Thu Oct 13 15:46:45 2011 (00:53:44 ago)
Config Parameters:
  Bandwidth:      30000 kbps (CT0) Priority:  7  7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  Hop-limit: disabled
  AutoRoute: enabled LockDown: disabled Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare:      0 equal loadshares
  Auto-bw: disabled
```

```

Fast Reroute: Enabled, Protection Desired: Any
Path Protection: Not Enabled
Soft Preemption: Enabled
Soft Preemption:
  Current Status: Preemption pending
  Last Soft Preemption: Thu Oct 13 16:38:53 2011 (00:01:36 ago)
  Addresses of preempting links:
    10.10.10.1: Thu Oct 13 16:38:53 2011 (00:01:36 ago)
  Duration in preemption pending: 96 seconds
  Preemption Resolution: Pending
Stats:
  Number of preemption pending events: 1
  Min duration in preemption pending: 0 seconds
  Max duration in preemption pending: 0 seconds
  Average duration in preemption pending: 0 seconds
  Resolution Counters: 0 reopt complete, 0 torn down
                      0 path protection switchover
SNMP Index: 9
History:
  Tunnel has been up for: 00:52:46 (since Thu Oct 13 15:47:43 EDT 2011)
  Current LSP:
    Uptime: 00:52:46 (since Thu Oct 13 15:47:43 EDT 2011)
  Reopt. LSP:
    Last Failure:
      LSP not signalled, has no S2Ls
      Date/Time: Thu Oct 13 16:40:24 EDT 2011 [00:00:05 ago]
  Prior LSP:
    ID: path option 1 [2]
    Removal Trigger: path error
Current LSP Info:
  Instance: 2, Signaling Area: OSPF ring area 0
  Uptime: 00:52:46 (since Thu Oct 13 15:47:43 EDT 2011)
  Outgoing Interface: GigabitEthernet0/0/0/0, Outgoing Label: 16002
  Router-IDs: local 192.168.0.1
              downstream 192.168.0.2
Soft Preemption: Pending
  Preemption Link: GigabitEthernet0/0/0/0; Address: 10.10.10.1
  Preempted at: Thu Oct 13 16:38:53 2011 (00:01:36 ago)
  Time left before hard preemption: 204 seconds
Path Info:
  Outgoing:
  Explicit Route:
    Strict, 10.10.10.2
    Strict, 14.14.14.2
    Strict, 14.14.14.4
    Strict, 192.168.0.4
  Record Route: Empty
  Tspec: avg rate=30000 kbits, burst=1000 bytes, peak rate=30000 kbits
  Session Attributes: Local Prot: Set, Node Prot: Not Set, BW Prot: Not Set
                    Soft Preemption Desired: Set
Resv Info:
  Record Route:
    IPv4 192.168.0.2, flags 0x20
    Label 16002, flags 0x1
    IPv4 10.10.10.2, flags 0x0
    Label 16002, flags 0x1
    IPv4 192.168.0.4, flags 0x20
    Label 3, flags 0x1
    IPv4 14.14.14.4, flags 0x0
    Label 3, flags 0x1
  Fspec: avg rate=30000 kbits, burst=1000 bytes, peak rate=30000 kbits
Displayed 1 (of 4) heads, 0 (of 0) midpoints, 0 (of 2) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads
This is sample output from the show mpls traffic-eng tunnels command with the mesh keyword:
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels auto-tunnel
Signalling Summary:
  LSP Tunnels Process: running
  RSVP Process: running
  Forwarding: enabled
  Periodic reoptimization: every 3600 seconds, next in 3098 seconds
  Periodic FRR Promotion: every 300 seconds, next in 238 seconds
  Auto-bw enabled tunnels: 1000

```

show mpls traffic-eng tunnels

```

Name: tunnel-te9000 Destination: 20.20.20.20 (auto-tunnel mesh)
Status:
  Admin:    up Oper:    up Path:    valid Signalling: connected
  path option 10, type dynamic (Basis for Setup, path weight 11)
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 0 kbps CT0
  Creation Time: Thu Jan 14 09:09:31 2010 (01:41:20 ago)
Config Parameters:
  Bandwidth:      0 kbps (CT0) Priority:  7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare:      0 equal loadshares
  Auto-bw: disabled
  Fast Reroute: Disabled, Protection Desired: None
  Path Protection: Not Enabled
  Attribute-set: TA-NAME (type auto-mesh)
Auto-tunnel Mesh:
  Group 40: Destination-list dl-40
  Unused removal timeout: not running
History:
  Tunnel has been up for: 01:40:53 (since Thu Jan 14 09:09:58 EST 2010)
  Current LSP:
    Uptime: 01:41:00 (since Thu Jan 14 09:09:51 EST 2010)
  Reopt. LSP:
    Last Failure:
      LSP not signalled, identical to the [CURRENT] LSP
      Date/Time: Thu Jan 14 09:42:30 EST 2010 [01:08:21 ago]

Path info (OSPF 100 area 0):
Hop0: 7.0.15.1
Hop1: 20.20.20.20

```

This shows an auto-tunnel mesh summary sample output from the **show mpls traffic-eng tunnels** command using the **summary** keyword:

```

RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels summary
Thu Jan 14 10:46:34.677 EST

```

```

          LSP Tunnels Process: running
          RSVP Process: running
          Forwarding: enabled
          Periodic reoptimization: every 3600 seconds, next in 3354 seconds
          Periodic FRR Promotion: every 300 seconds, next in 193 seconds
          Periodic auto-bw collection: 1000

Signalling Summary:
  Head: 2000 interfaces, 2000 active signalling attempts, 2000 established
        2000 explicit, 0 dynamic
        9250 activations, 7250 deactivations
        0 recovering, 2000 recovered
  Mids: 0
  Tails: 0

Fast ReRoute Summary:
  Head: 1000 FRR tunnels, 1000 protected, 0 rerouted
  Mid: 0 FRR tunnels, 0 protected, 0 rerouted
  Summary: 1000 protected, 500 link protected, 500 node protected, 0 bw protected

P2MP Summary:
  Tunnel Head: 250 total, 250 connected
  Destination Head: 500 total, 500 connected
  S2L Head: 500 established, 0 proceeding
  S2L Mid: 0 established, 0 proceeding
  S2L Tail: 0 established

P2MP Fast ReRoute Summary:
  Tunnel Head: 250 FRR enabled
  S2L Head: 500 FRR, 500 protected, 0 rerouted
  S2L Mid: 0 FRR, 0 protected, 0 rerouted
  Summary: 500 protected, 500 link protected, 0 node protected, 0 bw protected

```

<snip>

```
Auto-tunnel Mesh Summary:
  Auto-mesh Tunnels:
    50 created, 50 up, 0 down, 25 FRR, 20 FRR enabled
Mesh Groups:
  4 groups, 50 destinations
```

This shows an auto-tunnel mesh summary sample output from the **show mpls traffic-eng tunnels** command using the **auto-mesh** keyword:

```
RP/0/RP0/CPU0:router#show mpls traffic-eng tunnels auto-tunnel
Signalling Summary:
  LSP Tunnels Process: running
  RSVP Process: running
  Forwarding: enabled
  Periodic reoptimization: every 3600 seconds, next in 3098 seconds
  Periodic FRR Promotion: every 300 seconds, next in 238 seconds
  Auto-bw enabled tunnels: 1000

Name: tunnel-te9000 Destination: 20.20.20.20 (auto-tunnel mesh)
Status:
  Admin: up Oper: up Path: valid Signalling: connected
  path option 10, type dynamic (Basis for Setup, path weight 11)
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 0 kbps CT0
  Creation Time: Thu Jan 14 09:09:31 2010 (01:41:20 ago)
Config Parameters:
  Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  AutoRoute: disabled LockDown: disabled Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare: 0 equal loadshares
  Auto-bw: disabled
  Fast Reroute: Disabled, Protection Desired: None
  Path Protection: Not Enabled
  Attribute-set: TA-NAME (type auto-mesh)
Auto-tunnel Mesh:
  Group 40: Destination-list dl-40
  Unused removal timeout: not running
History:
  Tunnel has been up for: 01:40:53 (since Thu Jan 14 09:09:58 EST 2010)
  Current LSP:
    Uptime: 01:41:00 (since Thu Jan 14 09:09:51 EST 2010)
  Reopt. LSP:
    Last Failure:
      LSP not signalled, identical to the [CURRENT] LSP
      Date/Time: Thu Jan 14 09:42:30 EST 2010 [01:08:21 ago]

Path info (OSPF 100 area 0):
Hop0: 7.0.15.1
Hop1: 20.20.20.20
```

This example shows the details about the tunnel that is using auto-backup type of attribute-set.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels attribute-set auto-backup ab

Name: tunnel-te3000 Destination: 1.1.1.1 (auto-tunnel backup)
Status:
  Admin: up Oper: up Path: valid Signalling: connected

  path option 20, type explicit (autob_nhop_te3000) (Basis for Setup, path weight 2)
  path option 10, type explicit (autob_nhop_srlg_te3000) [disabled]
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 0 kbps CT0
  Creation Time: Tue Aug 14 23:24:27 2012 (00:05:28 ago)
Config Parameters:
  Bandwidth: 0 kbps (CT0) Priority: 7 7
  Number of affinity constraints: 2
  Include bit map : 0x4
```

show mpls traffic-eng tunnels

```

        Include name          : blue
        Exclude bit map       : 0x2
        Exclude name          : red

Metric Type: TE (default)
Hop-limit: disabled
AutoRoute: disabled  LockDown: disabled  Policy class: 1
Forwarding-Adjacency: disabled
Loadshare:          0 equal loadshares
Auto-bw: disabled
Fast Reroute: Disabled, Protection Desired: None
Path Protection: Not Enabled
Soft Preemption: Disabled
Auto Backup:
  Protected LSPs: 2
  Protected S2L Sharing Families: 0
  Protected S2L: 0
  Protected i/f: PO0/3/0/1
  Attribute-set: ab
  Protection: NHOP
  Unused removal timeout: not running
History:
  Tunnel has been up for: 00:04:57 (since Tue Aug 14 23:24:58 EST 2012)
  Current LSP:
    Uptime: 00:04:57 (since Tue Aug 14 23:24:58 EST 2012)

Path info (OSPF 100 area 16909060):
Node hop count: 2
Hop0: 23.9.0.2
Hop1: 12.9.0.2
Hop2: 12.9.0.1
Hop3: 1.1.1.1
Displayed 1 (of 7) heads, 0 (of 3) midpoints, 0 (of 0) tails Displayed 1 up, 0 down, 0
recovering, 0 recovered heads

```

This example shows the protected interface for auto-backup auto-tunnels.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels backup protected-interface
```

```

Interface: Gi0/2/0/1 (auto-tunnel backup)
  SRLG: N/A, NHOP-only: No
  Attribute-set: Not configured
  Auto-tunnel backup recreate time remaining: timer not running
  No backup tunnel found

Interface: Gi0/2/0/3
  tunnel-te340  PROTECTED : out i/f:  PO0/3/0/2  Admin:  up  Oper:  up

Interface: PO0/3/0/1 (auto-tunnel backup)
  SRLG: N/A, NHOP-only: No
  Attribute-set: ab
  Auto-tunnel backup recreate time remaining: timer not running
  *tunnel-te3000      NHOP : out i/f:  Gi0/2/0/2  Admin:  up  Oper:  up

```

* = automatically created backup tunnel

This example shows the details about all the tunnels that are using auto-mesh type of attribute-set.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels attribute-set auto-mesh all
```

```

Name: tunnel-te3501  Destination: 1.1.1.1 (auto-tunnel mesh)
Status:
  Admin:  up Oper:  up  Path:  valid  Signalling: connected

  path option 10, type dynamic (Basis for Setup, path weight 2)
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 100 kbps CT0
  Creation Time: Tue Aug 14 23:25:41 2012 (00:06:13 ago)
Config Parameters:
  Bandwidth: 100 kbps (CT0) Priority: 2 2
  Number of affinity constraints: 2
    Include bit map : 0x8
    Include name : yellow
    Exclude bit map : 0x2

```



```

Exclude name          : red

Metric Type: TE (default)
Hop-limit: disabled
AutoRoute: disabled  LockDown: disabled  Policy class: not set
Forwarding-Adjacency: disabled
Loadshare:           0 equal loadshares
Auto-bw: disabled
Fast Reroute: Enabled, Protection Desired: Node, Bandwidth
Path Protection: Not Enabled
Attribute-set: am (type auto-mesh)
Soft Preemption: Disabled
Auto-tunnel Mesh:
  Group ID: 1
  Destination list: blah
  Unused removal timeout: not running
History:
  Tunnel has been up for: 00:06:13 (since Tue Aug 14 23:25:41 EST 2012)
  Current LSP:
    Uptime: 00:06:13 (since Tue Aug 14 23:25:41 EST 2012)

Path info (OSPF 100 area 16909060):
Node hop count: 2
Hop0: 23.9.0.2
Hop1: 12.9.0.2
Hop2: 12.9.0.1
Hop3: 1.1.1.1

Name: tunnel-te3502  Destination: 2.2.2.2 (auto-tunnel mesh)
Status:
  Admin:    up Oper:    up   Path:  valid   Signalling: connected

  path option 10,  type dynamic  (Basis for Setup, path weight 1)
  G-PID: 0x0800 (derived from egress interface properties)
  Bandwidth Requested: 100 kbps  CT0
  Creation Time: Tue Aug 14 23:25:41 2012 (00:06:13 ago)
Config Parameters:
  Bandwidth:      100 kbps (CT0) Priority:  2  2
  Number of affinity constraints: 2
    Include bit map      : 0x8
    Include name         : yellow
    Exclude bit map      : 0x2
    Exclude name         : red

  Metric Type: TE (default)
  Hop-limit: disabled
  AutoRoute: disabled  LockDown: disabled  Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare:           0 equal loadshares
  Auto-bw: disabled
  Fast Reroute: Enabled, Protection Desired: Node, Bandwidth
  Path Protection: Not Enabled
  Attribute-set: am (type auto-mesh)
  Soft Preemption: Disabled
Auto-tunnel Mesh:
  Group ID: 1
  Destination list: blah
  Unused removal timeout: not running
History:
  Tunnel has been up for: 00:06:13 (since Tue Aug 14 23:25:41 EST 2012)
  Current LSP:
    Uptime: 00:06:13 (since Tue Aug 14 23:25:41 EST 2012)

Path info (OSPF 100 area 16909060):
Node hop count: 1
Hop0: 23.9.0.2
Hop1: 2.2.2.2

Name: tunnel-te3503  Destination: 4.4.4.4 (auto-tunnel mesh)
Status:
  Admin:    up Oper: down  Path: not valid  Signalling: Down

  path option 10,  type dynamic

```

```

Last PCALC Error: Tue Aug 14 23:31:26 2012
Info: No path to destination, 4.4.4.4 (affinity)
G-PID: 0x0800 (derived from egress interface properties)
Bandwidth Requested: 100 kbps CT0
Creation Time: Tue Aug 14 23:25:41 2012 (00:06:13 ago)
Config Parameters:
  Bandwidth:      100 kbps (CT0) Priority:  2  2
  Number of affinity constraints: 2
    Include bit map      : 0x8
    Include name         : yellow
    Exclude bit map      : 0x2
    Exclude name         : red

  Metric Type: TE (default)
  Hop-limit: disabled
  AutoRoute: disabled LockDown: disabled Policy class: not set
  Forwarding-Adjacency: disabled
  Loadshare:      0 equal loadshares
  Auto-bw: disabled
  Fast Reroute: Enabled, Protection Desired: Node, Bandwidth
  Path Protection: Not Enabled
  Attribute-set: am (type auto-mesh)
  Soft Preemption: Disabled
Auto-tunnel Mesh:
  Group ID: 1
  Destination list: blah
  Unused removal timeout: not running
Displayed 3 (of 7) heads, 0 (of 3) midpoints, 0 (of 0) tails Displayed 2 up, 1 down, 0
recovering, 0 recovered heads

```

This example shows the P2MP-TE head end inter-area related configuration details.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels p2mp detail
```

```

Name: tunnel-mtel
Status:
  Admin: up Oper: up (Up for 2d22h)

Config Parameters:
  Bandwidth: 10 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
  Metric Type: TE (default)
  Fast Reroute: Not Enabled, Protection Desired: None
  Record Route: Not Enabled

Destination summary: (2 up, 0 down, 0 disabled) Affinity: 0x0/0xffff
Auto-bw: disabled
Destination: 192.168.0.5
State: Up for 03:00:27
Path options:
  path-option 1 explicit name ABCE1 [active]
  Last Signalled Error: Wed Feb 22 00:12:28 2012
  Info: [10990] PathErr(25,13)-(notify, preferred tree exists) at 11.11.11.3
Reoptimization Info in Inter-area:
  Better Path Queries sent = 14; Preferred Tree Exists received = 2
  Last Better Path Query was sent 00:00:35 ago
  Last Preferred Tree exists was received 00:08:35 ago from 11.11.11.3
Destination: 192.168.0.8
State: Up for 03:00:27
Path options:
  path-option 1 explicit name ABCE1 [active]
  Last Signalled Error: Wed Feb 22 00:12:28 2012
  Info: [10990] PathErr(25,13)-(notify, preferred loose tree exists) at 11.11.11.3

Reoptimization Info in Inter-area:
  Better Path Queries sent = 14; Preferred Tree Exists received = 2
  Last Better Path Query was sent 00:00:35 ago
  Last Preferred Tree exists was received 00:08:35 ago from 11.11.11.3

History:
Reopt. LSP:
  Last Failure:
    LSP not signalled, identical to the [CURRENT] LSP
    Date/Time: Thu Feb 16 14:53:19 EST 2012 [00:57:25 ago]

```

```

Current LSP:
  lsp-id: 10992 p2mp-id: 1 tun-id: 1 src: 192.168.0.1 extid: 192.168.0.1
  LSP up for: 00:08:35 (since Wed Feb 22 00:12:28 EST 2012)
  Reopt Trigger: Received Preferred Tree Exists Msg, Reopt Reason: inter-area preferred
tree exists
...

```

This example shows the P2MP-TE midpoint inter-area related configuration details.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels p2mp detail
```

```

LSP Tunnel 192.168.0.1 1 [10013] is signalled, connection is up
Tunnel Name: rtrA mt1 Tunnel Role: Mid
InLabel: GigabitEthernet0/0/0/1, 16000
OutLabel: GigabitEthernet0/0/0/3, 16000
Signalling Info:
  Src 192.168.0.1 Dst 192.168.0.5, Tun ID 1, Tun Inst 10013, Ext ID 192.168.0.1
  Router-IDs: upstream 192.168.0.2
               local   192.168.0.3
               downstream 192.168.0.5
  Bandwidth: 10 kbps (CT0) Priority: 7 7 DSTE-class: 0
  Soft Preemption: None
  Path Info:
    Incoming Address: 11.11.11.3
    Incoming:
      Explicit Route:
        Strict, 11.11.11.3
        Strict, 192.168.0.3
    ERO Expansion Info:
      OSPF ring area 0, Metric 8(TE), Affinity 0x0, Mask 0xffff, Queries 8
      Last Better Path Query was received 00:00:35 ago
      Last Preferred Tree Exists was send 00:08:35 ago
    Outgoing:
      Explicit Route:
        Strict, 13.13.13.5
        Strict, 192.168.0.5
    Record Route: Disabled
    Tspec: avg rate=10 kbits, burst=1000 bytes, peak rate=10 kbits
    Session Attributes: Local Prot: Not Set, Node Prot: Not Set, BW Prot: Not Set
                      Soft Preemption Desired: Not Set
  Resv Info: None
  Record Route: Disabled
  Fspec: avg rate=10 kbits, burst=1000 bytes, peak rate=10 kbits
  TE LSP Info:
    Path-in      : Feb 13 19:26:08.950 (start)
    Path-out     : Feb 13 19:26:08.951 (1ms, 1ms)
    Resv-in      : Feb 13 19:26:08.961 (11ms, 10ms)
    Label rewrite : Not set (0ms, 0ms)
    Resv-out     : Feb 13 19:26:08.963 (13ms, 1ms)
  Displayed 0 (of 2) heads, 1 (of 2) midpoints, 0 (of 0) tails
  Displayed 0 up, 0 down, 0 recovering, 0 recovered heads

```

This example includes output for Generalized Multiprotocol Label Switching (GMPLS) User-Network Interface (UNI) configuration for the **show mpls traffic-eng tunnels** command using the **summary** keyword:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels auto-tunnel
Thu Jan 14 10:46:34.677 EST
```

```

LSP Tunnels Process: running
  RSVP Process: running
    Forwarding: enabled
  Periodic reoptimization: every 3600 seconds, next in 3354 seconds
  Periodic FRR Promotion: every 300 seconds, next in 193 seconds
  Periodic auto-bw collection: 1000

```

```

Signalling Summary:
  Head: 2000 interfaces, 2000 active signalling attempts, 2000 established
        2000 explicit, 0 dynamic
        9250 activations, 7250 deactivations

```

show mpls traffic-eng tunnels

```

        0 recovering, 2000 recovered
Mids: 0
Tails: 0

Fast ReRoute Summary:
  Head:    1000 FRR tunnels, 1000 protected, 0 rerouted
  Mid:     0 FRR tunnels, 0 protected, 0 rerouted
  Summary: 1000 protected, 500 link protected, 500 node protected, 0 bw protected

P2MP Summary:
  Tunnel Head:    250 total, 250 connected
  Destination Head: 500 total, 500 connected
  S2L Head: 500 established, 0 proceeding
  S2L Mid: 0 established, 0 proceeding
  S2L Tail: 0 established

P2MP Fast ReRoute Summary:
  Tunnel Head: 250 FRR enabled
  S2L Head: 500 FRR, 500 protected, 0 rerouted
  S2L Mid: 0 FRR, 0 protected, 0 rerouted
  Summary: 500 protected, 500 link protected, 0 node protected, 0 bw protected

<snip>
GMPLS UNI Summary:
  Heads: 23 up, 4 down
  Tails: 13 up, 2 down

```

Related Commands

Command	Description
auto-tunnel backup (MPLS-TE)	Builds automatic NHOP and NNHOP backup tunnels.
backup-bw	Specifies the bandwidth type that LSPs can use for a backup tunnel, whether the backup tunnel should provide bandwidth protection, and if yes, how much and in which bandwidth pool.
srlg	Configures an SRLG membership for a link on a given interface.
soft-preemption	Enables soft-preemption on a head-end for the MPLS TE tunnel.

show mpls traffic-eng tunnels auto-bw brief

To display the list of automatic bandwidth enabled tunnels, and to indicate if the current signaled bandwidth of the tunnel is identical to the bandwidth that is applied by the automatic bandwidth, use the **show mpls traffic-eng tunnels auto-bw brief** command in EXEC mode.

show mpls traffic-eng tunnels auto-bw brief

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

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.

Use the **show mpls traffic-eng tunnels auto-bw brief** command to determine if the automatic bandwidth application has been applied on a specified tunnel. If a single tunnel is specified, only the information for that tunnel is displayed.

Task ID	Operations
mpls-te	read

Examples The following sample output shows the list of automatic bandwidth enabled tunnels:

RP/0/RP0/CPU0:router# **show mpls traffic-eng tunnels auto-bw brief**

Tunnel Name	LSP ID	Last appl BW (kbps)	Requested BW (kbps)	Signalled BW (kbps)	Highest BW (kbps)	Application Time Left
tunnel-te0	1	10	10	50	2h 5m	
tunnel-te1	5	500	300	420	1h 10m	

This table describes the significant fields shown in the display.

Table 56: show mpls traffic-eng tunnels auto-bw brief Field Descriptions

Field	Description
Tunnel Name	Name for the tunnel.
LSP ID	ID of the Label Switched Path that is used by the tunnel.
Last appl BW (kbps)	Last bandwidth applied (for example, requested) by the automatic-bandwidth feature for the tunnel.
Requested BW (kbps)	Bandwidth that is requested for the tunnel.
Signalled BW (kbps)	Bandwidth that is actually signalled for the tunnel.
Highest BW (kbps)	Highest bandwidth measured since the last start of the application interval.
Application Time Left	Time left until the application period ends for this tunnel.

Related Commands

Command	Description
show mpls traffic-eng tunnels , on page 430	Displays information about MPLS-TE tunnels.

show mpls traffic-eng link-management soft-preemption

To display information about soft-preemption activity on a MPLS TE link, use the **show mpls traffic-eng link-management soft-preemption** command in EXEC mode.

show mpls traffic-eng link-management soft-preemption [*interfacetype interface-path-id*]

Syntax Description

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

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	Operations
mpls-te	read

Examples

This is sample output from the **show mpls traffic-eng link-management soft-preemption** command:

```
RP/0/RP0/CPU0:router# show mpls traffic-eng link-management soft-preemption interface
POS0/1/0/1
```

```
Name: POS0/1/0/1; IPv4 Address: 1.2.3.10
Total Soft Preempted Bandwidth (BC0/BC1) kbps: 1500/1000
Currently Soft Preempted Bandwidth (BC0/BC1) kbps: 1200/800
Released Soft Preempted Bandwidth (BC0/BC1) kbps: 300/200
Currently Over-subscribed Bandwidth (BC0/BC1) kbps: 1000/600
Currently Soft Preempted Tunnels: 5 tunnels
```

TunID	LSPID	Source	Destination	Pri S/H	BW Kbps	Class Type	Time out
50	10	4.4.4.40	1.1.1.10	2/2	400	BC0	100
51	11	4.4.4.40	1.1.1.10	2/2	600	BC0	100
52	12	4.4.4.40	1.1.1.10	3/3	200	BC0	80
53	11	4.4.4.40	1.1.1.10	3/3	500	BC1	90
54	12	4.4.4.40	1.1.1.10	4/4	300	BC1	90

show srlg

To show the SRLG interface and configuration information, use the **show srlg** command in EXEC mode.

```
show srlg [interface type interface-path-id] [location {node-id| all| mgmt-nodes}] [value value-number]
[trace{file filename original| hexdump | last entries| reverse | stats| tailf | unique | verbose | wrapping}]
```

Syntax Description

interface <i>type</i>	(Optional) Displays information on the specific 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	(Optional) Specifies a node.
<i>node-id</i>	Node ID. The <i>node-id</i> argument is entered in the <i>rack/slot/module</i> notation.
all	Specifies all locations.
mgmt-nodes	Specifies all management nodes.
value <i>value-number</i>	(Optional) Displays SRLG value numbers.
trace	(Optional) Displays trace information for SRLG.
file <i>filename</i>	(Optional) Displays trace information for a specific file name.
original	Displays the original location of the file.
hexdump	(Optional) Displays traces in hexadecimal format.
last	(Optional) Displays trace information for a specific number of entries.
<i>entries</i>	Number of entries. Replace entries with the number of entries you want to display. For example, if you enter 5, the display shows the last 5 entries in the trace data. Range is 1 to 4294967295.
reverse	(Optional) Displays the latest traces first.

stats	(Optional) Displays the statistics in the command output.
tailf	(Optional) Displays the new traces as they are added in the command output.
unique	(Optional) Displays the unique entries with counts in the command output.
verbose	(Optional) Displays the information for internal debugging in the command output.
wrapping	(Optional) Displays the wrapping entries in the command output.

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	Operation
ip-services	read

Examples

The following sample output is from the **show srlg value** command.

```

System Information::
Interface Count    : 2 (Maximum Interfaces Supported 250)

Interface   : POS0/1/0/0, Value Count : 2
SRLG Values : 10,20

Interface   : POS0/1/0/1, Value Count : 2
SRLG Values : 10,30

Interface   : POS0/1/0/2, Value Count : 2

```

```
SRLG Values : 10,40
Interface   : POS0/2/0/0, Value Count : 1
SRLG Values : 100
```

Related Commands

Command	Description
interface (MPLS-TE), on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.

signalled-bandwidth

To configure the bandwidth required for an MPLS-TE tunnel, use the **signalled-bandwidth** command in interface configuration mode. To disable the behavior, use the **no** form of this command.

signalled-bandwidth {*bandwidth* [**class-type** *ct*]| **sub-pool** *bandwidth*}

no signalled-bandwidth {*bandwidth* [**class-type** *ct*]| **sub-pool** *bandwidth*}

Syntax Description

<i>bandwidth</i>	Bandwidth required for an MPLS-TE tunnel. Bandwidth is specified in kilobits per second. By default, bandwidth is reserved in the global pool. Range is from 0 to 4294967295.
class-type <i>ct</i>	(Optional) Configures the class type of the tunnel bandwidth request. Range is from 0 to 1. Class-type 0 is strictly equivalent to global-pool. Class-type 1 is strictly equivalent to subpool.
sub-pool <i>bandwidth</i>	Reserves the bandwidth in the subpool instead of the global pool. Range is 1 to 4294967295. A subpool bandwidth value of 0 is not allowed.

Command Default

The default is 0 in class-type 0.

Command Modes

Interface configuration

Command History

Release	Modification
Release 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.

The **signalled-bandwidth** command supports two bandwidth pools (class-types) for the Diff-Serv Aware TE (DS-TE) feature. This command is also used as the bandwidth startup value to bring up the auto bandwidth enabled tunnels.



Note

The Cisco Diff-Serve Aware TE feature is compliant to IETF standard and will interoperate with third party vendor DS-TE. Both Russian Doll Model and Maximum Allocation Model for bandwidth allocation are supported. We recommended that IETF terminology be used in DS-TE bandwidth configurations, namely, Class-type (CT) and Bandwidth Constraints (BC).

Task ID

Task ID	Operations
mpls-te	read, write

Examples

This example shows how to set the bandwidth required for an MPLS-TE tunnel to 1000 in the global pool (class-type 0):

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 1000

RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 1000 class-type 0
```

This example shows how to set the bandwidth required for an MPLS-TE tunnel to 1000 in the sub-pool (class-type 1):

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth sub-pool 1000

RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 1000 class-type 1
```

Related Commands

Command	Description
show mpls traffic-eng tunnels , on page 430	Displays information about MPLS-TE tunnels.

signalled-name

To configure the name of the tunnel required for an MPLS-TE tunnel, use the **signalled-name** command in interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalled-name *name*

no signalled-bandwidth *name*

Syntax Description

<i>name</i>	Name used to signal the tunnel.

Command Default

Default name is the hostname_tID, where ID is the tunnel interface number.

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.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the tunnel name:

```
RP/0/RP0/CPU0:router(config)# interface tunnel-te 1
RP/0/RP0/CPU0:router(config-if)# signalled-name tunnel-from-NY-to-NJ
```

Related Commands

Command	Description
show mpls traffic-eng tunnels , on page 430	Displays information about MPLS-TE tunnels.

signalling advertise explicit-null (MPLS-TE)

To specify that tunnels terminating on a router use explicit-null labels, use the **signalling advertise explicit-null** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

signalling advertise explicit-null

no signalling advertise explicit-null

Syntax Description This command has no arguments or keywords.

Command Default Implicit-null labels are advertised.

Command Modes MPLS-TE configuration

Command History	Release	Modification
	Release 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.

Use the **signalling advertise explicit-null** command to specify that tunnels terminating on this router use explicit-null labels. This command applies to tunnel labels advertised to next to last (penultimate) hop.

The explicit label is used to carry quality-of-service (QoS) information up to the terminating-end router of the label switched path (LSP).

Task ID	Task ID	Operations
	mpls-te	read, write

Examples The following example shows how to configure explicit null tunnel labels:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# signalling advertise explicit-null
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.
path-selection loose-expansion metric (MPLS-TE) , on page 322	Configures a metric type to be used to expand a path to the next loose hop for a tunnel on an area border router.

snmp traps mpls traffic-eng

To enable the router to send Multiprotocol Label Switching traffic engineering (MPLS-TE) Simple Network Management Protocol (SNMP) notifications or informs, use the **snmp traps mpls traffic-eng** command in global configuration mode. To disable this behavior, use the **no** form of this command.

snmp traps mpls traffic-eng [*notification-option*] **preempt**

no snmp traps mpls traffic-eng [*notification-option*]

Syntax Description

<i>notification-option</i>	(Optional) Notification option to enable the sending of notifications to indicate changes in the status of MPLS-TE tunnels. Use one of these values: • up • down • reoptimize • reroute • p2mp • cisco-ext
preempt	Enables MPLS-TE tunnel preempt trap.

Command Default

None

Command Modes

Global configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The p2mp notification option was added to support the P2MP TE feature.
Release 4.2.0	The preempt 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.

If the command is entered without the *notification-option* argument, all MPLS-TE notification types are enabled.

SNMP notifications can be sent as either traps or inform requests.

The **snmp-server enable traps mpls traffic-eng** command enables both traps and inform requests for the specified notification types. To specify whether the notifications should be sent as traps or informs, use the **snmp-server host** command and specify the keyword **trap** or **informs**.

If you do not enter the **snmp traps mpls traffic-eng** command, no MPLS-TE notifications controlled by this command are sent. To configure the router to send these MPLS-TE SNMP notifications, you must enter at least one **snmp enable traps mpls traffic-eng** command. If you enter the command with no keywords, all MPLS-TE notification types are enabled. If you enter the command with a keyword, only the notification type related to that keyword is enabled. To enable multiple types of MPLS-TE notifications, you must issue a separate **snmp traps mpls traffic-eng** command for each notification type and notification option.

The **snmp traps mpls traffic-eng** command is used in conjunction with the **snmp host** command. Use the **snmp host** command to specify which host or hosts receive MPLS-TE SNMP notifications. To send notifications, you must configure at least one **snmp host** command.

For a host to receive an MPLS-TE notification controlled by this command, both the **snmp traps mpls traffic-eng** command and the **snmp host** command for that host must be enabled.

Task ID

Task ID	Operations
mpls-te	read/write

Examples

This example shows how to configure a router to send MPLS-TE tunnel up SNMP notifications when a configured MPLS-TE tunnel leaves the down state and enters the up state:

```
RP/0/RP0/CPU0:router(config)# snmp traps mpls traffic-eng up
```

Related Commands

Command	Description
snmp-server host	Specifies the recipient of a SNMP notification operation.
soft-preemption	Enables soft-preemption on a head-end for the MPLS TE tunnel.

soft-preemption

To enable soft-preemption with default timeout on a head-end for the MPLS TE tunnel, use the **soft-preemption** command in MPLS TE mode. To disable this feature, use the **no** form of this command.

soft-preemption timeout *seconds*

no soft-preemption

timeout <i>seconds</i>	Defines the timeout for soft-preempted LSP, in seconds. The default timeout is 60. Range is from 30 to 300.

Command Default The default *timeout seconds* is 60 seconds.

Command Modes MPLS TE configuration
Tunnel Interface configuration

Command History	Release	Modification
	Release 4.2.0	This command was introduced.

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
	MPLS-TE	write

Examples This example shows how to enable soft-preemption on a specific tunnel:

```
RP/0/RP0/CPU0:router(config)#interface tunnel-te 50
RP/0/RP0/CPU0:router(config-if)#soft-preemption
```

This example shows how to enable soft-preemption on a node :

```
RP/0/RP0/CPU0:router(config)#mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)#soft-preemption
RP/0/RP0/CPU0:router(config-soft-preemption)#
```

srlg

To configure an MPLS traffic engineering shared-risk link group (SRLG) value for a link on a given interface, use the **srlg** command in global configuration mode. To disable this configuration, use the **no** form of this command.

srlg *value*

no srlg *value*

Syntax Description

<i>value</i>	Value number that identifies the SRLG. Range is 0 to 4294967295.

Command Default

Shared Risk Link Group memberships are not configured.

Command Modes

Global configuration

Command History

Release	Modification
Release 3.8.0	This command was introduced.
Release 4.0.0	The value argument was added. Command mode was changed to the global 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.

You can enter up to 30 SRLG entries on the ingress and egress ports of the interface. SRLG entries configured over 30 are silently dropped.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure an SRLG with 10 member links:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router# (config)# srlg
RP/0/RP0/CPU0:router# (config-srlg)# interface POS 0/3/0/2
RP/0/RP0/CPU0:router# (config-srlg-if)# value 10
```

Related Commands

Command	Description
interface (MPLS-TE), on page 247	Enables MPLS-TE on an interface and enters MPLS-TE interface configuration mode.
mpls traffic-eng, on page 288	Enters MPLS-TE configuration mode.

switching (GMPLS)

To configure TE-link switching attributes, use the **switching** command in MPLS-TE interface configuration mode. To return to the default behavior, use the **no** form of this command.

switching {*key value*| **link**} [*capability switching*| **encoding** *encoding type*]

no switching {*key value*| **link**} [*capability switching*| **encoding** *encoding type*]

Syntax Description

key	Configures the Interface Switching Capability Key.
<i>value</i>	Local interface switching capability key value. Range is 1 to 99.
link	Enables link switching.
<i>capability switching</i>	(Optional) Configures switching capability type.
encoding <i>encoding type</i>	(Optional) Enables local encoding. Range is 1 to 99.

Command Default

No default behavior or values

Command Modes

MPLS-TE 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.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure interface switching key on Packet-over-SONET/SDH (POS) interface 0/7/0/1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# interface POS 0/7/0/1
RP/0/RP0/CPU0:router(config-mpls-te-if)# switching key 66
```

Related Commands

Command	Description
lmp hello (GMPLS), on page 272	Configures LMP IPCC management hello settings.
match (GMPLS), on page 284	Configures or matches active and passive tunnels.
passive (GMPLS), on page 311	Configures passive GMPLS tunnels.
remote (GMPLS), on page 348	Configures remote TE links.

switching endpoint (GMPLS)

To specify the switching capability and encoding types for all endpoint TE links used to signal the optical tunnel that is mandatory to set up the GMPLS LSP, use the **switching endpoint** command in interface tunnel-gte configuration mode. To disable this feature, use the **no** form of this command.

switching endpoint *capability switching type* [**encoding** *encoding type*]

no switching endpoint *capability switching type* [**encoding** *encoding type*]

Syntax Description

capability switching type Capability switching type is the optical LSP switching capability descriptor. The following types are used:

psc1

Specifies Packet-Switch Capable-1 that is equivalent to numeric 1.

lsc

Specifies Lambda-Switch Capable that is equivalent to numeric 150.

fsc

Specifies Fiber-Switch Capable that is equivalent to numeric 200.

encoding *encoding type* (Optional) Specifies the transport capability of the TE link over which the GMPLS LSP is established. For SONET links, the encoding is specified as sonetsdh. For Ethernet links, the encoding is specified as ethernet.

Command Default

No default behavior or values

Command Modes

Interface tunnel-gte configuration

Command History

Release	Modification
Release 3.3.2	This command was introduced.
Release 3.8.0	GMPLS interfaces are used under the tunnel-gte interface type.

Usage Guidelines

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

GMPLS interfaces are used under the tunnel-gte interface type.

Use the **switching endpoint** command to configure the optical LSP.

The switching and encoding types must match with the configured values at the termination point of the LSP.

**Note**

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure switching capability as psc1 and the encoding type as sonetsdh for the **switching endpoint** command:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-gte 1
RP/0/RP0/CPU0:router(config-if)# ipv4 address 99.99.99.2 255.255.255.254
RP/0/RP0/CPU0:router(config-if)# signalled-name tunnel-gte1
RP/0/RP0/CPU0:router(config-if)# switching endpoint psc1 encoding sonetsdh
RP/0/RP0/CPU0:router(config-if)# priority 2 2
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 2488320
RP/0/RP0/CPU0:router(config-if)# destination 109.109.109.109
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name g1-p1-p2
RP/0/RP0/CPU0:router(config-if)# path-option protecting 1 explicit name g2-p1-p2
```

Related Commands

Command	Description
interface tunnel-gte, on page 251	Configures an MPLS-TE tunnel interface for GMPLS interfaces.
switching transit (GMPLS), on page 484	Specifies the switching capability and encoding types for all transit TE links used to signal the optical tunnel.

switching transit (GMPLS)

To specify the switching capability and encoding types for all transit TE links used to signal the optical tunnel to configure an optical LSP, use the **switching transit** command in interface tunnel-gte configuration mode. To disable this feature, use the **no** form of this command.

switching transit *capability switching type* [**encoding** *encoding type*]

no switching transit *capability switching type* [**encoding** *encoding type*]

Syntax Description

capability switching type Capability switching type is the optical LSP switching capability descriptor. The following types are used:

psc1

Specifies Packet-Switch Capable-1 that is equivalent to numeric 1.

lsc

Specifies Lambda-Switch Capable that is equivalent to numeric 150.

fsc

Specifies Fiber-Switch Capable that is equivalent to numeric 200.

encoding *encoding type* (Optional) Specifies the transport capability of the TE link over which the GMPLS LSP is established. For SONET links, the encoding is specified as sonetsdh. For Ethernet links, the encoding is specified as ethernet.

Command Default

No default behavior or values

Command Modes

Interface tunnel-gte configuration

Command History

Release	Modification
Release 3.3.2	This command was introduced.
Release 3.8.0	GMPLS interfaces are used under the tunnel-gte interface type.

Usage Guidelines

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

GMPLS interfaces are used under the tunnel-gte interface type.

Use the **switching transit** command to configure the optical LSP.

The switching and encoding types must match with the configured values at the termination point of the LSP.

**Note**

The LMP and GMPLS-NNI features are not supported on x86 RPs.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to configure switching capability as lsc and the encoding type as sonetsdh for the **switching transit** command:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface tunnel-gte1
RP/0/RP0/CPU0:router(config-if)# ipv4 address 99.99.99.2 255.255.255.254
RP/0/RP0/CPU0:router(config-if)# signalled-name tunnel-gte1
RP/0/RP0/CPU0:router(config-if)# switching transit lsc encoding sonetsdh
RP/0/RP0/CPU0:router(config-if)# priority 2 2
RP/0/RP0/CPU0:router(config-if)# signalled-bandwidth 2488320
RP/0/RP0/CPU0:router(config-if)# destination 109.109.109.109
RP/0/RP0/CPU0:router(config-if)# path-option 1 explicit name g1-p1-p2
RP/0/RP0/CPU0:router(config-if)# path-option protecting 1 explicit name g2-p1-p2
```

Related Commands

Command	Description
interface tunnel-gte , on page 251	Configures an MPLS-TE tunnel interface for GMPLS interfaces.
switching endpoint (GMPLS) , on page 482	Specifies the switching capability and encoding types for all endpoint TE links used to signal the optical tunnel.

timers loose-path (MPLS-TE)

To configure the period between the headend retries after path errors, use the **timers loose-path** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

timers loose-path *retry-period* *value*

no timers loose-path *retry-period* *value*

Syntax Description

retry-period <i>value</i>	Configures the time, in seconds, between retries upon a path error. Range is 30 to 600.

Command Default

value: 120

Command Modes

MPLS-TE 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
mpls-te	read, write

Examples

The following example shows how to the period between retries after path errors to 300 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# timers loose-path retry-period 300
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.

Command	Description
path-selection loose-expansion affinity (MPLS-TE), on page 320	Specifies the affinity value to be used to expand a path to the next loose hop for a tunnel on an area border router.

timers removal unused (auto-tunnel backup)

To configure the frequency at which a timer scans backup autotunnels and removes tunnels that are not in use, use the **timers removal unused (auto-tunnel backup)** command in auto-tunnel backup configuration mode. To return to the default behavior, use the **no** form of this command.

timers removal unused *frequency*

no timers removal unused *frequency*

Syntax Description

<i>frequency</i>	Frequency, in minutes, between backup autotunnel scans to remove tunnels that are not used. Range is 0; 5 to 10080 minutes (7 days). A value of 0 disables the scanning and removal of tunnels.

Command Default

frequency: 60

Command Modes

auto-tunnel backup 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.

The **unused** auto-tunnel backup tunnel is the tunnel that is not assigned to protect any FRR tunnel.

Task ID

Task ID	Operation
mpls-te	read, write

Examples

The following example shows that unused automatic backup tunnels are removed after the 10 minute timer scan is reached.

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel backup
RP/0/RP0/CPU0:router(config-te-auto-bk)# timers removal unused 10
```

Related Commands

Command	Description
show mpls traffic-eng auto-tunnel backup unused	Displays the unused backup tunnels only.
auto-tunnel backup (MPLS-TE), on page 183	Builds automatic next-hop and next-next-hop tunnels, and enters auto-tunnel configuration mode.

timeout (soft-preemption)

To override the soft-preemption default timeout, use the **timeout** command in MPLS TE mode. To remove this configuration, use the **no** form of this command.

soft-preemption timeout *seconds*

no soft-preemption

Syntax Description

timeout <i>seconds</i>	Defines the timeout for soft-preempted LSP, in seconds. The default timeout is 60. Range is from 30 to 300.

Command Default

The default *timeout seconds* is 60 seconds.

Command Modes

MPLS TE configuration

Command History

Release	Modification
Release 4.2.0	This command was introduced.

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
MPLS-TE	write

Examples

This example shows how to override the soft-preemption default timeout:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# soft-preemption
RP/0/RP0/CPU0:router(config-soft-preemption)# timeout 60
```


topology holddown sigerr (MPLS-TE)

To specify the time that a router should ignore a link in its TE topology database in tunnel path constrained shortest path first (CSPF) computations following a TE tunnel signaling error on the link, use the **topology holddown sigerr** command in MPLS-TE configuration mode. To return to the default behavior, use the **no** form of this command.

topology holddown sigerr *seconds*

no topology holddown sigerr *seconds*

Syntax Description

<i>seconds</i>	Time that the router ignores a link during tunnel path calculations, following a TE tunnel error on the link, specified in seconds. Range is 0 to 300. Default is 10.

Command Default

seconds: 10

Command Modes

MPLS-TE configuration

Command History

Release	Modification
Release 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.

A router at the headend for TE tunnels can receive a Resource Reservation Protocol (RSVP) No Route error message before the router receives a topology update from the IGP routing protocol announcing that the link is down. When this happens, the headend router ignores the link in subsequent tunnel path calculations to avoid generating paths that include the link and are likely to fail when signaled. The link is ignored until the router receives a topology update from its IGP or a link holddown timeout occurs. Use the **topology holddown sigerr** command to change the link holddown time from its 10-second default value.

Task ID

Task ID	Operations
mpls-te	read, write

Examples

The following example shows how to set the link holddown time for signaling errors at 15 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# topology holddown sigerr 15
```

Related Commands

Command	Description
mpls traffic-eng , on page 288	Enters MPLS-TE configuration mode.
show mpls traffic-eng topology , on page 420	Displays the current MPLS-TE global topology of this node as well as the signaling error holddown time.

tunnel-id (auto-tunnel backup)

To configure the range of tunnel interface numbers to be used for automatic backup tunnels, use the **tunnel-id** command in auto-tunnel backup configuration mode. To delete the automatic backup tunnels, use the **no** form of this command.

tunnel-id *min number max number*

no tunnel-id

Syntax Description

min	(Optional) Minimum number for automatic backup tunnels.
<i>number</i>	Valid values are from 0 to 65535.
max	(Optional) Maximum number for automatic backup tunnels.

Command Default

No default behavior or values

Command Modes

Auto-tunnel backup 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.

If you increase the tunnel ID range, the automatic backup tunnels that failed earlier will get created the next time automatic backup assignments are processed.

Restrictions:

- Command is rejected if the **max** value minus **min** value is $\geq 1K$.
- Command is rejected if **min** value $>$ **max** value.
- Command is rejected if **min** value is greater than the tunnel ID of an existing automatic backup tunnel.
- Command is rejected if **max** value is smaller than the tunnel ID of an existing automatic backup tunnel.
- Command is rejected if a statically configured tunnel ID matches with the configured **min** and **max** range of values.
- Command is rejected if a static backup assignment is already configured to a tunnel with an ID within the **min** value / **max** value range.

Task ID

Task ID	Operation
mple-te	read, write

Examples

The following example allows 800 automatic backup tunnels to be created:

```
RP/0/RP0/CPU0:router(config)# mpls traffic-eng
RP/0/RP0/CPU0:router(config-mpls-te)# auto-tunnel backup
RP/0/RP0/CPU0:router(config-te-auto-bk)# tunnel-id min 1200 max 2000
```

Related Commands

Command	Description
auto-tunnel backup (MPLS-TE), on page 183	Builds automatic next-hop and next-next-hop tunnels, and enters auto-tunnel configuration mode.



RSVP Infrastructure Commands

This module describes the commands to configure and use Resource Reservation Protocol (RSVP). RSVP is a signaling protocol used to set up, maintain, and control end-to-end quality-of-service (QoS) reservations over IP. RSVP is specified in Internet Engineering Task Force (IETF) RFC 2205 (<ftp://ftp.isi.edu/in-notes/rfc2205.txt>).

The protocol has been extended to signal Multiprotocol Label Switching traffic engineering (MPLS-TE) tunnels, as specified in the IETF RFC 3209, *RSVP-TE: Extensions to RSVP for LSP Tunnels* and Optical UNI tunnels, as specified in the Optical Internetworking Forum (OIF) document OIF2000.125.7, *User Network Interface (UNI) 1.0, Signalling Specification*. The RSVP implementation supports fault handling as specified in IETF RFC 3473, *Generalized Multiprotocol Label Switching (GMPLS) Signaling RSVP-TE extensions*. The RSVP implementation also supports cryptographic authentication and refresh overhead reduction as specified in the RFC2747, *RSVP Cryptographic Authentication* and RFC2961, *RSVP Refresh Overhead Reduction Extensions* respectively.

For detailed information about MPLS concepts, configuration tasks, and examples, see *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router*.

Disable or Enable RSVP Message Checksum

Starting from Cisco IOS XR Release 4.0 RSVP computes and sets the checksum field on all outgoing RSVP messages, by default. RSVP also verifies the received checksum on all RSVP received messages to ensure its integrity.

A CLI is provided to override this default behavior and revert to the behavior exhibited in prior releases, whereby RSVP neither computes or sets the RSVP checksum field on outgoing RSVP messages, nor does it verify the checksum on received RSVP messages. This CLI is :

```
RP/0/RP0/CPU0:router(config)#rsvp signalling checksum disable
```



Note

When the **rsvp signalling checksum disable** command is configured, RSVP sets a zero checksum on all outgoing RSVP messages and ignores the checksum on all received RSVP incoming messages.

- [authentication \(RSVP\)](#), page 498
- [bandwidth \(RSVP\)](#), page 500
- [bandwidth mam \(RSVP\)](#), page 502

- [bandwidth rdm \(RSVP\), page 504](#)
- [clear rsvp authentication, page 506](#)
- [clear rsvp counters authentication, page 508](#)
- [clear rsvp counters all, page 510](#)
- [clear rsvp counters chkpt, page 512](#)
- [clear rsvp counters events, page 514](#)
- [clear rsvp counters messages, page 516](#)
- [clear rsvp counters oor, page 518](#)
- [clear rsvp counters prefix-filtering, page 520](#)
- [key-source key-chain \(RSVP\), page 522](#)
- [life-time \(RSVP\), page 524](#)
- [rsvp , page 526](#)
- [rsvp interface, page 527](#)
- [rsvp neighbor, page 529](#)
- [show rsvp authentication, page 531](#)
- [show rsvp counters, page 537](#)
- [show rsvp counters oor, page 541](#)
- [show rsvp counters prefix-filtering, page 543](#)
- [show rsvp fast-reroute, page 546](#)
- [show rsvp graceful-restart, page 549](#)
- [show rsvp hello instance, page 553](#)
- [show rsvp hello instance interface-based, page 556](#)
- [show rsvp interface, page 558](#)
- [show rsvp neighbor, page 561](#)
- [show rsvp request, page 563](#)
- [show rsvp reservation, page 566](#)
- [show rsvp sender, page 569](#)
- [show rsvp session, page 573](#)
- [signalling dscp \(RSVP\), page 577](#)
- [signalling graceful-restart, page 579](#)
- [signalling hello graceful-restart interface-based, page 581](#)
- [signalling hello graceful-restart refresh interval, page 582](#)
- [signalling hello graceful-restart refresh misses, page 584](#)

- [signalling prefix-filtering access-list, page 586](#)
- [signalling prefix-filtering default-deny-action, page 588](#)
- [signalling rate-limit, page 590](#)
- [signalling refresh interval, page 592](#)
- [signalling refresh missed, page 594](#)
- [signalling refresh reduction bundle-max-size, page 596](#)
- [signalling refresh reduction disable, page 598](#)
- [signalling refresh reduction reliable, page 600](#)
- [signalling refresh reduction summary, page 603](#)
- [window-size \(RSVP\), page 605](#)

authentication (RSVP)

To enter RSVP authentication mode, use the **authentication** command in global configuration mode, RSVP interface configuration mode, or RSVP neighbor configuration mode. To remove authentication parameters in the applicable mode, use the **no** form of this command.

authentication

no authentication

Syntax Description This command has no arguments or keywords.

Command Default The default value is no authentication, which means that the feature is disabled.

Command Modes

- Global configuration
- RSVP interface configuration
- RSVP neighbor 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
	mpls-te	read, write
	ouni	read, write

Examples The following example shows how to enter RSVP authentication configuration mode from global configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp authentication
RP/0/RP0/CPU0:router(config-rsvp-auth)#
```


The following example shows how to activate the RSVP on an interface and enter RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/2/1/0
RP/0/RP0/CPU0:router(config-rsvp-if)# authentication
RP/0/RP0/CPU0:router(config-rsvp-if-auth)#
```

The following example shows how to configure the RSVP neighbor with IP address 1.1.1.1 and enter neighbor authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp neighbor 1.1.1.1 authentication
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)#
```

Related Commands

Command	Description
key-source key-chain (RSVP) , on page 522	Specifies the source of the key information to authenticate RSVP signaling messages.
life-time (RSVP) , on page 524	Controls how long RSVP maintains idle security associations with trusted neighbors.
window-size (RSVP) , on page 605	Specifies the tolerance to accept out-of-sequence messages.

bandwidth (RSVP)

To configure RSVP bandwidth on an interface using prestandard DS-TE mode, use the **bandwidth** command in RSVP interface configuration mode. To reset the RSVP bandwidth on that interface to its default value, use the **no** form of this command.

bandwidth [*total-reservable-bandwidth* [*largest-reservable-flow*] [**sub-pool** *reservable-bw*]] [**global-pool** *bandwidth* [**sub-pool** *reservable-bw*]] [**bc0** *bandwidth* [**bc1** *reservable-bw*]]

no bandwidth

Syntax Description

<i>total-reservable-bandwidth</i>	(Optional) Total reservable bandwidth (in Kbps, Mbps or Gbps) that RSVP accepts for reservations on this interface. Range is 0 to 4294967295.
<i>largest-reservable-flow</i>	(Optional) Largest reservable flow (in Kbps, Mbps or Gbps) that RSVP accepts for reservations on this interface. Range is 0 to 4294967295.
sub-pool <i>reservable-bw</i>	(Optional) Configures the total reservable bandwidth in the sub-pool (in Kbps, Mbps, or Gbps). Range is 0 to 4294967295.
bc0 <i>bandwidth</i>	(Optional) Configures the total reservable bandwidth in the bc0 pool (in Kbps, Mbps or Gbps). The default is Kbps. Range is 0 to 4294967295.
bc1 <i>reservable-bw</i>	(Optional) Configures the total reservable bandwidth in the bc1 pool (in Kbps, Mbps or Gbps).
global-pool <i>bandwidth</i>	(Optional) Configures the total reservable bandwidth in the global-pool. Range is 0 to 4294967295 Kbps.

Command Default

sub-pool-bw: 0



Note

If the command is entered without the optional arguments, the total bandwidth is set to 75 percent of the intrinsic bandwidth of the interface. (If the interface has zero intrinsic bandwidth, none are reserved.)

Command Modes

RSVP interface configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.7.0	The sub-pool 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.

RSVP is enabled either using the **rsvp interface** command or when MPLS is configured on the interface. In addition, there are other instances in which RSVP is enabled automatically; for example, when an RSVP message is received on an interface that is not configured under RSVP or MPLS (such as out-of-band signaling for an Optical User Network Interface application).

If RSVP reservation messages are received on an interface different from the one through which the corresponding Path message was sent out, the interfaces are adjusted such that all resource reservations, such as bandwidth, are done on the outgoing interface of the Path message.

Prestandard DS-TE uses the Cisco proprietary mechanisms for RSVP signaling and IGP advertisements. This DS-TE mode does not interoperate with third-party vendor equipment. Note that prestandard DS-TE is enabled only after configuring the sub-pool bandwidth values on MPLS-enabled interfaces.

**Note**

You can also configure RSVP bandwidth on an interface using IETF DS-TE mode. This mode supports multiple bandwidth constraint models, including the Russian Doll Model (RDM) and the Maximum Allocation Model (MAM) both with two bandwidth pools.

Task ID

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

Examples

The following example shows how to limit the total of all RSVP reservations on POS interface 0/3/0/0 to 5000 Kbps:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/3/0/0
RP/0/RP0/CPU0:router(config-rsvp-if)# bandwidth 5000
```

Related Commands

Command	Description
bandwidth mam (RSVP), on page 502	Configures RSVP bandwidth on an interface using the MAM bandwidth constraints model.
bandwidth rdm (RSVP), on page 504	Configures RSVP bandwidth on an interface using the RDM bandwidth constraints model.

bandwidth mam (RSVP)

To configure RSVP bandwidth on an interface using the Maximum Allocation Model (MAM) bandwidth constraints model, use the **bandwidth mam** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

bandwidth mam {*total-reservable-bandwidth*| **max-reservable-bw** *maximum-reservable-bw*}
[*largest-reservable-flow* [**bc0** *reservable-bandwidth*] [**bc1** *reservable-bw*]]

no bandwidth mam

Syntax Description

<i>total-reservable- bandwidth</i>	Total reservable bandwidth (in Kbps, Mbps or Gbps) that RSVP accepts for reservations on this interface. Range is 0 to 4294967295.
max-reservable-bw <i>maximum-reservable-bw</i>	Configures the maximum reservable bandwidth (in Kbps, Mbps or Gbps) that RSVP accepts for reservations on this interface. Range is 0 to 4294967295.
<i>largest-reservable-flow</i>	(Optional) Largest reservable flow (in Kbps, Mbps or Gbps) that RSVP accepts for reservations on this interface. Range is 0 to 4294967295.
bc0 <i>reservable-bandwidth</i>	(Optional) Configures the total reservable bandwidth in the bc0 pool (in Kbps, Mbps or Gbps).
bc1 <i>reservable-bw</i>	(Optional) Configures the total reservable bandwidth in the bc1 pool (in Kbps, Mbps or Gbps).

Command Default

No default behavior or values.

Command Modes

RSVP 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.

Both the MAM and RDM models can be configured on a single interface to allow switching between each model.

**Note**

Non-stop forwarding (NSF) is not guaranteed when the bandwidth constraint model is changed.

Task ID

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

Examples

The following example shows how to limit the total of all RSVP reservations on POS interface 0/3/0/0 to 7500 kbps:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/3/0/0
RP/0/RP0/CPU0:router(config-rsvp-if)# bandwidth mam 7500
```

Related Commands

Command	Description
bandwidth (RSVP), on page 500	Configures RSVP bandwidth on an interface using prestandard DS-TE mode.
bandwidth rdm (RSVP), on page 504	Configures RSVP bandwidth on an interface using the RDM bandwidth constraints model.

bandwidth rdm (RSVP)

To configure RSVP bandwidth on an interface using the Russian Doll Model (RDM) bandwidth constraints model, use the **bandwidth rdm** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

bandwidth rdm {*total-reservable-bw*| **bc0** *total-reservable-bw*| **global-pool** *total-reservable-bw*}
[*largest-reservable-flow*] [**bc1** *reservable-bw*] [**sub-pool** *reservable-bw*]

no bandwidth rdm

Syntax Description

<i>total-reservable-bw</i>	Total reservable bandwidth (in Kbps, Mbps or Gbps). The default value is expressed in Kbps.
bc0 <i>total-reservable-bw</i>	Reserves bandwidth in the bc0 pool (in Kbps, Mbps or Gbps).
global-pool	Reserves bandwidth in the global pool.
<i>largest-reservable-flow</i>	(Optional) Largest reservable flow (in Kbps, Mbps or Gbps). The default value is expressed in Kbps.
bc1	(Optional) Reserves bandwidth in the bc1 pool (in Kbps, Mbps or Gbps).
sub-pool	(Optional) Reserves bandwidth in the sub-pool.
<i>reservable-bandwidth</i>	Reservable bandwidth in the sub- and bc1 pools (in Kbps, Mbps or Gbps). The default value is expressed in Kbps.

Command Default

No default behavior or values.

Command Modes

RSVP 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.

Both the MAM and RDM bandwidth constraint models support up to two bandwidth pools.

Cisco IOS XR software provides global configuration when switching between bandwidth constraint models. Both models are configured on a single interface to allow switching between models.

**Note**

Non-stop forwarding (NSF) is not guaranteed when the bandwidth constraint model is changed.

The **global pool** and **sub-pool** keywords are included in this command for backward compatibility with prestandard DS-TE. The **global pool** keyword is equivalent to the **bc0** keyword. The **sub-pool** keyword is equivalent to the **bc1** keyword.

RDM is the default bandwidth constraint model used in both pre-standard and IETF mode.

Task ID

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

Examples

The following example shows how to limit the total of all RSVP reservations on POS interface 0/3/0/0 to 7500 kbps, and allows each single flow to reserve no more than 1000 kbps:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/3/0/0
RP/0/RP0/CPU0:router(config-rsvp-if)# bandwidth rdm 7500 1000
```

Related Commands

Command	Description
bandwidth (RSVP), on page 500	Configures RSVP bandwidth on an interface using prestandard DS-TE mode.
bandwidth mam (RSVP), on page 502	Configures RSVP bandwidth on an interface using the MAM bandwidth constraints model.

clear rsvp authentication

To eliminate RSVP security association (SA) before the lifetime expires, use the **clear rsvp authentication** command in EXEC mode.

clear rsvp authentication [*type interface-path-id*] [**destination** *IP address*] [**source** *IP address*]

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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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) Eliminates the RSVP security associations (SA) before their lifetimes expire. All SAs with this destination IP address are cleared.
source <i>IP address</i>	(Optional) Eliminates the RSVP security associations (SA) before their lifetimes expire. All SAs with this source IP address are cleared.

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.

Use the **clear rsvp authentication** command for the following reasons:

- To eliminate security associations before their lifetimes expire
- To free up memory
- To resolve a problem with a security association being in an indeterminate state

You can delete all RSVP security associations if you do not enter an optional filter (interface, source, or destination IP address).

If you delete a security association, it is recreated as needed.

Task ID

Task ID	Operations
mpls-te	execute
ouni	execute

Examples

The following example shows how to clear each SA:

```
RP/0/RP0/CPU0:router# clear rsvp authentication
```

The following example shows how to clear each SA with the destination address 1.1.1.1:

```
RP/0/RP0/CPU0:router# clear rsvp authentication destination 1.1.1.1
```

The following example shows how to clear each SA with the source address 2.2.2.2:

```
RP/0/RP0/CPU0:router# clear rsvp authentication source 2.2.2.2
```

The following example shows how to clear each SA with the POS interface 0/2/1/0:

```
RP/0/RP0/CPU0:router# clear rsvp authentication POS 0/2/1/0
```

The following example shows how to clear each SA on the POS interface 0/2/1/0, destination address 1.1.1.1, and source address 2.2.2.2:

```
RP/0/RP0/CPU0:router# clear rsvp authentication POS 0/2/1/0 destination 1.1.1.1 source 2.2.2.2
```

Related Commands

Command	Description
life-time (RSVP) , on page 524	Controls how long RSVP maintains idle security associations with other trusted RSVP neighbors.

clear rsvp counters authentication

To eliminate RSVP counters for each security association (SA), use the **clear rsvp counters authentication** command in EXEC mode.

clear rsvp counters authentication [*type interface-path-id*] [**destination** *IP address*][**source** *IP address*]

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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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) Eliminates authentication-related statistics for each security association (SA) with this destination IP address.
source <i>IP address</i>	(Optional) Eliminates authentication-related statistics for each security association (SA) with this source IP address.

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
mpls-te	execute
ouni	execute

Examples

The following example shows how to clear authentication counters for each SA:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication
```

The following example shows how to clear authentication counters for each SA with the destination address 1.1.1.1:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication destination 1.1.1.1
```

The following example shows how to clear authentication counters for each SA with the source address 2.2.2.2:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication source 2.2.2.2
```

The following example shows how to clear authentication counters for each SA with the POS interface 0/2/1/0:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication POS 0/2/1/0
```

The following example shows how to clear authentication counters for each SA on the POS interface 0/2/1/0, destination address 1.1.1.1, and source address 2.2.2.2:

```
RP/0/RP0/CPU0:router# clear rsvp counters authentication POS 0/2/1/0 destination 1.1.1.1  
source 2.2.2.2
```

clear rsvp counters all

To clear (set to zero) all RSVP message and event counters that are being maintained by the router, use the **clear rsvp counters all** command in EXEC mode.

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

Command Modes

EXEC

Command History

Release	Modification
Release 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	Operations
mpls-te	read, write
ouni	read, write

Examples

The following example shows how to clear all message and event counters:

```
RP/0/RP0/CPU0:router# clear rsvp counters all
```

Related Commands

Command	Description
clear rsvp counters events, on page 514	Clears all RSVP event counters that are being maintained by the router.
clear rsvp counters messages, on page 516	Clears all RSVP message counters that are being maintained by the router.
show rsvp counters, on page 537	Shows all RSVP message/event counters that are being maintained by the router.

clear rsvp counters chkpt

To clear RSVP checkpoint counters, use the **clear rsvp counters chkpt** command in EXEC mode.

clear rsvp counters chkpt

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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	Operations
	mpls-te	read, write
	ouni	read, write

Examples The following example shows how to clear all message and event counters:

```
RP/0/RP0/CPU0:router# clear rsvp counters chkpt
```

Related Commands	Command	Description
	clear rsvp counters events, on page 514	Clears all RSVP event counters that are being maintained by the router.
	clear rsvp counters messages, on page 516	Clears all RSVP message counters that are being maintained by the router.

Command	Description
show rsvp counters, on page 537	Shows all RSVP message/event counters that are being maintained by the router.

clear rsvp counters events

To clear (set to zero) all RSVP event counters that are being maintained by the router, use the **clear rsvp counters events** command in EXEC mode.

clear rsvp counters events [*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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 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.

Use the **clear rsvp counters events** command to set all RSVP event counters to zero.

Task ID

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

Examples

The following example shows how to clear all event counters:

```
RP/0/RP0/CPU0:router# clear rsvp counters events
```

Related Commands

Command	Description
clear rsvp counters messages, on page 516	Clears all RSVP message counters that are being maintained by the router.
show rsvp counters, on page 537	Shows RSVP event counters that are being maintained by the router when the <i>events</i> option is specified.

clear rsvp counters messages

To clear (set to zero) all RSVP message counters that are being maintained by the router, use the **clear rsvp counters messages** command in EXEC mode.

clear rsvp counters messages [*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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 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.

Use the **clear rsvp counters messages** command to set all RSVP message counters to zero.

Task ID

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

Examples

The following example shows how to set all RSVP message counters for POS interface 0/3/0/2 to zero:

```
RP/0/RP0/CPU0:router# clear rsvp counters messages pos0/3/0/2
```

Related Commands

Command	Description
show rsvp counters, on page 537	Displays the number of RSVP messages sent and received.

clear rsvp counters oor

To clear internal RSVP counters on out of resources (OOR) events, use the **clear rsvp counters oor** command in EXEC mode.

clear rsvp counters oor [*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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 3.2	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 **clear rsvp counters oor** command to set RSVP OOR counters to zero.

Task ID

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

Examples

The following example show how to clear all RSVP message counters for POS interface 0/3/0/2 to zero:

```
RP/0/RP0/CPU0:router# clear rsvp counters oor pos0/3/0/2
```

Related Commands

Command	Description
show rsvp counters oor, on page 541	Displays the internal RSVP counters on OOR events.

clear rsvp counters prefix-filtering

To clear internal prefix-filtering related RSVP counters, use the **clear rsvp counters prefix-filtering** command in EXEC mode.

clear rsvp counters prefix-filtering {**interface** [*type interface-path-id*]| **access-list** [*aclname*]}

Syntax Description

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

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 **clear rsvp counters prefix-filtering** command to set RSVP prefix-filtering related RSVP counters to zero.

Task ID

Task ID	Operations
mpls-te	read, write

Task ID	Operations
ouni	read, write

Examples

The following example shows how to set all RSVP message counters for POS interface 0/3/0/2 to zero:

```
RP/0/RP0/CPU0:router# clear rsvp counters prefix-filtering interface pos0/3/0/2
```

The following example shows how to set all RSVP prefix-filtering counters for access-list banks to zero:

```
RP/0/RP0/CPU0:router# clear rsvp counters prefix-filtering access-list banks
```

Related Commands

Command	Description
show rsvp counters prefix-filtering, on page 543	Displays the internal prefix-filtering related RSVP counters.

key-source key-chain (RSVP)

To specify the source of the key information to authenticate RSVP messages, use the **key-source key-chain** command in the appropriate RSVP authentication configuration mode. To remove the key source from the appropriate RSVP authentication configuration mode, use the **no** form of this command.

key-source key-chain *key-chain-name*

no key-source key-chain *key-chain-name*

Syntax Description

<i>key-chain-name</i>	Name of the keychain. The maximum number of characters is 32.

Command Default

The default value is none, which means that the key source is not specified.

Command Modes

RSVP authentication configuration
 RSVP interface authentication configuration
 RSVP neighbor authentication 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.



Note

- RSVP authentication is enabled regardless of whether or not the specified keychain exists or has no available keys to use. If the specified keychain does not exist or there are no available keys in the keychain, RSVP authentication processing fails.
- The **key-source key-chain** command does not create a keychain but just specifies which keychain to use. You must configure a keychain first. For an example of how a key chain is configured, see *Cisco IOS XR System Security Configuration Guide for the Cisco CRS-1 Router*.
- The **no key-source key-chain** command does not necessarily disable the authentication.
- RSVP authentication supports only keyed-hash message authentication code (HMAC)-type algorithms.

For inheritance procedures, see *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router*.

Task ID

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

Examples

The following example shows that the source of the key information is specified for the keychain mpls-keys in RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp authentication
RP/0/RP0/CPU0:router(config-rsvp-auth)# key-source key-chain mpls-keys
```

The following example shows that the source of the key information is specified for the keychain mpls-keys for a POS interface in RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface POS 0/2/1/0
RP/0/RP0/CPU0:router(config-rsvp-if)# authentication
RP/0/RP0/CPU0:router(config-rsvp-if-auth)# key-source key-chain mpls-keys
```

The following example shows that the source of the key information is specified for the keychain mpls-keys in RSVP neighbor authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp neighbor 1.1.1.1 authentication
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)# key-source key-chain mpls-keys
```

Related Commands

Command	Description
life-time (RSVP) , on page 524	Controls how long RSVP maintains idle security associations with other trusted RSVP neighbors.
window-size (RSVP) , on page 605	Specifies the tolerance to accept out-of-sequence messages.

life-time (RSVP)

To control how long RSVP maintains idle security associations with other trusted RSVP neighbors, use the **life-time** command in the appropriate RSVP authentication configuration mode. To disable the lifetime setting, use the **no** form of this command.

life-time *seconds*

no life-time *seconds*

Syntax Description

<i>seconds</i>	Length of time, in seconds, that RSVP maintains security associations with other trusted RSVP neighbors. Range is 30 to 86400.

Command Default

seconds: 1800 (30 minutes)

Command Modes

RSVP authentication configuration
 RSVP interface authentication configuration
 RSVP neighbor authentication 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 inheritance procedures, see *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router*.

Use the **life-time (RSVP)** command to indicate when to end idle security associations with RSVP trusted neighbors.

By setting a larger lifetime, the router remembers the state for a long period time which provides better protection against a replay attack.

Use the **clear rsvp authentication** command to free security associations before their lifetimes expire.

Task ID

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

Examples

The following example shows how to configure a lifetime of 2000 seconds for each SA in RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp authentication
RP/0/RP0/CPU0:router(config-rsvp-auth)# life-time 2000
```

The following example shows how to configure a lifetime of 2000 seconds for each SA in RSVP neighbor authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp neighbor 1.1.1.1 authentication
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)# life-time 2000
```

The following example shows how to configure a lifetime of 2000 seconds for each SA in RSVP interface authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface POS 0/2/1/0
RP/0/RP0/CPU0:router(config-rsvp-if)# authentication
RP/0/RP0/CPU0:router(config-rsvp-if-auth)# life-time 2000
```

Related Commands

Command	Description
clear rsvp authentication, on page 506	Clears out RSVP security associations.
key-source key-chain (RSVP), on page 522	Specifies the source of the key information to authenticate RSVP signaling messages.
window-size (RSVP), on page 605	Specifies the tolerance to accept out-of-sequence messages.

rsvp

To enable functionality for Resource Reservation Protocol (RSVP) and enter RSVP configuration commands, use the **rsvp** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

rsvp

no rsvp

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 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	Operations
	mpls-te	read, write

Examples The following example shows how to enable RSVP functionality and enter the sub-mode for RSVP configuration commands:

```
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)#
```

rsvp interface

To configure RSVP on an interface, use the **rsvp interface** command in global configuration mode. To disable RSVP on that interface, use the **no** form of this command.

rsvp interface *type interface-path-id*

no rsvp 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 a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.

Command Default

RSVP is enabled by default on an interface under the following conditions. (Enabling RSVP on an interface means that interface can be used by RSVP to send and receive RSVP messages).

- RSVP is configured on that interface using the **rsvp interface** command.
- MPLS is configured on that interface.
- Automatically enabled as in the case of out-of-band signaling for the Optical User Network Interface (O-UNI) application, where an RSVP message could be received on an interface which is not configured under RSVP or MPLS.

Command Modes

Global configuration

Command History

Release	Modification
Release 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.

When RSVP is enabled on an interface by any of the three methods mentioned in the above section, the default bandwidth is 0. Use the bandwidth command in RSVP interface configuration mode to configure the bandwidth on an interface.

If the interface bandwidth is 0, RSVP can be used only to signal flows that do not require bandwidth on this interface. In the case of O-UNI, 0 bandwidth is not an issue, because O-UNI does not use bandwidth as a resource.

The **rsvp interface** command enables the RSVP interface configuration mode.

Task ID

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

Examples

The following example shows how to enable the RSVP interface configuration mode and to enable RSVP on this interface with 0 bandwidth:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/3/0/0
```

Related Commands

Command	Description
bandwidth (RSVP), on page 500	Configures RSVP bandwidth on an interface using prestandard DS-TE mode.
signalling dscp (RSVP), on page 577	Gives all RSVP packets sent out on a specific interface higher priority in the network by marking them with a particular DSCP.

rsvp neighbor

To specify an RSVP neighbor, use the **rsvp neighbor** command in global configuration mode. To deactivate authentication for a neighbor, use the **no** form of this command.

rsvp neighbor *IP-address* **authentication**

no rsvp neighbor *IP-address* **authentication**

Syntax Description

<i>IP-address</i>	IP address of the neighbor. A single IP address of a specific neighbor; usually one of the neighbor's physical or logical (loopback) interfaces.
authentication	Configures RSVP authentication parameters.

Command Default

No default values or behaviors

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.



Note

RSVP neighbor configuration mode can be used only if you want to configure authentication for a particular neighbor.

Task ID

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

Examples

The following example shows how to enter RSVP neighbor authentication configuration mode for IP address 1.1.1.1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp neighbor 1.1.1.1 authentication
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)#
```

Related Commands

Command	Description
key-source key-chain (RSVP) , on page 522	Specifies the source of the key information to authenticate RSVP signaling messages.
life-time (RSVP) , on page 524	Controls how long RSVP maintains idle security associations with other trusted RSVP neighbors.
window-size (RSVP) , on page 605	Specifies the tolerance to accept out-of-sequence messages.

show rsvp authentication

To display the database for the security association that RSVP has established with other RSVP neighbors, use the **show rsvp authentication** command in EXEC mode.

show rsvp authentication [*type interface-path-id*] [**destination** *IP-address*] [**detail**] [**mode** {**receive** | **send**}] [**neighbor** *IP-address*] [**source** *IP-address*]

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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 database for the security association (SA) for the destination IP address. The <i>IP address</i> argument is the IP address of the destination address.
detail	(Optional) Displays additional information about RSVP security SAs.
mode	(Optional) Specifies the SA type. An SA is used to authenticate either incoming (receive) or outgoing (send) messages.
receive	Displays SAs for incoming messages.
send	Displays SAs for outgoing messages.
neighbor <i>IP-address</i>	(Optional) Displays the RSVP authentication information for the neighbor IP address. The <i>IP-address</i> argument is the IP address of the neighbor. For the send SA, the neighbor address is the destination address. For receive, the neighbor address is the source address.
source <i>IP-address</i>	(Optional) Displays the database for the SA for the source IP address. The <i>IP-address</i> argument is the IP address of the source address.

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
mpls-te	read
ouni	read

Examples

The following sample output displays information for RSVP authentication:

```
RP/0/RP0/CPU0:router# show rsvp authentication
```

Codes: S - static, G - global, N - neighbor, I -interface, C - chain

Source Address	Dest Address	Interface	Mode	Key-Source	Key-ID	Code
3.0.0.1	3.0.0.2	PO0/7/0/2	Send	mpls-keys	1	SGC
3.0.0.2	3.0.0.1	PO0/7/0/2	Recv	mpls-keys	1	SGC

This table describes the significant fields shown in the display.

Table 57: show rsvp authentication Command Field Descriptions

Field	Description
Source Address	IP address of the sender. For Send mode, this is the local address (either the address of the Interface field or the local router ID). For Recv mode, this is the address of the RSVP neighbor.
Dest Address	IP address of the receiver. For Send mode, this is the address of the RSVP neighbor. For Recv mode, this is the local address (either the address of the Interface field or the local router ID).
Interface	Name of the interface over which the security association is being maintained.

Field	Description
Mode	Direction of the association for the following mode types: Send Authenticates messages that you forward. Recv Authenticates messages that you receive.
Key-Source	Key source identification string that is currently set to the configured keychain name.
Key-ID	The last successful key ID that is used for authentication and maps to the keychain ID configuration. If the value is too large to fit into the column, it is truncated and a (..) suffix is appended. Use the detail mode to see the non-truncated key ID.
Code	Code field has the following terms: Static Key is static and configured. Global Key is global-based. Neighbor Key is neighbor-based. Interface Key is interface-based. Chain Key is part of a keychain.

The following sample output shows detailed information about a Send mode SA that is followed by a Receive mode SA:

```
RP/0/RP0/CPU0:router# show rsvp authentication detail
```

```

RSVP Authentication Information:
  Source Address:      3.0.0.1
  Destination Address: 3.0.0.2
  Neighbour Address:   3.0.0.2
  Interface:           POS0/7/0/2
  Direction:           Send

```

```

LifeTime:                1800 (sec)
LifeTime left:           1305 (sec)
KeyType:                 Static Global KeyChain
Key Source:              name1
Key Status:              No error
KeyID:                   1
Digest:                  HMAC MD5 (16)
Challenge:               Not supported
TX Sequence:             5023969459702858020 (0x45b8b99b00000124)
Messages successfully authenticated: 245
Messages failed authentication: 0

Receive Errors:
  Incomplete security association: 0
  Missing INTEGRITY object: 0
  Incorrect digest: 0
  Digest type mismatch: 0
  Duplicate sequence number: 0
  Out-of-range sequence number: 0
  Invalid message format: 0

```

This table describes the significant fields shown in the display.

Table 58: show rsvp authentication detail Command Field Descriptions

Field	Description
Source Address	IP address of the sender. For Send mode, this is the local address (either the address of the Interface field or the local router ID). For Recv mode, this is the address of the RSVP neighbor.
Destination Address	IP address of the receiver. For Send mode, this is the address of the RSVP neighbor. For Recv mode, this is the local address (either the address of the Interface field or the local router ID).
Neighbor Address	IP address of the RSVP neighbor with which the security association is being maintained.
Interface	Name of the interface over which the security association is being maintained.
Direction	Direction of the association for the following mode types: Send Authenticates messages that you forward. Recv Authenticates messages that you receive.
LifeTime	Configured expiration timer value.
LifeTime left	Number of seconds until the expiration timer expires.

Field	Description
KeyType	Keys that are used: Static Key is static and configured. Global Key is global-based. Neighbor Key is neighbor-based. Interface Key is interface-based. Chain Key is part of a keychain.
Key-Source	Key source identification string that is currently set to the configured keychain name.
Key Status	Last status reported from the key source.
Key-ID	Last successful key ID that is used for authentication and that maps to the keychain ID configuration. If the value is too large to fit into the column, it is truncated and a (..) suffix is appended. (Use the detail mode to see the non-truncated key ID.)
Digest	Digest algorithm that is used. The algorithms are either HMAC-MD5 or HMAC-SHA1.
Challenge	Current challenge status (always not supported) reported.
Tx Sequence	Last sequence number that was sent.
Messages successfully authenticated	Number of messages authenticated by using this SA.
Messages failed authentication	Number of messages that failed authentication using this SA.
Sequence Window Size	Maximum configured RX sequence number window.
Sequence Window Count	Currently used size of the RX sequence number window.

Field	Description
Incomplete security association	Number of messages that are dropped due to a key failure.
Incorrect digest	Number of messages that are dropped due to an incorrect digest.
Digest type mismatch	Number of messages that are dropped due to an incorrect digest length, which implies an algorithm mismatch.
Duplicate sequence number	Number of messages that are dropped due to a duplicate sequence number.
Out-of-range sequence number	Number of messages that are dropped due to a sequence number range (window-size) checking.
Invalid message format	Number of messages that are dropped due to formatting errors, such as incorrect objects.

show rsvp counters

To display internal RSVP counters, use the **show rsvp counters** command in EXEC mode.

show rsvp counters {**messages** [*type interface-path-id*] **summary** }| **events** | **database**}

Syntax Description

messages	Displays a historical count of the number of messages RSVP has received and sent on each interface along with a summation.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
summary	(Optional) Displays the aggregate counts of all interfaces.
events	Displays the number of states expired for lack of refresh and a count of received No Acknowledgements (NACKs).
database	Displays counters on RSVP database, including number of paths, session, and so on.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	This command was supported on the Cisco XR 12000 Series Router. The database keyword was added.
Release 3.9.0	The summary 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.

In message counters, bundle messages are counted as single bundle messages. The component messages are not counted separately.

The **messages** keyword shows the counters for all the interfaces. In addition, the aggregate summary is shown by using both the **messages** and **summary** keywords.

Task ID

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

Examples

The following is sample output from the **show rsvp counters messages** command for POS0/3/0/0:

```
RP/0/RP0/CPU0:router# show rsvp counters messages POS 0/3/0/0
```

POS0/3/0/0	Recv	Xmit		Recv	Xmit
Path	24	1	Resv	0	0
PathError	0	0	ResvError	0	0
PathTear	5	1	ResvTear	0	0
ResvConfirm	0	0	Ack	34	0
Bundle	0		Hello	0	0
SRefresh	10118	0	OutOfOrder	0	
Retransmit		0	Rate Limited		0

This table describes the significant fields shown in the display.

Table 59: show rsvp counters messages Command Field Descriptions

Field	Description
Path	Number of Path messages sent downstream or received from an upstream node.
PathError	Number of PathError messages received from a downstream neighbor or sent to an upstream neighbor.
PathTear	Number of PathTear messages sent downstream, or messages received, from upstream neighbors.
ResvConfirm	Number of ResvConfirm messages received from an upstream neighbor or sent to a downstream neighbor.
Bundle	Number of Bundle messages containing RSVP messages sent and received by the neighbor.

Field	Description
SRefresh	Number of Summary Refresh messages sent to and received by a neighbor to refresh the path and reservation states.
Retransmit	Number of messages retransmitted to ensure reliable messaging (related to refresh reduction).
Resv	Number of Reservation messages received from a downstream neighbor or sent to an upstream neighbor to reserve resources.
ResvError	Number of Reservation Error messages received from a upstream neighbor or sent to a downstream neighbor.
ResvTear	Number of Reservation Tear messages received from a downstream neighbor or sent to an upstream neighbor to tear down RSVP flows.
Ack	Number of Acknowledgement messages sent and received by a neighbor acknowledging receipt of a message.
Hello	Number of Hello messages sent to and received by a neighbor.
OutOfOrder	Number of messages received that are out of order.
Rate Limited	Number of RSVP packets affected by rate limiting.

The following is sample output from the **show rsvp counters events** command:

```
RP/0/RP0/CPU0:router# show rsvp counters events

Ethernet0/0/0/0                                tunnell
  Expired Path states                          0      Expired Path states      0
  Expired Resv states                          0      Expired Resv states      0
  NACKs received                              0      NACKs received          0
POS0/3/0/1                                     POS0/3/0/2
  Expired Path states                          0      Expired Path states      0
  Expired Resv states                          0      Expired Resv states      0
  NACKs received                              0      NACKs received          0
POS0/3/0/3                                     All RSVP Interfaces
  Expired Path states                          0      Expired Path states      0
  Expired Resv states                          0      Expired Resv states      0
  NACKs received                              0      NACKs received          0
```

This table describes the significant fields shown in the display.

Table 60: show rsvp counters events Command Field Descriptions

Field	Description
Expired Path states	Number of Path states expired for lack of refresh.
Expired Reserve states	Number of Resv states expired for lack of refresh.
NACKS received	Number of NACKS received.

The following is sample output from the **show rsvp counters database** command:

```
RP/0/RP0/CPU0:router# show rsvp counters database
```

```
Sessions: 0
Locally created and incoming paths: 0
Outgoing paths: 0
Locally created and incoming Reservations: 0
Outgoing Reservations: 0
Interfaces: 4
```

This table describes the significant fields shown in the display.

Table 61: show rsvp counters database Command Field Descriptions

Field	Description
Sessions	RSVP sessions.
Locally created and incoming paths	Path states created by a: • Local application on the node. • Path message received from the network.
Outgoing paths	Outgoing path states.
Locally created and incoming Reservations	Reservations created by a: • Local application on the node. • Path message received from the network.
Outgoing Reservations	Outgoing reservation (request) states.
Interfaces	Known RSVP interfaces.

show rsvp counters oor

To display internal RSVP counters on out of resources (OOR) events, use the **show rsvp counters oor** command in EXEC mode.

show rsvp counters oor [*type interface-path-id*] **summary**

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 a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
summary	(Optional) Displays a summary of OOR events.

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
mpls-te	read, write
ouni	read, write

Examples

The following is sample output from the **show rsvp counters oor** command:

```
RP/0/RP0/CPU0:router# show rsvp counters oor
```

```

POS 0/3/0/0          Rejected
    Path              24
POS 0/3/0/2          Rejected
    Path              31
All RSVP Interfaces  Rejected
    Path              55

```

This table describes the significant fields shown in the display.

Table 62: show rsvp counters oor Command Field Descriptions

Field	Description
Path	Number of Path messages received on the interface that were rejected due to oor conditions.

show rsvp counters prefix-filtering

To display internal prefix-filtering related RSVP counters, use the **show rsvp counters prefix-filtering** command in EXEC mode.

show rsvp counters prefix-filtering interface [*type interface-path-id*] **summary**] **access-list** [*aclname*]

Syntax Description

interface	Displays RSVP prefix-filtering counters for all interfaces.
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
summary	(Optional) Displays a summary of RSVP prefix-filtering counters on all interfaces.
access-list	Displays RSVP prefix-filtering counters for the access control list.
<i>aclname</i>	(Optional) Name of the access control list.

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.



Note

Counters do not increment if you have not configured an access control list for prefix-filtering.

Task ID

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

Examples

The following is sample output from the **show rsvp counters prefix-filtering** command:

RP/0/RP0/CPU0:router# **show rsvp counters prefix-filtering interface**

Routed	Fwd	Local	Drop	Def-Drop	Def-Proc	Total
Path	4					4
PathTear	0					0
ResvConfirm	0					0
Total	4					4
POS0/5/0/1	Fwd	Local	Drop	Def-Drop	Def-Proc	Total
Path		1	0	219	2	222
PathTear		0	0	31	0	31
ResvConfirm		0	0	0	0	0
Total		1	0	219	2	253
POS0/5/0/2	Fwd	Local	Drop	Def-Drop	Def-Proc	Total
Path		0	0	0	1	1
PathTear		0	0	0	0	0
ResvConfirm		0	0	0	0	0
Total		0	0	0	1	1
ALL RSVP						
Interfaces	Fwd	Local	Drop	Def-Drop	Def-Proc	Total
Path	4	1	0	219	3	227
PathTear	0	0	0	31	0	31
ResvConfirm	0	0	0	0	0	0
Total	4	1	0	250	3	258

The following is sample output from the **show rsvp counters prefix-filtering interface type interface-path-id** command:

RP/0/RP0/CPU0:router# **show rsvp counters prefix-filtering interface POS 0/5/0/1**

POS0/5/0/1	Fwd	Local	Drop	Def-Drop	Def-Proc	Total
Path		1	0	219	2	222
PathTear		0	0	31	0	31
ResvConfirm		0	0	0	0	0
Total		1	0	250	2	253

The following is sample output from the **show rsvp counters prefix-filtering interface summary** command:

RP/0/RP0/CPU0:router# **show rsvp counters prefix-filtering interface summary**

ALL RSVP						
Interfaces	Fwd	Local	Drop	Def-Drop	Def-Proc	Total
Path	4	1	0	219	3	227
PathTear	0	0	0	31	0	31
ResvConfirm	0	0	0	0	0	0
Total	4	1	0	250	3	258

The following is sample output from the **show rsvp counters prefix-filtering access-list banks** command:

RP/0/RP0/CPU0:router# **show rsvp counters prefix-filtering access-list banks**

ACL: banks	Forward	Local	Drop	Total
Path	0	0	0	0
PathTear	0	0	0	0
ResvConfirm	0	0	0	0
Total	0	0	0	0

This table describes the significant fields shown in the display.

Table 63: show rsvp counters prefix-filtering interface and summary CommandField Descriptions

Field	Description
Fwd	Number of messages forwarded to the next router. Note The messages are counted against the <i>routed</i> interface only because RSVP has no record of what interface the messages will be forwarded to.
Local	Number of messages not forwarded (because they are locally destined).
Drop	Number of messages dropped.
Def-Drop	Number of messages dropped when an access control list match returns an implicit deny. (Results when RSVP is configured to drop implicit deny messages.)
Def-Proc	Number of messages processed by RSVP when an access control list match returns an implicit deny.
Path	Number of Path messages.
PathTear	Number of Path Tear messages.
ResvConfirm	Number of ResvConfirm messages.

show rsvp fast-reroute

To display RSVP Fast-Reroute (FRR) information, use the **show rsvp fast-reroute** command in EXEC mode.

show rsvp fast-reroute [**destination** *IP -address*] [**dst-port** *port*] [**p2mp-id** *value*] [**session-type** {**lsp-p2mp** | **lsp-p2p**}] [**source** *IP-address*] [**src-port** *source-port*] [**summary**]

Syntax Description

destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
dst-port <i>port</i>	(Optional) Displays the port address of the destination router.
p2mp-id <i>value</i>	(Optional) Displays the entries that match the specified P2MP ID, for example, a P2MP session type.
session-type	(Optional) Displays the entries that match the specified session type.
lsp-p2mp	Displays the entries that are used for P2MP sessions.
lsp-p2p	Displays the entries that are used for P2P sessions.
source <i>IP-address</i>	(Optional) Displays the IP address of the source network.
src-port <i>source-port</i>	(Optional) Displays the port number of the source router.
summary	(Optional) Displays summarized information about the FRR database.

Command Default

None

Command Modes

EXEC

Command History

Release	Modification
Release 3.2	This command was introduced.
Release 3.9.0	To support P2MP, the following keywords were added: • The p2mp-id keyword was added. • The session-type keyword was added. • The lsp-p2mp keyword was added. • The lsp-p2p 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
mpls-te	read, write
ouni	read, write

Examples

This is sample output from the **show rsvp fast-reroute** command:

```
RP/0/RP0/CPU0:router# show rsvp fast-reroute
```

Type	Destination	TunID	Source	PSBs	RSBs
LSP4	70.70.70.70	1	50.50.50.50	Ready	Ready

This table describes the significant fields shown in the display.

Table 64: show rsvp fast-reroute Command Field Descriptions

Field	Description
Type	Type of session.
Destination	Destination address of session.
TunID	Tunnel ID number.
Source	Source address of session.
PSBs	PSB FRR ³⁷ state.
RSBs	RSB FRR state.

³⁷ Fast reroute.

This is sample output from the **show rsvp fast-reroute summary** command:

```
RP/0/RP0/CPU0:router# show rsvp fast-reroute summary
```

States	Total	Ready	Act-Wait	Active
PSBs	1	1	0	0
RSBs	1	1	0	0

This table describes the significant fields shown in the display.

Table 65: show rsvp fast-reroute summary Command Field Descriptions

Field	Description
States	FRR ³⁸ state.
Total	Total number of path and reservation states.
Ready	Number of states in FRR ready state. No FRR processing has been done on these states.
Act-Wait	Number of states in “Active Wait” FRR state. • For PSBs, this indicates that after FRR the path message has not yet been sent. • For RSBs, this indicates that after FRR, the reservation message has not yet been received.
Active	Number of states in “Active” FRR state. • For PSBs, this indicates that after FRR the path message has been sent. • For RSBs, this indicates that after FRR, the reservation message has been received.

³⁸ Fast reroute.

Related Commands

Command	Description
show mrib mpls traffic-eng fast-reroute	Configures the multicast routing information base MPLS traffic engineering fast reroute information.

show rsvp graceful-restart

To display the local graceful-restart information for RSVP, use the **show rsvp graceful-restart** command in EXEC mode.

show rsvp graceful-restart [**neighbors**] [*IP-address*] [**detail**]

Syntax Description

neighbors	(Optional) Displays single-line status for each neighbor. If this keyword is not specified, only a multiline table entry is displayed showing local graceful-restart information.
<i>IP-address</i>	(Optional) Address of the neighbor you are displaying. Displays a specific neighbor with that destination address only. If this keyword is not specified, all neighbors are displayed.
detail	(Optional) Displays multiline status for each neighbor. If this keyword is not specified, only a single-line table entry is displayed.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 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.

Graceful-restart neighbors are displayed in ascending order of neighbor IP address.

Task ID

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

Examples

The following is sample output from the **show rsvp graceful-restart** command:

```
RP/0/RP0/CPU0:router# show rsvp graceful-restart

Graceful restart: enabled  Number of global neighbors: 1
Local MPLS router id: 192.168.55.55
Restart time: 60 seconds  Recovery time: 120 seconds
Recovery timer: Not running
Hello interval: 5000 milliseconds Maximum Hello miss-count: 4
```

This table describes the significant fields shown in the display.

Table 66: show rsvp graceful-restart Command Field Descriptions

Field	Description
Graceful restart	Indicates whether graceful restart is configured locally.
Number of global neighbors	Number of neighbors identified by a unique router ID.
Local MPLS router id	Local router ID used for the MPLS or OUNI applications.
Restart time	Amount of time after a loss in hello messages within which RSVP hello session is reestablished. This setting is manually configurable.
Recovery time	Local recovery time advertised to neighbors. This is dynamically computed based on the number of LSPs established and is the time used by neighbors to refresh states in the event of a failure.
Recovery timer	Countdown timer which, upon expiry, causes un-refreshed data forwarding states to be deleted (usually beginning with a value that is equivalent to the sum of the restart and recovery times).
Hello interval	Interval at which hello messages are sent to neighbors.
Maximum hello miss-count	Number of hellos from a neighbor that can be missed before declaring hellos down.

The following is sample output from the **show rsvp graceful-restart neighbors** command, which displays information about graceful restart neighbors in the router:

```
RP/0/RP0/CPU0:router# show rsvp graceful-restart neighbors

Neighbor      App  State Recovery      Reason      Since      LostCnt
-----
```

```
192.168.77.77 MPLS      UP      DONE      N/A  19/12/2002 17:02:25      0
```

This table describes the significant fields shown in the display.

Table 67: show rsvp graceful-restart neighbors Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor.
App	Application type of a global neighbor (MPLS or OUNI).
State	State of the hello session to a global neighbor (up, down, INIT).
Recovery	State at which the local node is recovering a global neighbor.
Reason	Last reason for which communication has been lost for a global neighbor. If none has occurred, this field is marked as N/A.
Since	Time at which the current hello state for a global neighbor has been established.
LostCnt	Number of times hello communication has been lost with a global neighbor.

The following is sample output from the **show rsvp graceful-restart neighbors detail** command, which displays detailed information about all graceful restart neighbors:

```
RP/0/RP0/CPU0:router# show rsvp graceful-restart neighbors detail

Neighbor: 192.168.77.77 Source: 192.168.55.55 (MPLS)
  Hello instance for application MPLS
    Hello State: UP      (for 00:20:52)
    Number of times communications with neighbor lost: 0
    Reason: N/A
  Recovery State: DONE
  Number of Interface neighbors: 1
    address: 192.168.55.0
  Restart time: 120 seconds  Recovery time: 120 seconds
  Restart timer: Not running
  Recovery timer: Not running
  Hello interval: 5000 milliseconds  Maximum allowed missed Hello messages: 4
```

This table describes the significant fields shown in the display.

Table 68: show rsvp graceful-restart neighbors detail Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor.

Field	Description
Source	Local router ID and application type.
Hello State	State of the hello instance for the global neighbor (up, down, or init) and duration of the current state.
Number of times communications with neighbor lost	Number of times hello communication has been lost with a global neighbor.
Reason	Last reason indicating why communication was lost for a global neighbor. If none has occurred, this field is marked as N/A.
Recovery State	State at which the local node is recovering a global neighbor.
Number of Interface neighbors	Number of interfaces belonging to a global neighbor.
Address	IP address of the interface neighbor.
Recovery timer	Remote recovery time for a global neighbor.
Hello interval	Interval at which hello messages are sent by the remote global neighbor.
Maximum allowed missed Hello messages	Number of hellos that can be missed by the remote global neighbor before declaring hellos down.

show rsvp hello instance

To display the RSVP hello instances, use the **show rsvp hello instance** command in EXEC mode.

show rsvp hello instance [*Hostname or IP-address*] [**detail**]

Syntax Description

<i>Hostname or IP-address</i>	(Optional) Address of the neighbor you are displaying. If this argument is not specified, all neighbors are displayed.
detail	(Optional) Displays multiline status for each hello instance. If this keyword is not specified, only a single-line table entry is displayed.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 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.

Hello instances are displayed in ascending order of neighbor IP address.

Task ID

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

Examples

The following is sample output from the **show rsvp hello instance** command, which displays brief information about all hello instances in the router:

```
RP/0/RP0/CPU0:router# show rsvp hello instance
```

Neighbor	Type	State	Interface	LostCnt
-----	-----	-----	-----	-----
192.168.77.77	ACTIVE	UP	None	0

This table describes the significant fields shown in the display.

Table 69: show rsvp hello instance Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor hosting the hello instance.
Type	Hello instance type (active or passive). Active type indicates that a node is sending hello requests and passive indicates that a node is sending hello acknowledgements.
State	State of the hello session to a global neighbor (up, down, or init).
Interface	Interface for interface bound hello's used for FRR ³⁹ . Hello instances bound to a global neighbor show Interface as None. Hellos used for FRR are currently not supported.
LostCnt	Number of times hello communication has been lost with a global neighbor.

³⁹ Fast reroute.

The following is sample output from the **show rsvp hello instance** command, which displays detailed information about all hello instances in the router:

```
RP/0/RP0/CPU0:router# show rsvp hello instance detail

Neighbor: 192.168.77.77 Source: 192.168.55.55 (MPLS)
State: UP (for 00:07:14)
Type: ACTIVE (sending requests)
I/F: None
Hello interval (msec) (used when ACTIVE)
Configured: 5000
Src_instance 0x484b01, Dst_instance 0x4d4247
Counters:
Communication with neighbor lost:
  Num of times: 0   Reasons:
    Missed acks: 0
    New Src_Inst received: 0
    New Dst_Inst received: 0
    I/f went down: 0
    Neighbor disabled Hello: 0
Msgs Received: 93
Sent: 92
Suppressed: 87
```

This table describes the significant fields shown in the display.

Table 70: show rsvp hello instance detail Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor.
Source	Local router ID and application type.
State	State of the hello instance for the global neighbor (up, down or init) and duration of the current state.
Type	Hello instance type (active or passive). Active type indicates that a node is sending hello requests and passive indicates that a node is sending hello acks.
I/F	Interface for interface bound hellos. Hello instances for Graceful restart show interface as None.

show rsvp hello instance interface-based

To display the RSVP hello instances on a specific interface, use the **show rsvp hello instance interface-based** command in EXEC mode.

show rsvp hello instance interface-based [*IP-address*] [detail]

Syntax Description

<i>IP-address</i>	(Optional) Address of the neighboring interface. you are displaying. If this argument is not specified, all neighbors are displayed.
detail	(Optional) Displays detailed information for the specified interface.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 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.

Hello instances are displayed in ascending order of neighbor IP address.

Task ID

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

Examples

The following is sample output from the **show rsvp hello instance interface-based** command, which displays detailed information about hello instances on a specific interface:

```
RP/0/RP0/CPU0:router# show rsvp hello instance interface-based 10.10.10.10
```

```
Neighbor      Type      State      Interface      LostCnt
-----
```

```
10.10.10.10      ACTIVE  UP      None      0
```

This table describes the significant fields shown in the display.

Table 71: show rsvp hello instance interface-based Command Field Descriptions

Field	Description
Neighbor	Router ID of a global neighbor hosting the hello instance.
Type	Hello instance type (active or passive). Active type indicates that a node is sending hello requests and passive indicates that a node is sending hello acknowledgements.
State	State of the hello session to a global neighbor (up, down, or init).
Interface	Interface for interface bound hello's used for FRR ⁴⁰ . Hello instances bound to a global neighbor show interface as none. Hellos used for FRR are currently not supported.
LostCnt	Number of times hello communication has been lost with a global neighbor.

⁴⁰ Fast reroute.

show rsvp interface

To display information about all interfaces with RSVP enabled, use the **show rsvp interface** command in EXEC mode.

show rsvp interface [*type interface-path-id*] [**detail**]

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 a virtual interface. Note Use the show interfaces command to see a list of all possible interfaces currently configured on the router. For more information about the syntax for the router, use the question mark (?) online help function.
detail	(Optional) Displays multiline status for each interface. If this keyword is not specified, only a single-line table entry is displayed.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	Sample output was modified.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 rsvp interface** command to display various configuration settings such as the list of neighbors and their refresh reduction capabilities.

Task ID

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

Examples

The following is sample output from the **show rsvp interface** command, which displays brief information about the RSVP-configured interfaces running in prestandard DS-TE mode:

```
RP/0/RP0/CPU0:router# show rsvp interface gigabitEthernet 0/3/0/0

Thu Oct 22 20:35:07.737 UTC
INTERFACE: GigabitEthernet0/3/0/0 (ifh=0x4000300).
  BW (bits/sec): Max=750M. MaxFlow=750M.
                Allocated=0 (0%).
                BC0=750M. BC1=0.
```

The following is sample output from the **show rsvp interface** command, which displays brief information about the RSVP-configured interfaces for the GigabitEthernet interface type:

```
RP/0/RP0/CPU0:router# show rsvp interface gigabitEthernet 0/3/0/0

Thu Oct 22 20:35:42.323 UTC
Interface      MaxBW (bps) MaxFlow (bps) Allocated (bps)      MaxSub (bps)
-----
Gi0/3/0/0      750M        750M          0 ( 0%)              0
```

This following is sample output from the **show rsvp interfaces detail** command running in standard DS-TE mode:

```
RP/0/RP0/CPU0:router# show rsvp interface gigabitEthernet 0/3/0/0 detail

Thu Oct 22 20:35:11.638 UTC
INTERFACE: GigabitEthernet0/3/0/0 (ifh=0x4000300).
VRF ID: 0x60000000 (Default).
  BW (bits/sec): Max=750M. MaxFlow=750M.
                Allocated=0 (0%).
                BC0=750M. BC1=0.
  Signalling: No DSCP marking. No rate limiting.
  States in: 0. Max missed msgs: 4.
  Expiry timer: Not running. Refresh interval: 45s.
  Normal Refresh timer: Not running. Summary refresh timer: Running.
  Refresh reduction local: Enabled. Summary Refresh: Enabled (1472 bytes max).
  Reliable summary refresh: Disabled. Bundling: Enabled. (1500 bytes max).
  Ack hold: 400 ms, Ack max size: 1500 bytes. Retransmit: 900ms.
  Neighbor information:
    Neighbor-IP      Nbor-MsgIds States-out Refresh-Reduction Expiry(min::sec)
    -----
      9.0.0.1         0           6           Enabled 14::56
     10.10.10.10     0           0           Enabled 14::33
```

This table describes the significant fields shown in the display.

Table 72: show rsvp interface detail Command Field Descriptions

Field	Description
Bandwidth	Configured values on the interface and currently allocated bandwidth.
Ack hold	Time, in milliseconds, before RSVP responds with an acknowledgment.

Field	Description
Neighbor-IP	Address of peer that RSVP is exchanging messages on that interface.
Nbor-msglds	Message IDs received from the neighbor (corresponding to the number of LSPs with reliable messaging).
States-out	States (including paths or reservations) sent on this interface to the neighbor.
Refresh Reduction	Neighbor Refresh Reduction capability.
Expiry	Time a neighbor entry in the interface database expires if there is no activity on this interface with the corresponding neighbor.

Related Commands

Commands	Description
show rsvp counters, on page 537	Displays internal RSVP counters.

show rsvp neighbor

To display information about RSVP neighbors, use the **show rsvp neighbor** command in EXEC mode.

show rsvp neighbor [detail]

Syntax Description	detail	(Optional) Displays detailed information about RSVP neighbors.

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.

Use the **show rsvp interface** command to display various configuration settings such as the list of neighbors and their refresh reduction capabilities.

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

Examples	The following is sample output from the show rsvp neighbor command using the detail keyword:

```
RP/0/RP0/CPU0:router# show rsvp neighbor detail
```

```
Global Neighbor: 40.40.40.40
Interface Neighbor: 1.1.1.1
Interface: POS0/0/0/0
Refresh Reduction: "Enabled" or "Disabled".
Remote epoch: 0XXXXXXXXX
Out of order messages: 0
Retransmitted messages: 0
Interface Neighbor: 2.2.2.2
Interface: POS0/1/0/0
```

show rsvp neighbor

```
Refresh Reduction: "Enabled" or "Disabled".  
Remote epoch: 0XXXXXXXXX  
Out of order messages: 0  
Retransmitted messages: 0
```


show rsvp request

To list all the requests that RSVP knows about on a router, use the **show rsvp request** command in EXEC mode.

show rsvp request [**destination** *IP-address*] [**detail**] [**dst-port** *port-num*] [**p2mp-id** *p2mp-id*] [**session-type** {**lsp-p2mp** | **lsp-p2p** | **uni**}] [**source** *IP-address*] [**src-port** *port-num*]

Syntax Description

detail	(Optional) Displays multiline status for each path. If this keyword is not specified, only a single-line table entry is displayed.
destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
dst-port <i>port-num</i>	(Optional) Displays destination port and tunnel information.
p2mp-id <i>p2mp-id</i>	(Optional) Displays the entries that match the specified P2MP ID, for example, a P2MP session type.
session-type	(Optional) Displays the entries that match the specified session type.
lsp-p2mp	Displays the entries that are used for P2MP sessions.
lsp-p2p	Displays the entries that are used for P2P sessions.
uni	Displays the entries that are used for O-UNI sessions.
source <i>IP-address</i>	(Optional) Displays source address information.
src-port <i>port-num</i>	(Optional) Displays port and LSP ID information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.

Release	Modification
Release 3.9.0	To support P2MP, the following keywords were added: • The p2mp-id keyword was added. • The session-type keyword was added. • The lsp-p2mp keyword was added. • The lsp-p2p keyword was added. • The uni 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 displays information about upstream reservations only; that is, reservations being sent to upstream hops. Information about downstream reservations (that is, incoming or locally created reservations) is available using the **show rsvp reservation** command.

Reservations are displayed in ascending order of destination IP address, destination port, source IP address, and source port.

Task ID

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

Examples

The following is sample output from the **show rsvp request** command:

```
RP/0/RP0/CPU0:router# show rsvp request
```

```

      Dest Addr DPort      Source Addr SPort Pro  OutputIF Sty Serv Rate Burst
-----
192.168.40.40 2001      192.168.67.68      2    0  PO0/7/0/1  SE LOAD      0    1K

```

The following is sample output from the **show rsvp request detail** command, which displays detailed information about all requests in the router. Requests are reservation states for the reservation messages sent upstream:

```
RP/0/RP0/CPU0:router# show rsvp request detail
```

```

REQ:  IPv4-LSP Session addr: 192.168.40.40. TunID: 2001. LSPId: 2.
      Source addr: 192.168.67.68. ExtID: 192.168.67.68.
      Output interface: POS0/7/0/1. Next hop: 192.168.67.68 (lih: 0x19700001).
      Flags: Local Receiver.
      Style: Shared-Explicit. Service: Controlled-Load.
      Rate: 0 bits/sec. Burst: 1K bytes. Peak: 0 bits/sec.
      MTU min: 0, max: 500 bytes.
      Policy: Forwarding. Policy source(s): MPLS/TE.

```

```

Number of supporting PSBs: 1
Destination Add DPort      Source Add SPort Pro      Input IF Rate Burst Prot
192.168.40.40  2001        192.168.67.68 2    0      PO0/7/0/1    0    1K    Off
Number of supporting RSBs: 1
Destination Add DPort      Source Add SPort Pro      Input IF Sty Serv Rate Burst
192.168.40.40  2001        65.66.67.68 2    0      None SE LOAD    0    1K

```

This table describes the significant fields shown in the display.

Table 73: show rsvp request detail Command Field Descriptions

Field	Description
Number of supporting PSBs	Number of senders for this session (typically, 1).
Number of supporting RSBs	Number of reservations per session (typically, 1).
Policy	Admission control status.
Policy source	Entity performing the admission control (MPLS-TE or COPS).

Related Commands

Commands	Description
show rsvp reservation, on page 566	Displays internal RSVP reservation counters.

show rsvp reservation

To display all reservations that RSVP knows about on a router, use the **show rsvp reservation** command in EXEC mode.

show rsvp reservation [**destination** *IP address*] [**detail**] [**dst-port** *port-num*] [**p2mp-id** *p2mp-id*] [**session-type** {**lsp-p2mp** | **lsp-p2p** | **uni**}] [**source** *IP-address*] [**src-port** *port-num*]

Syntax Description

detail	(Optional) Displays multiline status for each reservation. If the detail keyword is not specified, only a single-line table entry is displayed.
destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
dst-port <i>port-num</i>	(Optional) Displays destination port and tunnel ID information.
p2mp-id <i>p2mp-id</i>	(Optional) Displays the entries that match the specified P2MP ID, for example, a P2MP session type.
session-type	(Optional) Displays the entries that match the specified session type.
lsp-p2mp	Displays the entries that are used for P2MP sessions.
lsp-p2p	Displays the entries that are used for P2P sessions.
uni	Displays the entries that are used for O-UNI sessions.
source <i>IP-address</i>	(Optional) Displays source address information.
src-port <i>port-num</i>	(Optional) Displays source port and LSP ID information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.

Release	Modification
Release 3.9.0	To support P2MP, the following keywords were added: • The p2mp-id keyword was added. • The session-type keyword was added. • The lsp-p2mp keyword was added. • The lsp-p2p keyword was added. • The uni 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.

The **show rsvp reservation** command displays information about downstream reservations only (that is, reservations received on this device or created by application program interface (API) calls). Upstream reservations or requests are displayed using the **show rsvp request** command.

Task ID

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

Examples

The following is sample output from the **show rsvp reservation** command:

```
RP/0/RP0/CPU0:router# show rsvp reservation
```

Dest Addr	DPort	Source Addr	SPort	Pro	Input IF	Sty	Serv	Rate	Burst
192.168.40.40	2001	192.168.67.68	2	0	None	SE	LOAD	0	1K
192.168.67.68	2000	10.40.40.40	15	0	PO0/7/0/1	SE	LOAD	0	1K

The following example displays detailed information about all reservations in the router:

```
RP/0/RP0/CPU0:router# show rsvp reservation detail
```

```

RESV: IPv4-LSP Session addr: 192.168.40.40. TunID: 2001. LSPid: 2.
Source addr: 192.168.67.68. ExtID: 192.168.67.68.
Input adjusted interface: None. Input physical interface: None.
Next hop: 0.0.0.0 (lih: 0x0).
Style: Shared-Explicit. Service: Controlled-Load.
Rate: 0 bits/sec. Burst: 1K bytes. Peak: 0 bits/sec.
MTU min: 40, max: 500 bytes.
Flags: Local Receiver.
State expires in 0.000 sec.
Policy: Accepted. Policy source(s): MPLS/TE.
Header info: RSVP TTL=255. IP TTL=255. Flags: 0x0. TOS=0xff.
Resource:
Labels: Local downstream: 3.
```

```

RESV: IPv4-LSP Session addr: 192.168.67.68. TunID: 2000. LSPId: 15.
Source addr: 192.168.40.40. ExtID: 10.10.40.40.
Input adjusted interface: PO0/7/0/1. Input physical interface: PO0/7/0/1.
Next hop: 10.66.67.68 (lih: 0x8DE00002).
Style: Shared-Explicit. Service: Controlled-Load.
Rate: 0 bits/sec. Burst: 1K bytes. Peak: 0 bits/sec.
MTU min: 0, max: 500 bytes.
Flags: None.
State expires in 361.184 sec.
Policy: Accepted. Policy source(s): MPLS/TE.
Header info: RSVP TTL=254. IP TTL=254. Flags: 0x1. TOS=0xff.
Resource:
Labels: Outgoing downstream: 3.

```

This table describes the significant fields shown in the display.

Table 74: show rsvp reservation detail Command Field Descriptions

Field	Description
Input adjusted interface	Interface to reflect the path's outgoing interface.
Input physical interface	Interface where the reservation was received.
Next hop	Address of the downstream node that sent the reservation to this node.
Lih	Logical interface handle sent in the hop object of path returned to us in the reservation to figure out what interface the path was sent on.
Flags	Indicates path state, including as Local Repair, Local Sender (LSP ⁴¹ ingress node), and others.
Policy	Admission control status.
Policy source	Entity performing the admission control on the LSP.
Header info	RSVP header information as described in RFC 2205.

⁴¹ Link-state packet

Related Commands

Command	Description
show rsvp request , on page 563	Lists all the requests that RSVP knows about on a router.

show rsvp sender

To display all path states that RSVP knows about on this router, use the **show rsvp sender** command in EXEC mode.

show rsvp sender [**destination** *IP-address*] [**detail**] [**dst-port** *port-num*] [**p2mp-id** *p2mp-id*] [**session-type** {**lsp-p2mp** | **lsp-p2p** | **uni**}] [**source** *IP-address*] [**src-port** *port-num*]

Syntax Description

detail	(Optional) Displays multiline status for each path. If the detail keyword is not specified, only a single-line table entry is displayed.
destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
dst-port <i>port-num</i>	(Optional) Displays destination port and tunnel ID information.
p2mp-id <i>p2mp-id</i>	(Optional) Displays the entries that match the specified P2MP ID, for example, a P2MP session type.
session-type	(Optional) Displays the entries that match the specified session type.
lsp-p2mp	Displays the entries that are used for P2MP sessions.
lsp-p2p	Displays the entries that are used for P2P sessions.
uni	Displays the entries that are used for O-UNI sessions.
source <i>IP-address</i>	(Optional) Displays source address information.
src-port <i>port-num</i>	(Optional) Displays source port and LSP ID information.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.

Release	Modification
Release 3.9.0	To support P2MP, the following keywords were added: • The p2mp-id keyword was added. • The session-type keyword was added. • The lsp-p2mp keyword was added. • The lsp-p2p keyword was added. • The uni 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.

The **show rsvp sender** command displays information about path states.

Task ID

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

Examples

The following is sample output from the **show rsvp sender** command:

```
RP/0/RP0/CPU0:router# show rsvp sender
```

Dest Addr	DPort	Source Addr	SPort	Pro	Input IF	Rate	Burst	Prot
10.40.40.40	2001	10.66.67.68	2	0	PO0/7/0/1	0	1K	Off
10.66.67.68	2000	10.40.40.40	15	0	None	0	1K	Off

This table describes the significant fields shown in the display.

Table 75: show rsvp sender Command Field Descriptions

Field	Description
DProt	Destination port number and tunnel-id.
Dest Address	Destination and session address of LSP ⁴² .
SPort	Source port and LSP ID.
Source Addr	Address of the ingress node of the LSP.
Input IF	Interface on which the Path message was received.

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The following example displays detailed information about all paths in the system:

```
RP/0/RP0/CPU0:router# show rsvp sender detail

PATH: IPv4-LSP Session addr: 65.66.67.68. TunID: 1. LSPId: 25.
Source addr: 40.40.40.40. ExtID: 40.40.40.40.
Prot: Off. Backup tunnel: None.
Setup Priority: 7, Reservation Priority: 0
Rate: 0 bits/sec. Burst: 1K bytes. Peak: 0 bits/sec.
Min unit: 40 bytes, Max unit: 500 bytes
Flags: Bidirectional.
State expires in 370.154 sec.
Policy: Accepted. Policy source(s): Default.
Header info: RSVP TTL=254. IP TTL=254. Flags: 0x1. TOS=0xc0.
Input interface: PO0/3/0/0. Previous hop: 40.40.40.40 (lih: 0x40600001).
Resource:
  Labels: Outgoing upstream: 3.
Class-Type: None.
Explicit Route (Incoming):
  Strict, 65.66.67.68(interface-path-id 5)
  Strict, 65.66.67.68/32
```

This table describes the significant fields shown in the display.

Table 76: show rsvp sender detail Command Field Descriptions

Field	Description
Prot	LSP configured as a protected tunnel.
Backup tunnel	Name of the backup tunnel assigned to protect this LSP ⁴³ .
Flags	Path state, including as local repair, local sender (LSP ingress node), and others.
Policy	Admission control status for Path message in the incoming direction.
Policy source	Entity doing the admission control, such as COPS or MPLS-TE ⁴⁴ .
Header info	RSVP header information as described in RFC 2205.
Input interface	Interface on which the path was received. At ingress mode, it is None.
Previous hop	Address of the upstream peer who sent us the Path message. May be the interface address or node-id depending on LSP (packet or optical).
Lih	Logical interface handle received in the hop object of the path.

Field	Description
Output interface	Interface on which the path was forwarded to the downstream neighbor
Policy	Admission control status for the path in the outgoing direction.
Explicit route	Explicit route specified in the explicit-route object of the Path message.

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show rsvp session

To list all sessions that RSVP knows about on this router, use the **show rsvp session** command in EXEC mode.

```
show rsvp session [destination IP-address] [detail] [dst-port port-num] [session-type {lsp-p2mp | lsp-p2p | uni}] [tunnel-name tunnel-name]
```

Syntax Description

detail	(Optional) Displays multiline status for each path. If the detail keyword is not specified, only a single-line table entry is displayed.
destination <i>IP-address</i>	(Optional) Displays the entries that match the specified address.
dst-port <i>port-num</i>	(Optional) Displays destination port and tunnel ID information.
session-type	(Optional) Displays the entries that match the specified session type.
lsp-p2mp	Displays the entries that are used for P2MP sessions.
lsp-p2p	Displays the entries that are used for P2P sessions.
uni	Displays the entries that are used for O-UNI sessions.
tunnel-name <i>tunnel-name</i>	(Optional) Displays status for the session matching the specified tunnel-name.

Command Modes

EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	To support P2MP, the following keywords were added: • The session-type keyword was added. • The lsp-p2mp keyword was added. • The lsp-p2p keyword was added. • The uni 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.

Sessions are displayed in ascending order of destination IP address, destination port, and source IP address.

Task ID

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

Examples

The following is sample output from the **show rsvp session** command:

```
RP/0/RP0/CPU0:router# show rsvp session
```

Type	Session Addr	Port	Proto/ExtTunID	PSBs	RSBs	Reqs
LSP4	10.40.40.40	2001	10.66.67.68	1	1	1
LSP4	10.66.67.68	2000	10.40.40.40	1	1	0

This table describes the significant fields shown in the display.

Table 77: show rsvp session Command Field Descriptions

Field	Description
Type	Type of data flow (Traffic-Engineering LSP (LSP4), OUNI, or IPV4 session).
Session Addr	Destination address of the data packets and also tail of the LSP.
Port	Destination port or tunnel ID in case of TE and OUNI tunnels.
Proto/ExtTunID	Source address of TE and OUNI tunnels or protocol as in the case of IPV4 sessions.
PSBs	Number of path state blocks for this session.
RSBs	Number of reservation state blocks pertaining to incoming or local reservations for this session.
Reqs	Number of requests. State data structure representing reservations sent up-stream.

The following is sample output for the **show rsvp session detail** command:

```
RP/0/RP0/CPU0:router# show rsvp session detail

SESSION: IPv4-LSP Addr: 65.66.67.68, TunID: 1, ExtID: 40.40.40.40
PSBs: 1, RSBs: 1, Requests: 0
LSPId: 1
Tunnel Name: newhead_t1
RSVP Path Info:
  InLabel: No intf, No label
  Incoming Address: Unknown
  Explicit Route:
    Strict, 65.66.67.68(interface-path-id 5)
    Strict, 65.66.67.68/32
  Record Route: None
  Tspec: avg rate=0, burst=1K, peak rate=0
RSVP Resv Info:
  OutLabel: POS0/7/0/1, 5
  FRR OutLabel: No intf, No label
  Record Route:
    Node-id 65.66.67.68, interface index 5
  Fspec: avg rate=0, burst=1K, peak rate=0
```

This table describes the significant fields shown in the display.

Table 78: show rsvp session detail Command Field Descriptions

Field	Description
TunID	Tunnel identifier and the destination port of the LSP ⁴⁵ .
ExtID	Ingress node address of LSP.
Tunnel Instance	Source port of the LSP (with the ExtId forming the source parameters).
Tunnel Name	Name of the tunnel and LSP.
InLabel	Incoming interface and label info for the LSP in the upstream direction. At the egress node, using penultimate hop popping at the egress node, (implicit-null) appears as <i>No Label</i> .
Incoming Address	Address of the ingress interface.
Explicit Route	Explicit route specified in the explicit-route object of the Path message.
Record Route	Record route object in either the path or reservation message.
Tspec	Traffic parameters.
OutLabel	Outgoing interface and label sent downstream.

Field	Description
FRR OutLabel	For FRR ⁴⁶ , displays the backup tunnel and Merge-point label.
Fspec	Flow spec parameters for specified QoS.

⁴⁵ Link-state packet.

⁴⁶ Fast reroute.

signalling dscp (RSVP)

To give all RSVP signaling packets sent out on a specific interface higher priority in the network by marking them with a particular Differentiated Service Code Point (DSCP), use the **signalling dscp** command in RSVP interface configuration submode. To return to the default behavior, use the **no** form of this command.

signalling dscp *dscp*

no signalling dscp

Syntax Description

<i>dscp</i>	DSCP priority number. Range is 0 to 63.

Command Default

No default behavior or values

Command Modes

RSVP interface configuration

Command History

Release	Modification
Release 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.

DSCP marking improves signaling setup and teardown times.

Ordinarily, when a router receives Path messages for a particular state marked with a DSCP value, it sends out Path messages for that state marked with the same DSCP value. This command overrides that DSCP persistence and ensures that all messages sent out a particular interface are marked with a specified DSCP.

Though this command controls RSVP signaling packets, it has no effect on ordinary IP or MPLS data packets traveling along the path created or reserved by this RSVP session.

DSCP persistence operates on a per-state basis, but this command operates on a per-interface basis. So, if some incoming message (for example, multicast Path) with DSCP 10 causes two outgoing messages on interfaces A and B, ordinarily both are sent with DSCP 10. If **signalling dscp 5** is configured for RSVP on interface A, the Path messages being sent out interface A is marked with DSCP 5, but the Path messages being sent out interface B are marked with DSCP 10.

There is a difference between the **signalling dscp 0** and **no signalling dscp** commands. The first command instructs RSVP to explicitly set to 0 the DSCP on all packets sent out this interface. The second command removes any override on the packets being sent out this interface, and allows the DSCP of received packets that created this state to persist on packets forwarded out this interface.

The RFC specifies a standard mapping from the eight IP precedence values to eight values in the 64-value DSCP space. You can use those special DSCP values to specify IP precedence bits only.

Task ID

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

Examples

The following example shows how to mark all RSVP packets going out on POS interface 0/1/0/1 as DSCP 20:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/1/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling dscp 20
```

The following example shows how to disable DSCP marking of signaling packets going out POS interface 0/1/0/1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/1/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# interface pos 0/1/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling dscp
```


signalling graceful-restart

To enable or disable RSVP signaling graceful restart, use the **signalling graceful-restart** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling graceful-restart [**recovery-time** *time*] **restart-time** *time*]

no signalling graceful-restart

Syntax Description

recovery-time	(Optional) Configures the recovery time that is advertised in the Restart Cap object in the Hello messages.
<i>time</i>	Time, in seconds, for the neighbor to wait for the node to recover (replay) existing states after the Hello session is reestablished before initiating TEARs. Range is 0 to 3600.
restart-time	(Optional) Configures the restart time that is advertised in the Restart Cap object in hello messages.
<i>time</i>	Time, in seconds, after a control-plane restart that RSVP can start exchanging hello messages. Range is 60 to 3600. Default is 120.

Command Default

RSVP signaling graceful restart is disabled.

Command Modes

RSVP configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The recovery-time 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.

The **signalling graceful-restart** command provides a mechanism that helps minimize the negative effects on MPLS and Optical User Network Interface (O-UNI) traffic for the following types of faults. This is an implementation of the fault handling section of the IETF standard RFC 3473:

Control-channel-failure

Disruption of communication channels between 2 nodes when the communication channels are separated from the data channels.

Node-failure

Control plane of a node fails, but the node preserves its data forwarding states.

The **signalling graceful-restart** command instigates the exchange of RSVP hello messages between the router and its neighbor nodes. After the hello messages are established with a given neighbor, RSVP can detect these types of faults when they occur.

If no hello messages are received from a neighbor within a certain number of hello intervals, a node assumes that communication with the neighbor has been lost. The node waits the amount of time advertised by the last restart time communicated by the neighbor, before invoking procedures for recovery from communication loss.

The configured restart time is important in case of recovery from failure. The configured value should accurately reflect the amount of time within which, after a control-plane restart, RSVP can start exchanging hello messages.

Task ID

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

Examples

The following example shows how to enable RSVP signalling graceful restart:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling graceful-restart
```

The following example shows how to set the restart time:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling graceful-restart restart-time 200
```

The following example shows how to reset the restart time to the default of 120 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# no signalling graceful-restart restart-time
```

signalling hello graceful-restart interface-based

To enable RSVP to accept interface-based hello requests from the neighbor on an interface and send a Hello Acknowledgment to it, use the **signalling hello graceful-restart interface-based** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling hello graceful-restart interface-based

no signalling hello graceful-restart interface-based

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes RSVP 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.

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

Examples The following example shows how to enable interface-based graceful restart:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 66
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling hello graceful-restart interface based
```

signalling hello graceful-restart refresh interval

To configure the interval at which RSVP graceful-restart hello messages are sent to each neighbor, use the **signalling hello graceful-restart refresh interval** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling hello graceful-restart refresh interval *refresh-interval*

no signalling hello graceful-restart refresh interval

Syntax Description

<i>refresh-interval</i>	Interval, in milliseconds, at which RSVP graceful-restart hello messages are sent to each neighbor. Range is 3000 to 30000.

Command Default

refresh interval: 5000

Command Modes

RSVP configuration

Command History

Release	Modification
Release 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.

The **signalling hello graceful-restart refresh interval** command determines how often hello messages are sent to each neighbor. If the interval is made short, the hello messages are sent more frequently. Although a short interval may help detect failures quickly, it also results in increased network traffic. Optimizations in the RSVP hello mechanism exist to reduce the number of hello messages traveling over the network.

When an RSVP hello message is received, the receiving node acknowledges the hello and restarts its hello timer to the neighbor. By doing this, a hello is transmitted to the neighbor only if a hello is not received before the hello refresh interval has expired.

If two neighboring nodes do not have the same hello interval, the node with the larger hello interval has to acknowledge its neighbor's (more frequent) hellos. For instance, if node A has a hello interval of 5 seconds, and node B has a hello interval of 10 seconds, node B still has to send hello messages every 5 seconds.

The hello backoff mechanism is an optimization that is tailored to minimize the number of hello messages from a neighbor that either does not have graceful restart enabled, or that fails to come back up during the restart interval. The restart interval is provided by the neighbor in the restart cap object.

Task ID

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

Examples

The following example sets the hello graceful-restart refresh interval to 4000 msec:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling hello graceful-restart refresh interval 4000
```

Related Commands

Command	Description
signalling hello graceful-restart refresh misses, on page 584	Configures the number of consecutive missed RSVP hello messages before a neighbor is declared down or unreachable.

signalling hello graceful-restart refresh misses

To configure the number of consecutive missed RSVP hello messages before a neighbor is declared down or unreachable, use the **signalling hello graceful-restart refresh misses** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling hello graceful-restart refresh misses *refresh-misses*

no signalling hello graceful-restart refresh misses

Syntax Description

refresh-misses

Number of misses for hello messages before a neighbor is declared down or unreachable. Range is 1 to 10. Default is 3.

Command Default

refresh-misses: 3

Command Modes

RSVP configuration

Command History

Release

Release 2.0

Modification

This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 hello messages (request or ACK) are received from a neighbor within the configured number of refresh misses, the node assumes that communication with the neighbor has been lost.

Task ID

Task ID

mpls-te

ouni

Operations

read, write

read, write

Examples

The following example shows how to set hello graceful-restart refresh misses to 4:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling hello graceful-restart refresh misses 4
```

Related Commands

Command	Description
signalling hello graceful-restart refresh interval, on page 582	Configures the interval at which RSVP graceful restart hello messages are sent per neighbor.

signalling prefix-filtering access-list

To specify the extended access control list to use for prefix filtering of RSVP Router Alert messages, use the **signalling prefix-filtering access-list** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling prefix-filtering access-list *access list name*

no signalling prefix-filtering access-list *access list name*

Syntax Description

<i>access list name</i>	Extended access-list name as a string (maximum 32 characters).

Command Default

No default behavior or values

Command Modes

RSVP 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 extended access control list containing the source and destination prefixes used for packet filtering is configured separately.

Task ID

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

Examples

The following example shows how to configure the access control list name banks for prefix-filtering of RSVP Router Alert messages:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling prefix-filtering access-list banks
```

The following example shows how to disable RSVP prefix-filtering of RSVP Router Alert messages:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# no signalling prefix-filtering access-list banks
```

Related Commands

Command	Description
signalling prefix-filtering default-deny-action, on page 588	Configures RSVP to drop messages when an access control list match yields an implicit deny.

signalling prefix-filtering default-deny-action

To configure RSVP to drop RSVP Router Alert messages when an access control list match returns an implicit deny, use the **signalling prefix-filtering default-deny-action** command in RSVP configuration mode. To return to the default behavior, use the **no** form of this command.

signalling prefix-filtering default-deny-action drop

no signalling prefix-filtering default-deny-action drop

Syntax Description	drop Specifies when RSVP router alert messages are dropped.	
Command Default	Performs normal RSVP processing of Path, Path Tear, and ResvConfirm message packets.	
Command Modes	RSVP 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
	mpls-te	read, write
	ouni	read, write

Examples The following example shows how to configure RSVP Router Alert messages when an access control list match returns an implicit deny:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp
RP/0/RP0/CPU0:router(config-rsvp)# signalling prefix-filtering default-deny-action drop
```

Related Commands

Command	Description
signalling prefix-filtering access-list , on page 586	Configures extended access control lists for prefix-filtering of an RSVP Router Alert messages.

signalling rate-limit

To limit the rate of RSVP signaling messages being sent out a particular interface, use the **signalling rate-limit** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling rate-limit[*rate messages*] [*interval interval-length*]

no signalling rate-limit [*rate messages*] [*interval interval-length*]

Syntax Description

rate <i>messages</i>	(Optional) Configures the number of messages sent per scheduling interval. Range is 1 to 500 messages.
interval <i>interval-length</i>	(Optional) Specifies the length, in milliseconds, between scheduling intervals. Range is 250 to 2000.

Command Default

messages: 100
interval-length: 1,000 (1 second)

Command Modes

RSVP interface configuration

Command History

Release	Modification
Release 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.

Use the rate-limiting feature with caution. Limiting the rate of RSVP signaling has the advantage of avoiding an overload of the next hop router's input queue, because such overloads would cause the next hop router to drop RSVP messages. However, reliable messaging and rapid retransmit usually enable the router to recover very rapidly from message drops; so rate limiting might not be necessary.

If the rate is set too low, it causes slower convergence times. This command limits all RSVP messages except acknowledgments (ACK) and SRefresh messages. The command does not let you make a router generate messages faster than its inherent limit. (That limit differs among router models.)

Task ID

Task ID	Operations
mpls-te	read, write

Task ID	Operations
ouni	read, write

Examples

The following example shows how to enable rate-limiting:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface POS0/3/0/0
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling rate-limit
```

The following example shows how to limit the rate to 50 messages per second:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/3/0/0
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling rate-limit rate 50
```

The following example shows how to set a limit at 40 messages for every 250 milliseconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/3/0/0
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling rate-limit rate 40 interval 250
```

The following example shows how to restore the rate to the default of 100 messages per second:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/3/0/0
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling rate-limit rate
```

The following example shows how to disable rate-limiting:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/3/0/0
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling rate-limit
```

Related Commands

Command	Description
signalling refresh reduction bundle-max-size, on page 596	Specifies the maximum bundle size of maximum size of single RSVP bundle message.

signalling refresh interval

To change the frequency with which a router updates the network about the RSVP state of a particular interface, use the **signalling refresh interval** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh interval *seconds*

no signalling refresh interval

Syntax Description

<i>seconds</i>	Number of seconds the router waits to update the network about the RSVP state of an interface, in seconds. Range is 10 to 180. Default is 45.

Command Default

seconds: 45

Command Modes

RSVP interface configuration

Command History

Release	Modification
Release 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.

RSVP relies on a soft-state mechanism to maintain state consistency in the face of network losses. That mechanism is based on continuous refresh messages to keep a state current. Each RSVP router is responsible for sending periodic refresh messages to its neighbors.

The router attempts to randomize network traffic and reduce metronomic burstiness by jittering the actual interval between refreshes by as much as 50 percent. As a result, refreshes may not be sent at exactly the interval specified. However, the average rate of refreshes are within the specified refresh interval.

Lengthening the interval reduces the refresh load of RSVP on the network but causes downstream nodes to hold state longer. This reduces the responsiveness of the network to failure scenarios. Shortening the interval improves network responsiveness but expands the messaging load on the network.

The reliable messaging extension, implemented through the **signalling refresh reduction reliable** command, may cause new or changed messages to be temporarily refreshed at a more rapid rate than specified to improve network responsiveness.

The use of reliable messaging with rapid retransmit substantially improves network responsiveness in case of transient message loss; if the refresh interval is changed when using the reliable messaging feature, it is more useful to lengthen the interval than to shorten it.

The summary refresh extension, implemented through the **signalling refresh reduction summary** command, provides a lower-cost mechanism to refresh RSVP state. The router uses the same refresh interval between successive refreshes of a single state when using summary refresh and when using ordinary message-based refresh.

Task ID

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

Examples

The following example shows how to specify a refresh interval of 30 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh interval 30
```

The following example shows how to restore the refresh interval to the default value of 45 seconds:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh interval
```

Related Commands

Command	Description
signalling refresh missed, on page 594	Specifies the number of successive missed refresh messages before RSVP deems the state expired and tears it down.
signalling refresh reduction reliable, on page 600	Customizes acknowledgment message size and hold interval, and the RSVP message retransmit interval.
signalling refresh reduction summary, on page 603	Enables and configures the maximum size of the SRefresh message.

signalling refresh missed

To specify the number of successive refresh messages that can be missed before the RSVP deems a state to be expired (resulting in the state to be torn down), use the **signalling refresh missed** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh missed*number*

no signalling refresh missed

Syntax Description	<i>number</i>	Number of successive missed refresh messages. Range is 1 to 8. Default is 4.

Command Default	<i>number</i> : 4

Command Modes	RSVP interface configuration

Command History	Release	Modification
	Release 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.
	Decreasing the missed-message number improves RSVP responsiveness to major failures like router failure or link faults, but decreases the resilience of RSVP resulting in packet drops or temporary network congestion. The latter condition makes RSVP too sensitive.
	Increasing the missed-message number increases the resilience of RSVP to such transient packet loss, but decreases the RSVP responsiveness to more intransient network failures such as router failure or link fault.
	The default value of 4 provides a balance of resilience and responsiveness factors.

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

Examples

The following example shows how to specify a missed refresh limit of six (6) messages:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh missed 6
```

The following example shows how to return the missed refresh limit to the default value of four (4):

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh missed
```

Related Commands

Command	Description
signalling refresh interval, on page 592	Changes the frequency with which a router updates the network about the RSVP state of an interface.
signalling refresh reduction reliable, on page 600	Customizes acknowledgment message size and hold interval, and the RSVP message retransmit interval.
signalling refresh reduction summary, on page 603	Enables and configures the maximum size of the SRefresh message.

signalling refresh reduction bundle-max-size

To configure the maximum size of a single RSVP bundle message, use the **signalling refresh reduction bundle-max-size** command in RSVP interface configuration mode.

signalling refresh reduction bundle-max-size *size*

Syntax Description

<i>size</i>	Maximum size, in bytes, of a single RSVP bundle message. Range is 512 to 65000.

Command Default

size: 4096

Command Modes

RSVP 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
mpls-te	read, write
ouni	read, write

Examples

The following example shows how to set the maximum bundle size of a single RSVP bundle message to 4000:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction bundle-max-size 4000
```

Related Commands

Command	Description
show rsvp interface , on page 558	Displays information about all interfaces with RSVP enabled.

signalling refresh reduction disable

To disable RSVP refresh reduction on an interface, use the **signalling refresh reduction disable** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh reduction disable

no signalling refresh reduction disable

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes RSVP interface configuration

Command History	Release	Modification
	Release 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.

The following features of the IETF refresh reduction standard RFC 2961 are enabled with this command:

- Setting the refresh-reduction-capable bit in message headers
- Message-ID usage
- Reliable messaging with rapid retransmit, acknowledgment (ACK), and NACK messages
- Summary refresh extension

Because refresh reduction relies on cooperation of the neighbor, the neighbor must also support the standard. If the router detects that a neighbor is not supporting the refresh reduction standard (either through observing the refresh-reduction-enabled bit in messages received from the next hop, or by sending a Message-ID object to the next hop and receiving an error), refresh reduction is not used on this link. That information is obtained through use of the **show rsvp interface detail** command.

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

Examples

The following example shows how to disable RSVP refresh reduction on an interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction disable
```

The following example shows how to enable RSVP refresh reduction on the interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction disable
```

Related Commands

Command	Description
show rsvp interface, on page 558	Displays information about all interfaces with RSVP enabled.
signalling refresh interval, on page 592	Changes the frequency with which a router updates the network about the RSVP state of an interface.
signalling refresh reduction reliable, on page 600	Customizes acknowledgment message size and hold interval, and the RSVP message retransmit interval.
signalling refresh reduction summary, on page 603	Enables and configures the maximum size of the signalling refresh message.

signalling refresh reduction reliable

To configure the parameters of reliable messaging, use the **signalling refresh reduction reliable** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh reduction reliable {**ack-max-size** *bytes*| **ack-hold-time** *milliseconds*| **retransmit-time** *milliseconds*| **summary-refresh**}

no signalling refresh reduction reliable {**ack-max-size** *bytes*| **ack-hold-time** *milliseconds*| **retransmit-time** *milliseconds*| **summary-refresh**}

Syntax Description

ack-max-size	Specifies the maximum size of the RSVP component within a single acknowledgment message.
<i>bytes</i>	Number of bytes that define the maximum size of an RSVP component. Range is 20 to 65000.
ack-hold-time	Specifies the maximum amount of time a router holds an acknowledgment before sending it, in an attempt to bundle several acknowledgments into a single acknowledgment message.
<i>milliseconds</i>	Number of milliseconds that define the acknowledgment hold time. Range is 100 to 5000.
retransmit-time	Specifies the amount of time the router initially waits for an acknowledgment message before resending the RSVP message.
<i>milliseconds</i>	Number of milliseconds that define the retransmit time. Range is 100 to 10000.
summary-refresh	Enables the use of reliable transmission for RSVP summary refresh messages.

Command Default

ack-max-size *bytes*: 4096
ack-hold-time *milliseconds*: 400 (0.4 seconds)
retransmit-time *milliseconds*: 900 (0.9 seconds)

Command Modes

RSVP interface configuration

Command History

Release	Modification
Release 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.

For reliable messaging to work properly, configure the retransmit time on the send router (A) and acknowledgment hold time on the peer router (B). (Vice versa for messages in reverse direction.)

The retransmit time must be greater than the acknowledgment hold time, so that the acknowledgment message has time to get back to the sender before the message retransmits. We recommend that the retransmit-time interval be at least twice the acknowledgment hold-time interval. If the retransmit-time value is smaller than the acknowledgment hold-time value, then router A retransmits the message even though router B may have received the message and is waiting for an acknowledgment hold time to time out to send the acknowledgment. This causes unnecessary network traffic.

Reducing the value of **ack-max-size** causes more acknowledgment messages to be issued, with fewer acknowledgments contained within each acknowledgment message. However, reducing the acknowledgment-max-size does not speed up the rate at which acknowledgment messages are issued because their frequency is still controlled by the time values (acknowledgment hold time and retransmit time).

To use reliable messaging for summary refresh messages, use **thersvp interface interface-name** and **signalling refresh reduction summary** commands.

Task ID

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

Examples

The following example shows how to set the maximum acknowledgment message size to 4096 bytes on POS interface 0/4/0/1:

```
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/4/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction reliable ack-max-size
4096
```

The following example shows how to return the maximum acknowledgment message size to the default of 1000 bytes on POS interface 0/4/0/1:

```
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/4/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# no rsvp signalling refresh reduction reliable
```

The following example shows how to set the acknowledgment hold time to 1 second:

```
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/4/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction reliable ack-hold-time
1000
```

The following example shows how to return the acknowledgment hold time to the default of 0.4 second:

```
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/4/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction reliable ack-hold-time
```

The following example shows how to set the retransmit timer to 2 seconds:

```
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/4/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction reliable retransmit-time 2000
```

The following example shows how to return the retransmit timer to the default of 0.9 seconds:

```
RP/0/RP0/CPU0:router(config)# rsvp interface pos 0/4/0/1
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction reliable
```

The following example shows how to enable the use of reliable transmission for RSVP summary refresh messages:

```
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction reliable summary-refresh
```

The following example shows how to disable the use of reliable transmission for RSVP summary refresh messages:

```
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction reliable summary-refresh
```

Related Commands

Command	Description
signalling refresh reduction disable, on page 598	Disables RSVP refresh reduction on an interface.

signalling refresh reduction summary

To configure RSVP summary refresh message size on an interface, use the **signalling refresh reduction summary** command in RSVP interface configuration mode. To return to the default behavior, use the **no** form of this command.

signalling refresh reduction summary*max-size**bytes*

no signalling refresh reduction summary *max-size**bytes*

Syntax Description

max-size <i>bytes</i>	Specifies the maximum size, in bytes, of a single RSVP summary refresh message. Range is 20 to 65000.

Command Default

bytes: 4096

Command Modes

RSVP interface configuration

Command History

Release	Modification
Release 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.

Use the **signalling refresh reduction summary** command to specify the maximum size of the summary refresh messages sent. Message size is verified using the **show rsvp interface detail** command.

Task ID

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

Examples

The following example shows how to change the summary message maximum size on an interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# signalling refresh reduction summary max-size 6000
```

The following example shows how to return the summary message maximum size to the default value on an interface:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface tunnel-te 2
RP/0/RP0/CPU0:router(config-rsvp-if)# no signalling refresh reduction summary max-size 6000
```

Related Commands

Command	Description
show rsvp interface, on page 558	Displays information about all interfaces with RSVP enabled.
signalling refresh interval, on page 592	Changes the frequency with which a router updates the network about the RSVP state of an interface.

window-size (RSVP)

To specify the maximum number of RSVP authenticated messages that can be received out of sequence, use the **window-size** command in RSVP authentication configuration mode, RSVP interface authentication configuration mode, or RSVP neighbor authentication configuration mode. To disable the window size, use the **no** form of this command.

window-size *N*

no window-size

Syntax Description

<i>N</i>	Size of the window to restrict out-of-sequence messages. Range is 1 to 64. Default is 1. All out-of-sequence messages are dropped.

Command Default

N: 1

Command Modes

RSVP authentication configuration
RSVP interface authentication configuration
RSVP neighbor authentication 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.

Use the **window-size** command to specify the maximum number of authenticated messages that are received out of sequence. All RSVP authenticated messages include a sequence number that is used to prevent replays of RSVP messages.

With a default window size of one message, RSVP rejects any out-of-order or out-of-sequence authenticated messages because they are assumed to be replay attacks. However, sometimes bursts of RSVP messages become reordered between RSVP neighbors. If this occurs on a regular basis, and you can verify that the node sending the burst of messages is trusted, you can use the window-size option to adjust the burst size such that RSVP does not discard such reordered bursts. RSVP checks for duplicate messages within these bursts.

Task ID

Task ID	Operations
mpls-te	read, write

Task ID	Operations
ouni	read, write

Examples

The following example shows how to configure the size of the window to 33 in RSVP neighbor authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp neighbor 1.1.1.1 authentication
RP/0/RP0/CPU0:router(config-rsvp-nbor-auth)# window-size 33
```

The following example shows how to configure the size of the window to 33 in RSVP authentication configuration mode:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp authentication
RP/0/RP0/CPU0:router(config-rsvp-auth)# window-size 33
```

The following example shows how to configure the size of the window to 33 in RSVP interface authentication configuration mode by using the **rsvp interface** command:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# rsvp interface POS 0/2/1/0
RP/0/RP0/CPU0:router(config-rsvp-if)# authentication
RP/0/RP0/CPU0:router(config-rsvp-if-auth)# window-size 33
```

Related Commands

Command	Description
key-source key-chain (RSVP), on page 522	Specifies the source of the key information to authenticate RSVP signaling messages.
life-time (RSVP), on page 524	Controls how long RSVP maintains idle security associations with other trusted RSVP neighbors.



MPLS Optical User Network Interface Commands

This module describes the commands used to configure, monitor, and troubleshoot an Optical User Network Interface (O-UNI). It provides a description of the Static Link Management Protocol (LMP) commands. LMP is a user-configured version of the Internet Engineering Task Force's (IETF) LMP; hence, the keyword **lmp** is used in the management commands.

The Unified Control Plane (UCP) (sometimes referred to as the Optical Control Plane [OCP]) is a standards-based approach toward an open architecture for the control and provisioning of optical transport elements and capacity. It allows customers to establish standards-based Optical Internetworking Forum (OIF) connections through heterogeneous optical networks (OTNs) based on the Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) specifications. These connections are made across OTNs comprising Cisco equipment or third-party vendor equipment.



Note

The LMP and GMPLS-NNI features are not supported on x86 RPs.

For detailed information about MPLS concepts, configuration tasks, and examples, see *Cisco IOS XR MPLS Command Reference for the Cisco CRS-1 Router*.

- [destination address ipv4](#), page 609
- [ipcc routed](#), page 611
- [lmp neighbor \(MPLS O-UNI\)](#), page 613
- [neighbor \(O-UNI\)](#), page 615
- [passive \(MPLS O-UNI\)](#), page 617
- [remote interface-id](#), page 619
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- [show mpls lmp interface-id](#), page 626
- [show mpls optical-uni](#), page 628
- [show mpls optical-uni checkpoint](#), page 632
- [show mpls optical-uni diagnostics](#), page 634

- [show mpls optical-uni interface, page 638](#)
- [show mpls optical-uni lmp, page 642](#)
- [show mpls optical-uni timers all, page 648](#)
- [show mpls optical-uni timers global, page 650](#)
- [show mpls optical-uni timers interfaces, page 652](#)
- [show mpls optical-uni timers nodes, page 655](#)
- [tna ipv4, page 657](#)

destination address ipv4

To establish an O-UNI connection to a specific destination transport network address (TNA), use the **destination address ipv4** command in MPLS O-UNI interface mode. To return to the default behavior, use the **no** form of this command.

destination address ipv4 *destination-TNA*

no destination address ipv4 *destination-TNA*

Syntax Description

destination-TNA

Destination TNA to which a connection is created.

Command Default

No default behavior or values

Command Modes

MPLS O-UNI interface

Command History

Release

Release 2.0

Modification

This command was introduced.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 **destination address ipv4** command whenever an O-UNI connection is established by the router. Both O-UNI-C sides participating in an O-UNI connection is configured with the **destination address ipv4** command. In this case, the destination TNA specified by each side must correspond to the TNA configured by the other side.



Note

Based on the contention detection and backoff mechanisms defined in O-UNI 1.0, one of the routers acts as though configured with the **passive** command.

Task ID

Task ID

ouni

Operations

read, write

destination address ipv4

Examples

The following example shows how to configure the interface to initiate an O-UNI connection to TNA 10.10.10.10:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# interface POS 0/1/0/1
RP/0/RP0/CPU0:router(config-mpls-ouni-if)# destination address ipv4 10.10.10.10
```

Related Commands

Command	Description
passive (MPLS O-UNI), on page 617	Configures an interface to terminate an O-UNI connection.

ipcc routed

To configure an Internet Protocol Control Channel (IPCC) that is routable, use the **ipcc routed** command in O-UNI LMP neighbor configuration mode. To return to the default behavior, use the **no** form of this command.

ipcc routed

no ipcc routed

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes O-UNI LMP neighbor configuration

Release	Modification
Release 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.

This type of IPCC is IPv4 routed to the O-UNI neighbor to which it is connected. Ensure that the O-UNI neighbor is configured with a reachable IPv4 node ID.

When a routed IPCC is configured to a given neighbor, control traffic destined to that neighbor is IP routed to the configured remote router ID for that neighbor. A correctly configured routed IPCC to a given LMP neighbor is required before an O-UNI label switched path (LSP) connection to that neighbor is established.

Task ID	Operations
ouni	read, write

Examples The following example shows how to configure a routed IPCC for O-UNI neighbor router1 where the destination IP address is the node ID of the neighbor router1 on an interface determined dynamically by an IP routing protocol:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# lmp neighbor router1
RP/0/RP0/CPU0:router(config-ouni-nbr-router1)# ipcc routed
```

ipcc routed

Imp neighbor (MPLS O-UNI)

To configure or update a new or existing O-UNI specific LMP neighbor and its associated parameters, use the **imp neighbor** command in MPLS O-UNI configuration mode. To return to the default behavior, use the **no** form of this command.

imp neighbor *neighbor-name*

no imp neighbor *neighbor-name*

Syntax Description

<i>neighbor-name</i>	Text string representing the name of the LMP neighbor.

Command Default

No default behavior or values

Command Modes

MPLS O-UNI configuration

Command History

Release	Modification
Release 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.

Neighbor names must be unique. A neighbor does not become operational until both the remote node ID and a routed Internet Protocol Control Channel (IPCC) are configured for that neighbor.



Note

You can configure up to ten LMP neighbors for each router.

Task ID

Task ID	Operations
ouni	read, write

Examples

The following example shows how to enter LMP neighbor configuration mode for neighbor router 1, and create the LMP neighbor if it does not already exist.

```
RP/0/RP0/CPU0:router# configure
```

Imp neighbor (MPLS O-UNI)

```
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# lmp neighbor router 1
```

Related Commands

Command	Description
neighbor (O-UNI), on page 615	Associates an interface with an LMP neighbor.

neighbor (O-UNI)

To associate an interface with a given LMP neighbor, use the **neighbor** command in O-UNI LMP datalink adjacency configuration mode. To return to the default behavior, use the **no** form of this command.

neighbor *neighbor-name*

no neighbor *neighbor-name*

Syntax Description

<i>neighbor-name</i>	String of alphanumeric characters that defines the name of the LMP neighbor to create or modify.

Command Default

No default behavior or values

Command Modes

O-UNI LMP datalink adjacency configuration

Command History

Release	Modification
Release 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.

You can specify a forward reference to a neighbor that you have not yet configured. A neighbor does not become operational until both the remote node ID and a routed Internet Protocol Control Channel (IPCC) is configured for that neighbor. LMP neighbors are configured under the MPLS O-UNI configuration mode.

Task ID

Task ID	Operations
ouni	read, write

Examples

The following example shows how to associate the neighbor router1 with the datalink PoS interface 0/1/0/1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# interface POS 0/1/0/1
RP/0/RP0/CPU0:router(config-mpls-ouni-if)# lmp data-link adjacency
RP/0/RP0/CPU0:router(config-mpls-ouni-if-adj)# neighbor router1
```

Related Commands

Command	Description
lmp neighbor (MPLS O-UNI), on page 613	Configures or updates a new or existing O-UNI specific LMP neighbor and its associated parameters.

passive (MPLS O-UNI)

To terminate an O-UNI connection, use the **passive** command in the MPLS O-UNI interface configuration mode. To return to the default behavior, use the **no** form of this command.

passive

no passive

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes MPLS O-UNI interface configuration

Command History	Release	Modification
	Release 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.

Use the **passive** command whenever the router is to terminate an O-UNI connection. The interface accepts the incoming connection request of any O-UNI-C. The router does not actively attempt to create a connection, but rather waits for an incoming connection request.



Note If a **destination address ipv4** command is configured, you must enter the **no destination address ipv4** command before attempting to configure the **passive** command. Otherwise, you receive an error.

Task ID	Task ID	Operations
	ouni	read, write

Examples The following example shows how to configure PoS interface 0/1/0/1 as the passive end of an O-UNI:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# interface POS 0/1/0/1
```

passive (MPLS O-UNI)

RP/0/RP0/CPU0:router(config-mpls-ouni-if)# **passive**

Related Commands

Command	Description
remote interface-id, on page 619	Configures the remote datalink interface ID.

remote interface-id

To configure the remote datalink interface ID, use the **remote interface-id** command in O-UNI LMP neighbor adjacency configuration mode. To return to the default behavior, use the **no** form of this command.

remote interface-id *remote-interface-path-id*

no remote interface-id *remote-interface-path-id*

Syntax Description

<i>remote-interface-path-id</i>	Interface ID of the neighbor's datalink. Range is 1 to 4294967295.

Command Default

No remote datalink interface ID is configured.

Command Modes

O-UNI LMP neighbor adjacency configuration

Command History

Release	Modification
Release 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.

The remote interface ID must be set to the local interface ID at the neighbor end of the datalink.

Task ID

Task ID	Operations
ouni	read, write

Examples

The following example shows how to configure the interface ID for the remote neighbor of the datalink that is associated with PoS interface 0/1/0/1:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# interface pos 0/2/0/0 lmp data-link adjacency
RP/0/RP0/CPU0:router(config-mpls-ouni-if)# lmp data-link adjacency
RP/0/RP0/CPU0:router(config-mpls-ouni-if-adj)# remote interface-path-id 2
```

remote interface-id

Related Commands

Command	Description
passive (MPLS O-UNI), on page 617	Terminates an O-UNI connection.

remote node-id

To configure the remote node ID for an O-UNI LMP neighbor, use the **remote node-id** command in LMP neighbor configuration mode.

remote node-id *ip-address*

Syntax Description

<i>ip-address</i>	Address to which routed control messages are sent.

Command Default

No default behavior or values

Command Modes

LMP neighbor configuration

Command History

Release	Modification
Release 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.

The remote node ID must be set to the local LMP node ID of the neighbor.

Task ID

Task ID	Operations
ouni	read, write

Examples

The following example shows how to configure the node ID for a neighbor node:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# lmp neighbor router1
RP/0/RP0/CPU0:router(config-ouni-nbr-router1)# remote node-id 192.168.20.10
```

Related Commands

Command	Description
passive (MPLS O-UNI) , on page 617	Terminates an O-UNI connection.

remote node-id

router-id (MPLS O-UNI)

To configure the local O-UNI LMP node ID, also known as a router ID, on a router, use the **router-id** command in MPLS O-UNI configuration mode.

router-id *{ip-address| interface-name}*

Syntax Description

<i>ip-address</i>	IPv4 address to use as the router ID.
<i>interface-name</i>	Name of an interface whose address is used as the LMP node ID.

Command Default

No default behavior or values

Command Modes

MPLS O-UNI configuration

Command History

Release	Modification
Release 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	Operations
ouni	read, write

Examples

The following example shows how to configure the node ID for a neighbor node:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# router-id pos 0/6/4/1
```

show mpls lmp clients

To display information about LMP clients, use the **show mpls lmp clients** command in EXEC mode.

show mpls lmp clients

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

Use the **show mpls lmp clients** command to display a list of LMP client names with associated job IDs, the nodes on which the client is running, and the client uptime.

Task ID	Task ID	Operations
	ouni	read

Examples The following is sample output from the **show mpls lmp clients** command:

```
RP/0/RP0/CPU0:router# show mpls lmp clients

Current time: Thu Jun 20 6 07:26:27 2006
Total Number of Clients = 2
  Client | Job ID | Node | Uptime | Since
-----+-----+-----+-----+-----
      rsvp |    114 | node0_0_0 | 36m13s | Tue Jun 20 11:22:39 2006
 ucp_O-UNI |    116 | node0_0_0 | 28m51s | Tue Feb 20 11:30:01 2006
```

This table describes the significant fields shown in the display.

Table 79: show mpls ldp clients Command Field Descriptions

Field	Description
Client	Process name registered with LMP OLM ⁴⁷ server.
Job ID	Job ID of the client process.
Node	Node ID of the client.
Uptime	Time connection has been established.
Since	Time when the connection was successfully established. This field is empty until a connection is established.

⁴⁷ Optical Link Manager

show mpls lmp interface-id

To display the local LMP interface ID (also known as port ID, or component interface ID) for a given interface, use the **show mpls lmp interface-id** command in EXEC mode.

show mpls lmp interface-id [*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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 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	Operations
ouni	read

Examples

The following is sample output from the **show mpls lmp interface-id** command:

```
RP/0/RP0/CPU0:router# show mpls lmp interface-path-id pos 0/7/0/0
Local LMP interface ID: Hex = 0xa, Dec = 10
```


This table describes the significant fields shown in the display.

Table 80: show mpls lmp inference-id Command Field Descriptions

Field	Description
Local LMP interface ID	32-bit value which uniquely identifies a router interface.
Hex	Value in hexadecimal notation (base 16).
Dec	Value in decimal notation (base 10).

Related Commands

Command	Description
show mpls optical-uni interface, on page 638	Displays O-UNI information for an interface.

show mpls optical-uni

To display information about the state of O-UNI connections, use the **show mpls optical-uni** command in EXEC mode.

show mpls optical-uni

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

Use the **show mpls optical-uni** command to display brief information for the state of O-UNI connection states.

Task ID	Task ID	Operations
	ouni	read

Examples The following is sample output from the **show mpls optical-uni** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni

Index of abbreviations:
-----
M=O-UNI configuration Mode.
P=Passive
AR =active/receiver
AS=active/sender
U=Unknown

Interface   TunID      M   Sig State      CCT Up Since      Remote Addr
-----
POS2/0/0/0 000001 AS   Connected      27/02/2002 05:20:35 10.3.4.2
```

This table describes the significant fields shown in the display.

Table 81: show mpls optical-uni Command Field Descriptions

Field	Description
Interface	Name of the O-UNI configured interface.
TunID	Tunnel ID used in performing the signaling operation.
M	Mode of operation for the interface, as follows: P Interface is configured with the O-UNI passive (MPLS O-UNI) , on page 617 command. AS Router is acting as the connection initiator. AR Router is acting as the connection termination endpoint. U An O-UNI internal error has occurred. Normally, the value U is not seen under this column.

Field	Description
Sig State	Indicates the signaling state of the O-UNI connection. The following states exist: No Connection A connection could not be initiated on the interface Wait Resv A Path message was sent, and a Resv message is awaited. Connected A O-UNI connection is established. Wait PErr PSR The graceful deletion procedure has been initiated from the interface acting as the O-UNI-C source, a Path(D&R) message has been sent towards the destination O-UNI-C node, and a PathErr(PSR) message is awaited. Wait Path A path is awaited to initiate the O-UNI connection establishment procedures. Wait Resvconf At an O-UNI-C destination side, a Path message has been received, a Resv message has been sent towards the O-UNI-C source and now the O-UNI system awaits the ResvConf message to complete the connection setup. Wait PTear The graceful deletion procedure has been initiated from the interface acting as an O-UNI-C destination, a Resv(D&R) message has been sent towards source O-UNI-C, and the O-UNI system waits for a PathTear message to complete the deletion. Path Retry A previous attempt to establish a connection on the interface as an O-UNI-C source has failed, and the O-UNI system waits for a Retry timer to expire to make the next attempt.

Field	Description
CCT Up Since	The time at which a connection was successfully established. This field is empty until a connection is established.
Remote Addr	The remote address of a connection. If the interface has a passive configuration, this field is populated only after a connection is established.

Related Commands

Command	Description
show mpls optical-uni interface, on page 638	Displays detailed O-UNI information for a specific interface.

show mpls optical-uni checkpoint

To display O-UNI information used during restart operations, use the **show mpls optical-uni checkpoint** command in EXEC mode.

show mpls optical-uni checkpoint

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

Use the **show mpls optical-uni checkpoint** command to display O-UNI information used during restart operations.



Note

In general, this command is not used during normal operation. This command is used to diagnose problem conditions within the O-UNI process and are used only when an O-UNI internal error occurs.

Task ID	Task ID	Operations
	ouni	read

Examples The following is sample output from the **show mpls optical-uni checkpoint** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni checkpoint
  Interface      TunID  LspID  CCT  Up  Since
  -----
  POS0_2_0_2     00004  00004  04/11/2006 15:01:07
```

This table describes the significant fields in the sample display.

Table 82: show mpls optical-uni checkpoint Command Field Descriptions

Field	Description
Interface	Interface associated with the O-UNI connection.
TunID	ID of the tunnel associated with the O-UNI connection.
LspID	ID of the label switched path associated with the connection.
CCT Up Since	Time when a connection was successfully established. This field is empty until a connection is established.

show mpls optical-uni diagnostics

To display diagnostics information for an O-UNI connection for a specific interface, use the **show mpls optical-uni diagnostics** command in EXEC mode.

show mpls optical-uni diagnostics [*interface type interface-path-id*] **all**

Syntax Description

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

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 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.

Use the **show mpls optical-uni diagnostics** command to display O-UNI diagnostics information for a specific interface.

Task ID

Task ID	Operations
ouni	read

Examples

The following is sample output from the **show mpls optical-uni diagnostics** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni diagnostics interface POS 0/2/0/2

Interface [POS0/2/0/2]

Configuration: Active->User
Signaling State: [Path Retry]

Connection to OLM/LMP established? Yes
O-UNI to OLM/LMP DB sync. status: Synchronized

Connection to RSVP established? Yes
RSVP to OLM/LMP DB sync. status: Synchronized

The neighbor [router1] has been configured, and has the node id [55.56.57.58]
Found a route to the neighbor [router1]

Remote switching capability is TDM.
TNA [10.0.0.5] configured.

All required configs have been entered.

Global Code: No Error/ Success @ unknown time
Datalink Code: PathErr Received @ 04/11/2006 17:06:48
```

This table describes the significant fields in the sample display.

Table 83: show mpls optical-uni diagnostics Command Field Descriptions

Field	Description
Interface	Interface name for which the diagnostics information is displayed.
Configuration	Indicates if the interface is acting as the O-UNI-C source and in this case “Active” is displayed, or as the O-UNI-C destination and in this case “Passive” is displayed.

Field	Description
Signaling State	Indicates the signaling state of the O-UNI connection. The following states exist: No Connection A connection could not be initiated on the interface. Wait Resv A Path message was sent, and a Resv message is awaited. Connected A O-UNI connection is established. Wait PErr PSR The graceful deletion procedure has been initiated from the interface acting as the O-UNI-C source, a Path(D&R) message has been sent towards the destination O-UNI-C node, and a PathErr(PSR) message is awaited. Wait Path A path is awaited to initiate the O-UNI connection establishment procedures. Wait Resvconf At an O-UNI-C destination side, a Path message has been received, a Resv message has been sent towards the O-UNI-C source and now the O-UNI system awaits the ResvConf message to complete the connection setup. Wait PTear The graceful deletion procedure has been initiated from the interface acting as an O-UNI-C destination, a Resv(D&R) message has been sent towards source O-UNI-C, and the O-UNI system waits for a PathTear message to complete the deletion. Path Retry A previous attempt to establish a connection on the interface as an O-UNI-C source has failed, and the O-UNI system waits for a Retry timer to expire to make the next attempt.

Field	Description
Connection to OLM/LMP	Indicates if the communication with the LMP collaborator is established.
O-UNI to OLM/LMP DB sync. status	Indicates if the O-UNI client interaction with LMP is functioning correctly.
Connection to RSVP	Indicates if the communication with the RSVP collaborator is established.
RSVP to OLM/LMP DB sync. status	Indicates if the RSVP client interaction with LMP is functioning correctly.
Neighbor	Diagnostic information about the neighbor node with respect to the interface. Also diagnostics for the O-UNI link is displayed and missing configuration is flagged.
Global Code	Indicates if a signaling error that may pertain to this interface has occurred.
Datalink Code	Indicates if an error has occurred in processing a signaling message associated with this interface.

Related Commands

Command	Description
show mpls optical-uni , on page 628	Displays information about the state of O-UNI connections.

show mpls optical-uni interface

To display detailed O-UNI information for a specific interface, use the **show mpls optical-uni interface** command in EXEC mode.

show mpls optical-uni 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 a virtual interface. Note Use the show interfaces command to see a list of all possible 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 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.

Use this command to display O-UNI information for a specific interface.

Task ID

Task ID	Operations
ouni	read

Examples

The following is sample output from the **show mpls optical-uni interface** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni interface POS 0/2/0/2
Interface POS0/2/0/2
```

```
Configuration: Active->User
Signaling State: Connected since 04/11/2006 15:01:07
TNA: 10.0.0.5
Sender NodeID/Tunnel ID: 11.12.13.14/4
Local Data Link ID: 2
Remote Data Link ID: 2
Local Switching Capability: PSC 1
Remote Switching Capability: TDM
Primary IPCC: Interface: Routed
                Local IP Address: 0.0.0.0
                Remote IP Address: 55.56.57.58
```

This table describes the significant fields shown in the display.

Table 84: show mpls optical-uni interface Command Field Descriptions

Field	Description
Configuration	Indicates if the interface is acting as the O-UNI-C source and in this case “Active” is displayed, or as the O-UNI-C destination and in this case “Passive” is displayed.

Field	Description
Signaling State	Indicates the signaling state of the O-UNI connection. The following states exist: No Connection A connection could not be initiated on the interface. Wait Resv A Path message was sent, and a Resv message is awaited. Connected A O-UNI connection is established. Wait PErr PSR The graceful deletion procedure has been initiated from the interface acting as the O-UNI-C source, a Path(D&R) message has been sent towards the destination O-UNI-C node, and a PathErr(PSR) message is awaited. Wait Path A path is awaited to initiate the O-UNI connection establishment procedures. Wait Resvconf At an O-UNI-C destination side, a Path message has been received, a Resv message has been sent towards the O-UNI-C source and now the O-UNI system awaits the ResvConf message to complete the connection setup. Wait PTear The graceful deletion procedure has been initiated from the interface acting as an O-UNI-C destination, a Resv(D&R) message has been sent towards source O-UNI-C, and the O-UNI system waits for a PathTear message to complete the deletion. Path Retry A previous attempt to establish a connection on the interface as an O-UNI-C source has failed, and the O-UNI system waits for a Retry timer to expire to make the next attempt.

Field	Description
TNA	The local transport network address of the O-UNI Link
Sender NodeID/Tunnel ID	Node ID of the sender/tunnel ID associated with the O-UNI connection.
Local Data Link ID	Number associated with the local interface configured for the O-UNI connection.
Remote Data Link ID	Number associated with the remote interface configured for the O-UNI connection.
Primary IPCC	Configuration for the primary IPCC.
Interface	IPCC type, only routed type supported.
Local IP	Local IPCC IP address assigned by LMP. For routed IPCCs, this value is address is 0.0.0.0.
Remote IP	Remote IPCC IP address assigned by LMP.

Related Commands

Command	Description
show mpls optical-uni, on page 628	Displays information about the state of all O-UNI connections.

show mpls optical-uni lmp

To display information related to the LMP, use the **show mpls optical-uni lmp** command in EXEC mode.

show mpls optical-uni lmp [**neighbor** [*neighbor-name*]| **ipcc**| **interface** *type interface-path-id*]

Syntax Description

neighbor	(Optional) Displays detailed information about all or a specific LMP neighbor identified by <i>neighbor-name</i> .
<i>neighbor-name</i>	(Optional) A string of alphanumeric characters that defines the name of the LMP neighbor. When not specified, information about all neighbors is displayed.
ipcc	(Optional) Displays configured IP control channels (IPCCs) and the status of each.
interface	(Optional) Displays LMP information related to the interface specified by <i>type interface-path-id</i> .
<i>type</i>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<i>interface-path-id</i>	Physical interface or a virtual interface. Note Use the show interfaces command to see a list of all possible 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 2.0	This command was introduced on the Cisco CRS-1.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 mpls optical-uni lmp** command to display information about LMP.

Task ID

Task ID	Operations
ouni	read

Examples

The following is sample output from the **show mpls optical-uni lmp neighbor** command for a neighbor named router1:

```
RP/0/RP0/CPU0:router# show mpls optical-uni lmp neighbor router1
```

```
LMP Neighbor
Name: router1, IP: 10.33.44.11, Owner: Optical UNI
IPCC ID: 1, State Up
  Known via      : Configuration
  Type           : Routed
  Destination IP  : 10.33.44.11
  Source IP      : None
```

```
Data Link I/F | Lcl Data Link ID | Link TNA Addr | Data Link LMP state
-----+-----+-----+-----
POS0/1/0/0 2   10.0.0.20 Up Alloc
```

This table describes the significant fields shown in the display.

Table 85: show mpls optical-uni lmp neighbor Command Field Descriptions

Field	Description
Name	Name of the neighbor.
IP	Destination address of the neighbor. This is the router ID of the neighbor.
Owner	Protocol that is using this LMP neighbor.
IPCC ID	IPCC identifier.
State	Operational state of the IPCC.
Known via	Indicates how the IPCC is learned (for example, user configuration).
Type	IPCC is routed or bound to a specific interface. Only routed IPCCs are supported at this release.
Destination IP	Destination IP address of the IPCC to which you are binding. For routed IPCCs, this specifies the remote router-id.
Source IP	Source IP address (None if the IPCC is routed).

Field	Description
Data Link I/F	Interface name corresponding to the data link used by the neighbor.
Lcl Data Link ID	Local unnumbered ID assigned to the data link.
Link TNA Addr	Local TNA ⁴⁸ of the data link.
Data Link LMP state	Data link state and allocation status from LMP view point, for example, <i>up alloc</i> means that the LMP state of the data link is up and that it has been allocated.

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The following is sample output from the **show mpls optical-uni lmp ipcc** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni lmp ipcc
```

Id	Type	IPCC IP	Status	Neighbor Name
2	Routed	10.21.21.21	Up	router1
1	Routed	10.42.8.4	Up	router12

This table describes the significant fields shown in the display.

Table 86: show mpls optical-uni lmp ipcc Command Field Descriptions

Field	Description
Id	Number that identifies the IPCC.
Type	Type of the IPCC.
IP	Destination IP address of the IPCC.
Status	Operational status of the IPCC.
Neighbor Name	Neighbor name of the associated IPCC.

The following is sample output from the **show mpls optical-uni lmp** command, which summarizes all LMP information about neighbors and IPCCs. In addition, it displays the local LMP router ID:

```
RP/0/RP0/CPU0:router# show mpls optical-uni lmp

Local O-UNI CLI LMP Node ID: 10.3.3.3
(Source: O-UNI LMP CLI configuration, I/F: Loopback0)

LMP Neighbor
Name: router1, IP: 10.33.44.11, Owner: Optical UNI
IPCC ID: 1, State Up
  Known via      : Configuration
  Type           : Routed
```

```

Destination IP      : 30.31.32.33
Source IP           : None

Data Link I/F | Lcl Data Link ID | Link TNA Addr | Data Link LMP state
-----+-----+-----+-----
POS0/4/0/2    | 1                    | 10.4.4.4      | UP

```

This table describes the significant fields shown in the display. For other field descriptions, see [Table 85: show mpls optical-uni lmp neighbor Command Field Descriptions](#), on page 643

Table 87: show mpls optical-uni lmp Command Field Descriptions

Field	Description
Local node-id	Local router ID value used by LMP.

The following is sample output from the **show mpls optical-uni lmp interface** command:

```

RP/0/RP0/CPU0:router# show mpls optical-uni lmp interface POS0/2/0/0

Interface: POS0/2/0/0
Owner: Optical UNI
Local data link ID type: Unnumbered
Local data link ID: Hex = 0x1, Dec = 1
TNA address type: IPv4
TNA address: 10.0.0.50
Local TE link switching capability: Packet-Switch Capable-1 (PSC-1)
Remote neighbor name: router1
Remote neighbor node ID: 10.33.44.11
Remote data link ID type: Unnumbered
Remote data link ID: Dec = 1, Hex = 0x1
Remote TE link switching capability: Time-Division-Multiplex Capable (TDM)
Data link I/F state: Up
Data link LMP state: Up/Allocated
TE link LMP state: Up
Data link allocation status: Allocated
IPCC ID: 2
IPCC type: Routed
IPCC destination IP address: 10.41.11.1

```

This table describes the significant fields shown in the display.

Table 88: show mpls optical-uni lmp interface Command Field Descriptions

Field	Description
Interface	Interface associated with this datalink.
Owner	Protocol using this LMP neighbor.
Local data link ID type	Local data link identifier type: numbered or unnumbered. Unnumbered interfaces are identified by the local node ID and the local interface ID, and the numbered interfaces are identified by the IP address assigned to them.

Field	Description
Local data link ID	Interface identifier assigned to the local data link. This value is unique amongst all data links identifiers on this router.
TNA address type	Local TNA ⁴⁹ address type (IPv4/ IPv6/ NSAP) provisioned on the link.
TNA address	Local TNA address assigned to the datalink.
Local TE link switching capability	Switching capability of the local datalink.
Remote neighbor name	LMP neighbor connected by this datalink.
Remote neighbor node ID	Router ID of the neighbor node attached at the other end of the datalink.
Remote data link ID type	Local data link identifier type: numbered or unnumbered. Unnumbered interfaces are identified by the local node ID and the local interface ID, while the numbered interfaces are identified by the IP address assigned to them.
Remote data link ID	Datalink identifier assigned to the remote data link.
Remote TE link switching capability	Switching capability of the remote datalink.
Data link I/F state	State of the data link interface.
Data link LMP state	State and allocation status of the data link from LMP perspective.
TE link LMP state	LMP state of the datalink.
Data-link allocation status	Application data link allocation status.
IPCC id	Identifier of the IPCC associated with this datalink.
IPCC type	IPCC type associated with the datalink.
IPCC destination IP address	Destination address for the IPCC associated with this datalink.

⁴⁹ Transport Network Address

Related Commands

Command	Description
show mpls optical-uni , on page 628	Displays general information about O-UNI connections.

show mpls optical-uni timers all

To display the state of all timers running within the O-UNI process, use the **show mpls optical-uni timers all** command in EXEC mode.

show mpls optical-uni timers all

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

Use the **show mpls optical-uni timers all** command to display a list of all timers running within the O-UNI process. The output of the command also displays the associated interface name, the type and name of the timer, the time the timer was set, and how long the timer runs before expiring.



Note This command is used during normal operational conditions in order to determine the time left until a timer expires.

Task ID	Task ID	Operations
	ouni	read

Examples The following is sample output from the **show mpls optical-uni timers all** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni timers all
Present Time: 04/11/2006 15:59:45
O-UNI timers presently active for nodes:
```

```

IP addr.      Type      Name      Set@      Timeout
-----
55.56.57.5   Node Id  NBRREFR   04/11/2006 15:59:35  0000120

```

Present Time: 04/11/2006 15:59:45

O-UNI timers presently active on interfaces:

```

Ifname      Type      Name      Set@      Timeout
-----
POS0/2/0/2  Interface RETRY   04/11/2006 15:59:26  0000060

```

Present Time: 04/11/2006 15:59:45O-UNI global timers presently active:

```

Type      Name      Set@      Timeout
-----

```

This table describes the significant fields shown in the display.

Table 89: show mpls optical-uni timers all Command Field Descriptions

Field	Description
IP addr.	IP address of the node.
Type	Type of timer.
Name	Name of the timer.
Set @	Time the timer was set.
Timeout	Time, in seconds, before the timer expires.
Ifname	Name of the interface.

Related Commands

Command	Description
show mpls optical-uni timers global, on page 650	Displays a list of global timers running within the O-UNI process.
show mpls optical-uni timers interfaces, on page 652	Displays a list of interface timers running within the O-UNI process.
show mpls optical-uni timers nodes, on page 655	Displays a list of internal process node timers running within the O-UNI process.

show mpls optical-uni timers global

To display a list of global timers running within the O-UNI process, use the **show mpls optical-uni timers global** command in EXEC mode.

show mpls optical-uni timers global

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

Use the **show mpls optical-uni timers global** command to determine the state of O-UNI internal global process timers.

Task ID	Task ID	Operations
	ouni	read

Examples The following is sample output from the **show mpls optical-uni timers global** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni timers global

Present Time: 04/11/2006 16:45:38

O-UNI global timers presently active:

Type      Name      Set@      Timeout
-----
Global    OLM Registra 04/11/2006 16:45:38  00000005
```

This table describes the significant fields shown in the display.

Table 90: show mpls optical-uni timers global Command Field Descriptions

Field	Description
Type	Type of timer (in the example, Global).
Name	Name of timer. The following global timers are implemented: CHPTCONF (60 sec.) When running, O-UNI waits for confirmation of checkpointed entries; when expires, unconfirmed entries are cleaned. OLM ⁵⁰ Registration (5sec.)—Activated when communication with LMP/OLM has been lost; when fires, a connection with LMP/OLM collaborator retries.
Set@	Time the timer was set.
Timeout	Time, in seconds, before the timer expires.

⁵⁰ Optical Link Manager.

Related Commands

Command	Description
show mpls optical-uni timers all, on page 648	Displays a list of all timers running within the O-UNI process.
show mpls optical-uni timers interfaces, on page 652	Displays a list of interface timers running within the O-UNI process.
show mpls optical-uni timers nodes, on page 655	Displays a list of node timers running within the O-UNI process.

show mpls optical-uni timers interfaces

To display interface timers running within the O-UNI process, use the **show mpls optical-uni timers interfaces** command in EXEC mode.

show mpls optical-uni timers interfaces

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

Use the **show mpls optical-uni timers interfaces** command to determine the state of O-UNI internal interface process timers.

Task ID	Task ID	Operations
	ouni	read

Examples The following is sample output from the **show mpls optical-uni timers interfaces** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni timers interfaces

Present Time: 04/11/2006 16:54:57

O-UNI timers presently active on interfaces:

Ifname      Type      Name      Set@      Timeout
-----
POS0/2/0/2  Interface  RETRY     04/11/2006 16:54:38  0000060
```

This table describes the significant fields shown in the display.

Table 91: show mpls optical-uni timers interfaces Command Field Descriptions

Field	Descriptions
Ifname	Name of the interface on which the timers are set.
Type	The type of interface timer. Interface is displayed in this case.
Name	Name of the interface timer. The following interface level timers are implemented: WAITRESV (120 sec.) While running, O-UNI waits for a Resv message in response to Path; active at source O-UNI-C. RETRY (60 sec.) When fires, O-UNI retries connection establishment (60 sec); active at source O-UNI-C. PATHTEAR (60 sec.) While running, O-UNI waits for a PathTear in response to Resv(D&R); used when connection deletion is initiated by destination O-UNI-C; active at destination O-UNI-C. PATHERR (60 sec.) While running, O-UNI waits for a PathErr(PSR) in response to PathTear; used when connection deletion is initiated by source O-UNI-C; active at source O-UNI-C. RESVCONF (60 sec.) While running, O-UNI waits for a ResvConf message to complete connection establishment; active at destination O-UNI-C.
Set@	Time the interface timer was set.
Timeout	Time, in seconds, before the interface timer expires.

Related Commands

Command	Description
show mpls optical-uni timers all, on page 648	Displays a list of all timers running within the O-UNI process.
show mpls optical-uni timers global, on page 650	Displays a list of global timers running within the O-UNI process.
show mpls optical-uni timers nodes, on page 655	Displays a list of node timers running within the O-UNI process.

show mpls optical-uni timers nodes

To display the state of O-UNI internal process node timers, use the **show mpls optical-uni timers nodes** command in EXEC mode.

show mpls optical-uni timers nodes

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 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.

Use the **show mpls optical-uni timers nodes** command to display O-UNI internal process node timers.

Task ID	Task ID	Operations
	ouni	read

Examples The following is sample output from the **show mpls optical-uni timers nodes** command:

```
RP/0/RP0/CPU0:router# show mpls optical-uni timers nodes

Present Time: 04/11/2006 17:02:34

O-UNI timers presently active for nodes:

IP addr.      Type      Name      Set@      Timeout
-----
55.56.57.5    Node Id   NBRREFR   04/11/2006 17:02:21  0000120
```

This table describes the significant fields shown in the display.

Table 92: show mpls optical-uni timers nodes Command Field Descriptions

Field	Description
IP address	IP address of the node.
Type	Type of node timer. The following node level timer is implemented: NBRREFR (120 sec. with RSVP-GR enabled, 360 otherwise)—Activated when communications with local RSVP process is lost; when fires O-UNI connections are cleaned;
Name	Name of the node timer.
Set@	Time the node was set.
Timeout	Time, in seconds, before the node timer expires.

Related Commands

Command	Description
show mpls optical-uni timers all, on page 648	Displays a list of all timers running within the O-UNI process.
show mpls optical-uni timers global, on page 650	Displays a list of global timers running within the O-UNI process.
show mpls optical-uni timers interfaces, on page 652	Displays a list of interface timers running within the O-UNI process.

tna ipv4

To configure the transport network address (TNA) for an O-UNI datalink, use the **tna ipv4** command in LMP datalink adjacency configuration mode.

tna ipv4 *ip-address*

Syntax Description	<i>ip-address</i>	O-UNI TNA. This address is assigned by the optical transport network (OTN) operator.

Command Default	No default behavior or values

Command Modes	LMP datalink adjacency configuration

Command History	Release	Modification
	Release 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	Operations
	ouni	read, write

Examples	The following example shows how to configure the datalink for POS interface 0/1/0/1 to the TNA 192.168.4.5:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls optical-uni
RP/0/RP0/CPU0:router(config-mpls-ouni)# interface pos 0/1/0/1
RP/0/RP0/CPU0:router(config-mpls-ouni-if)# lmp data-link adjacency
RP/0/RP0/CPU0:router(config-mpls-ouni-if-adj)# tna ipv4 192.168.4.5
```

tna ipv4



MPLS OAM Commands

This module describes Multiprotocol Label Switching (MPLS) label switched path (LSP) verification commands. These commands provide a means to detect and diagnose data plane failures and are the first set of commands in the MPLS Operations, Administration, and Maintenance (OAM) solution.

For detailed information about MPLS concepts, configuration tasks, and examples, see *Cisco IOS XR MPLS Configuration Guide for the Cisco CRS-1 Router*.

- [clear mpls oam counters, page 660](#)
- [echo disable-vendor-extension, page 662](#)
- [echo revision, page 663](#)
- [mpls oam, page 665](#)
- [ping mpls ipv4, page 666](#)
- [ping mpls traffic-eng, page 671](#)
- [ping pseudowire \(AToM\), page 675](#)
- [ping mpls traffic-eng tunnel-te \(P2P\), page 679](#)
- [ping mpls traffic-eng tunnel-mte \(P2MP\), page 683](#)
- [ping mpls mldp \(P2MP\), page 690](#)
- [ping mpls mldp \(MP2MP\), page 697](#)
- [show mpls oam, page 704](#)
- [show mpls oam database, page 706](#)
- [traceroute mpls ipv4, page 708](#)
- [traceroute mpls multipath, page 712](#)
- [traceroute mpls traffic-eng, page 716](#)
- [traceroute mpls traffic-eng tunnel-te \(P2P\), page 719](#)
- [traceroute mpls traffic-eng tunnel-mte \(P2MP\), page 722](#)
- [traceroute mpls mldp \(P2MP\), page 726](#)
- [traceroute mpls mldp \(MP2MP\), page 732](#)

clear mpls oam counters

To clear MPLS OAM counters, use the **clear mpls oam counters** command in EXEC mode.

clear mpls oam counters {**global**| **interface** [*type interface-path-id*]} **packet**}

Syntax Description

global	Clears global counters.
interface	Clears counters on a specified interface.
<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.
packet	Clears global packet counters.

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.

Task ID

Task ID	Operations
mpls-te	execute
mpls-ldp	execute
mpls-static	execute

Examples

The following example shows how to clear all global MPLS OAM counters:

```
RP/0/RP0/CPU0:router# clear mpls oam counters global
```

echo disable-vendor-extension

To disable sending the vendor extension type length and value (TLV) in the echo request, use the **echo disable-vendor extension** command in MPLS OAM configuration mode. To return to the default behavior, use the **no** form of this command.

echo disable-vendor-extension

no echo disable-vendor-extension

Syntax Description This command has no arguments or keywords.

Command Default The default value is 4.

Command Modes MPLS OAM configuration mode

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	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples The following example shows how to disable inclusion of the vendor extensions TLV in the echo requests:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls oam
RP/0/RP0/CPU0:router(config-oam)# echo disable-vendor-extension
```

echo revision

To set the echo packet revision, use the **echo revision** command in MPLS OAM configuration mode. To return to the default behavior, use the **no** form of this command.

echo revision {1 | 2 | 3 | 4 }

no echo revision

Syntax Description

1 | 2 | 3 | 4

Draft revision number:

- 1: draft-ietf-mpls-lsp-ping-03 (initial)
- 2: draft-ietf-mpls-lsp-ping-03 (rev 1)
- 3: draft-ietf-mpls-lsp-ping-03 (rev 2)
- 4: draft-ietf-mpls-lsp-ping-09 (initial)

Command Default

The default echo revision is 4 (in draft 9).

Command Modes

MPLS OAM 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.

Task ID

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples

The following example shows how to set the echo packet default revision:

```
RP/0/RP0/CPU0:router# configure  
RP/0/RP0/CPU0:router(config)# mpls oam  
RP/0/RP0/CPU0:router(config-oam)# echo revision 1
```

mpls oam

To enable MPLS OAM LSP verification, use the **mpls oam** command in global configuration mode. To return to the default behavior, use the **no** form of this command.

mpls oam

no mpls oam

Syntax Description This command has no arguments or keywords.

Command Default By default, MPLS OAM functionality is disabled.

Command Modes Global 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.

The **mpls oam** command and OAM functionality is described in the IETF LSP ping draft.

Task ID	Operations
mpls-te	read, write
mpls-ldp	read, write
mpls-static	read, write

Examples The following example shows how to enable MPLS OAM:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# mpls oam
RP/0/RP0/CPU0:router(config-oam)#
```

ping mpls ipv4

To check MPLS host reachability and network connectivity by specifying the destination type as a Label Distribution Protocol (LDP) IPv4 address, use the **ping mpls ipv4** command in EXEC mode.

ping mpls ipv4 *address/mask* [**destination** *start-address end-address increment*] [**dsmap**] [**exp** *exp-bits*] [**force-explicit-null**] [**interval** *min-send-delay*] [**output interface** *type interface-path-id*] [**nexthop** *nexthop-address*][**pad** *pattern*][**repeat** *count*] [**reply** {**dscp** *dscp-value* | **reply mode** {**ipv4** | **no-reply** | **router-alert**} | **reply pad-tlv**}] [**revision** *version*] [**size** *packet-size*] [**source** *source-address*] [**sweep** *min value max value increment*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**] [**fec-type** {**bgp** | **generic** | **ldp**}]

Syntax Description

<i>address/mask</i>	Address prefix of the target and number of bits in the target address network mask.
destination <i>start address end address address increment</i>	(Optional) Specifies a network 127/8 address to be used as the destination address in the echo request packet. <i>start address</i> Start of the network address. <i>end address</i> Start of the ending network address. <i>address increment</i> Incremental value of the network address, which is expressed as a decimal number value or IP address.
dsmap	(Optional) Indicates that a downstream mapping (DSMAP) type length and value should be included in the LSP echo request.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
interval <i>min-send-delay</i>	(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.

output interface	(Optional) Specifies the output interface where echo request packets are sent.
<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, use the question mark (?) online help function.
nexthop	(Optional) Specifies the nextop as an IP address.
<i>nexthop-iaddress</i>	(Optional) IP address for the next hop.
pad pattern	(Optional) Specifies the pad pattern for an echo request.
repeat count	(Optional) Specifies the number of times to resend a packet. Range is 1 to 2147483647. Default is 5.
reply dscp dscp-value	Specifies the differentiated service codepoint value for an MPLS echo reply.
reply mode [ipv4 router-alert no-reply]	Specifies the reply mode for the echo request packet. no-reply Do not reply ipv4 Reply with an IPv4 UDP packet (this is the default) router-alert Reply with an IPv4 UDP packet with the IP router alert set
reply pad-tlv	Indicates that a pad TLV should be included.

revision <i>version</i>	(Optional) Specifies the Cisco extension TLV versioning field: • 1 draft-ietf-mpls-lsp-ping-03 (initial) • 2 draft-ietf-mpls-lsp-ping-03 (rev 1) • 3 draft-ietf-mpls-lsp-ping-03 (rev 2) • 4 draft-ietf-mpls-lsp-ping-09 (initial)
size <i>packet size</i>	(Optional) Specifies the packet size or number of bytes in each MPLS echo request packet. Range is 100 to 17986. Default is 100.
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
sweep <i>min value max value interval</i>	(Optional) Specifies a range of sizes for the echo packets sent. <i>min value</i> Minimum or start size for an echo packet (range is 100 to 17986) <i>max value</i> Maximum or end size for an echo packet (range is 100 to 17986) <i>interval</i> Number used to increment an echo packet size (range is 1 to 8993)
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp bits*: 0

interval *min-send-delay*: 0

repeat *count* : 5

reply-mode: IPv4

timeout *timeout* : 2

Command Modes

EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.4.1	Sample output was modified.

Usage Guidelines

To use this command, you must be in a user group associated with a task 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 **output interface** keyword specifies the output interface on which the MPLS echo request packets are sent. If the specified output interface is not part of the LSP, the packets are not transmitted.

In cases where the sweep keyword is used, values larger than the outgoing interface's MTU are not transmitted.

The **ping** command sends an echo request packet to an address, and then awaits a reply. Ping output can help you evaluate path-to-host reliability, delays over the path, and whether the host can be reached or is functioning.



Note

The **ping mpls** command is not supported on optical LSPs. If an optical LSP is encountered along the LSP's path, it is treated as a physical interface.

For detailed configuration information about the MPLS **ping** command, see *Cisco IOS XR System Monitoring Configuration Guide for the CRS-1 Router*.

Task ID

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

Examples

The following example shows the destination type as a label distribution protocol (LDP) prefix and specifies a range of sizes for the echo packets sent:

```
RP/0/RP0/CPU0:router# ping mpls ipv4 140.140.140/32 verbose sweep 100 200 15 repeat 1
```

```
Sending 1, [100..200]-byte MPLS Echos to 140.140.140.140/32,
timeout is 2 seconds, send interval is 0 msec:
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
```

'R' - transit router, 'I' - unknown upstream index,
 'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

```
! size 100, reply addr 196.100.1.26, return code 3
! size 115, reply addr 196.100.1.26, return code 3
! size 130, reply addr 196.100.1.26, return code 3
! size 145, reply addr 196.100.1.26, return code 3
! size 160, reply addr 196.100.1.26, return code 3
! size 175, reply addr 196.100.1.26, return code 3
! size 190, reply addr 196.100.1.26, return code 3
```

Success rate is 100 percent (7/7), round-trip min/avg/max = 5/6/8 ms

The following example shows the destination type as a label distribution protocol (LDP) prefix and specifies FEC type as generic and verbose option:

```
RP/0/RP0/CPU0:router# ping mpls ipv4 11.11.11.11/32 fec-type generic output interface
gigabitEthernet 0/0/0/3
nexthop 172.40.103.2 verbose
```

Sending 5, 100-byte MPLS Echos to 11.11.11.11/32,
 timeout is 2 seconds, send interval is 0 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
 'L' - labeled output interface, 'B' - unlabeled output interface,
 'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
 'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
 'P' - no rx intf label prot, 'p' - premature termination of LSP,
 'R' - transit router, 'I' - unknown upstream index,
 'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

```
! size 100, reply addr 11.101.11.11, return code 3
! size 100, reply addr 11.101.11.11, return code 3
! size 100, reply addr 11.101.11.11, return code 3
! size 100, reply addr 11.101.11.11, return code 3
! size 100, reply addr 11.101.11.11, return code 3
```

Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/6 ms

ping mpls traffic-eng

To specify the destination type as an MPLS-TE tunnel and tunnel interface, use the **ping mpls traffic-eng** command in EXEC mode.

ping mpls traffic-eng tunnel *tunnel-ID* [**dsmap**] [**exp** *exp-bits*] [**force-explicit-null**] [**interval** *min-send-delay*] [**pad** *pattern*] [**repeat** *count*] [**reply** {**dscp** *dscp-value* | **reply mode** {**ipv4** | **no-reply** | **router-alert**} | **reply pad-tlv**}] [**revision** *version*] [**size** *packet-size*] [**source** *source-address*] [**sweep** *min-value max-value increment*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**]

Syntax Description

tunnel <i>tunnel-ID</i>	Specifies the destination type as an MPLS traffic engineering (TE) tunnel and the tunnel interface number. The range for the tunnel interface number is from 0 to 65535.
dsmap	(Optional) Indicates that a downstream mapping (DSMAP) type length and value should be included in the LSP echo request.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
interval <i>min-send-delay</i>	(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.
pad <i>pattern</i>	(Optional) Specifies the pad pattern for an echo request.
repeat <i>count</i>	(Optional) Specifies the number of times to resend a packet. Range is 1 to 2147483647. Default is 5.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.
reply mode [ipv4 router-alert no-reply]	(Optional) Specifies the reply mode for the echo request packet. no-reply Do not reply ipv4 Reply with an IPv4 UDP packet (this is the default) router-alert Reply with an IPv4 UDP packet with the IP router alert set
reply pad-tlv	(Optional) Indicates that a pad TLV should be included.

revision <i>version</i>	(Optional) Specifies the Cisco extension TLV versioning field: • 1 draft-ietf-mpls-lsp-ping-03 (initial) • 2 draft-ietf-mpls-lsp-ping-03 (rev 1) • 3 draft-ietf-mpls-lsp-ping-03 (rev 2) • 4 draft-ietf-mpls-lsp-ping-09 (initial)
size <i>packet-size</i>	(Optional) Specifies the packet size or number of bytes in each MPLS echo request packet. Range is 100 to 17986. Default is 100.
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
sweep <i>min-value max-value interval</i>	(Optional) Specifies a range of sizes for the echo packets sent. <i>min-value</i> Minimum or start size for an echo packet (range is 100 to 17986) <i>max-value</i> Maximum or end size for an echo packet(range is 100 to 17986) <i>interval</i> Number used to increment an echo packet size(range is 1 to 8993)
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp-bits*: 0
interval *min-send-delay*: 0
repeat *count*: 5
reply-mode: IPv4
timeout *timeout* : 2

Command Modes

EXEC

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.4.1	Sample output was modified.
Release 4.0.0	This command was introduced. This command was replaced by the ping mpls traffic-eng tunnel-te (P2P) 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 **output interface** keyword specifies the output interface on which the MPLS echo request packets are sent. If the specified output interface is not part of the LSP, the packets are not transmitted.

In cases where the **sweep** keyword is used, values larger than the outgoing interface's MTU are not transmitted.

The **ping** command sends an echo request packet to an address, and then awaits a reply. Ping output can help you evaluate path-to-host reliability, delays over the path, and whether the host can be reached or is functioning.

**Note**

The **ping mpls traffic-eng** command is not supported on optical LSPs. If an optical LSP is encountered along the LSP's path, it is treated as a physical interface.

Task ID

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

Examples

The following example shows how to check connectivity by using the **ping mpls traffic-eng** command when a TE tunnel 10 is present. Return code, reply address, and packet size are displayed due to the **verbose** keyword.

```
RP/0/RP0/CPU0:router# ping mpls traffic-eng tunnel 10 repeat 1 verbose

Sending 1, 100-byte MPLS Echos to tunnel-te10,
  timeout is 2 seconds, send interval is 0 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
       'L' - labeled output interface, 'B' - unlabeled output interface,
       'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
       'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
       'P' - no rx intf label prot, 'p' - premature termination of LSP,
       'R' - transit router, 'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.
!      size 100, reply addr 196.100.1.18, return code 3
```

Success rate is 100 percent (1/1), round-trip min/avg/max = 15/15/15 ms

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.
ping mpls traffic-eng tunnel-te (P2P)	Verifies the connectivity of the LSP path for the MPLS-TE tunnel.

ping pseudowire (AToM)

To verify connectivity between provider edge (PE) LSRs in an Any Transport over MPLS (AToM) setup, use the **ping pseudowire** command in EXEC mode.

ping [mpls] pseudowire *remote-PE -address pw-id* [**exp** *exp-bits*] [**interval** *min-send-delay*] [**pad** *pattern*] [**repeat** *count*] [**reply** {**dscp** *dscp-value* | **reply mode** {**ipv4** | **no-reply** | **router-alert** | **control-channel**} | **reply pad-flv**}] [**size** *packet-size*] [**source** *source-address*] [**sweep** *min-value max-value increment*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**]

Syntax Description

mpls	(Optional) Verifies the Labeled Switch Path (LSP).
<i>remote-PE address</i>	IP address of the remote PE LSR.
<i>pw-id</i>	Pseudowire ID that identifies the pseudowire in which MPLS connectivity is being verified. The pseudowire is used to send the echo request packets. The range is from 1 to 4294967295.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
interval <i>min-send-delay</i>	(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.
pad <i>pattern</i>	(Optional) Specifies the pad pattern for an echo request.
repeat <i>count</i>	(Optional) Specifies the number of times to resend a packet. Range is 1 to 2147483647. Default is 5.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.

reply mode { ipv4 router-alert no-reply control-channel }	(Optional) Specifies the reply mode for the echo request packet.
no-reply	Do not reply
ipv4	Reply with an IPv4 UDP packet (the default)
router-alert	Reply with an IPv4 UDP packet with the IP router alert set
control-channel	Force the use of a VCCV control channel.
	Reply using an application for a defined control channel. This applies only to pseudowires in which VCCV is used in the reply path. This is the default choice for pseudowire ping.
reply pad-tlv	(Optional) Indicates that a reply pad TLV should be included.
size <i>packet-size</i>	(Optional) Specifies the packet size or number of bytes in each MPLS echo request packet. Range is 100 to 17986. Default is 100.
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
sweep <i>min-value max-value interval</i>	Specifies a range of sizes for the echo packets sent.
	min-value
	Minimum or start size for an echo packet (range is 100 to 17986)
	max-value
	Maximum or end size for an echo packet (range is 100 to 17986)
	interval
	Number used to increment an echo packet size (range is 1 to 8993)
timeout <i>timeout</i>	(Optional) Specifies the timeout interval in seconds. Range is 0 to 3600. Default is 2 seconds.
ttl <i>value</i>	(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255).

verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp bits*: 0
interval *min-send-delay*: 0
repeat *count*: 5
reply-mode: IPv4
timeout *timeout* : 2

Command Modes

EXEC

Command History

Release	Modification
Release 3.4.1	This command was introduced.
Release 3.9.0	The following keywords and arguments were added: • force-control-channel, control-word, ra-label and ttl-expiry 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.

In cases in which the **sweep** keyword is used, values larger than the outgoing interface's MTU are not transmitted.

The **ping** command sends an echo request packet to an address, and then awaits a reply. Ping output can help you evaluate path-to-host reliability, delays over the path, and whether the host can be reached or is functioning.

**Note**

The **ping mpls** command is not supported on optical LSPs. If an optical LSP is encountered along the LSP's path, it is treated as a physical interface.

AToM VCCV allows the sending of control packets inband of an AToM pseudowire (PW) from the originating provider edge (PE) router. The transmission is intercepted at the destination PE router, instead of being forwarded to the customer edge (CE) router. This lets you use MPLS LSP ping to test the pseudowire section of AToM virtual circuits (VCs).

The no interactive version of the **ping pseudowire (AToM)** command is supported.

The control word setting is either enabled along the entire path between the Terminating-Provider Edge (T-PE) or it is completely disabled. If the control word configuration is enabled on one segment and disabled on another segment, the multisegment pseudowire does not come up.

Task ID

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

Examples

The following example shows how the **ping mpls pseudowire** command is used to verify PE to PE connectivity in which the remote PE address is 150.150.150.150. Only one echo request packet is sent and the remote PE is to answer using IPv4 instead of the control channel.

```
RP/0/RP0/CPU0:router# ping mpls pseudowire 150.150.150.150 21 repeat 1 reply mode ipv4
```

```
  Sending 1, 100-byte MPLS Echos to 150.150.150.150 VC: 21,
    timeout is 2 seconds, send interval is 0 msec:
```

```
Codes: '.' - success, 'Q' - request not sent, '.' - timeout,
       'L' - labeled output interface, 'B' - unlabeled output interface,
       'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
       'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
       'P' - no rx intf label prot, 'p' - premature termination of LSP,
       'R' - transit router, 'I' - unknown upstream index,
       'X' - unknown return code, 'x' - return code 0
```

```
Type escape sequence to abort.
```

```
!
```

```
Success rate is 100 percent (1/1), round-trip min/avg/max = 23/23/23 ms
```

ping mpls traffic-eng tunnel-te (P2P)

To specify the destination type as an MPLS-TE tunnel and tunnel interface, use the **ping mpls traffic-eng tunnel-te** command in EXEC mode.

ping mpls traffic-eng tunnel-te *tunnel-ID* {**destination** *start-address end-address increment*} [**dsmap**] [**exp** *exp-bits*] [**force-explicit-null**] [**interval** *min-send-delay*] [**lsp** {**active**|**reopt**}] [**pad** *pattern*] [**repeat** *count*] [**reply** {**dscp** *dscp-value* | **mode** {**ipv4** | **no-reply** | **router-alert**} | **pad-tlv**}] [**revision** *version*] [**size** *packet-size*] [**source** *source-address*] [**sweep** *min-value max-value increment*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**]

Syntax Description

tunnel-te <i>tunnel-ID</i>	Specifies the destination type as an MPLS traffic engineering (TE) tunnel and the tunnel interface number. The range for the tunnel interface number is 0 to 65535.
destination <i>start-address end-address increment</i>	Specifies a network 127/8 address to be used as the destination address in the echo request packet. <i>start address</i> Start of the network address. <i>end address</i> Start of the ending network address. <i>address increment</i> Incremental value of the network address, which is expressed as a decimal number value or IP address.
dsmap	(Optional) Indicates that a downstream mapping (DSMAP) type length and value should be included in the LSP echo request.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
interval <i>min-send-delay</i>	(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.
pad <i>pattern</i>	(Optional) Specifies the pad pattern for an echo request.
repeat <i>count</i>	(Optional) Specifies the number of times to resend a packet. Range is 1 to 2147483647. Default is 5.

reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.
mode [ipv4 router-alert no-reply]	(Optional) Specifies the reply mode for the echo request packet. no-reply Do not reply ipv4 Reply with an IPv4 UDP packet (this is the default) router-alert Reply with an IPv4 UDP packet with the IP router alert set
reply pad-tlv	(Optional) Indicates that a pad TLV should be included.
revision <i>version</i>	(Optional) Specifies the Cisco extension TLV versioning field: • 1 draft-ietf-mpls-lsp-ping-03 (initial) • 2 draft-ietf-mpls-lsp-ping-03 (rev 1) • 3 draft-ietf-mpls-lsp-ping-03 (rev 2) • 4 draft-ietf-mpls-lsp-ping-09 (initial)
size <i>packet-size</i>	(Optional) Specifies the packet size or number of bytes in each MPLS echo request packet. Range is 100 to 17986. Default is 100.
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.

sweep <i>min-value max-value interval</i>	(Optional) Specifies a range of sizes for the echo packets sent. <i>min-value</i> Minimum or start size for an echo packet (range is 100 to 17986) <i>max-value</i> Maximum or end size for an echo packet(range is 100 to 17986) <i>interval</i> Number used to increment an echo packet size(range is 1 to 8993)
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp-bits*: 0
interval *min-send-delay*: 0
repeat *count*: 5
reply-mode: IPv4
timeout *timeout* : 2

Command Modes

EXEC

Command History

Release	Modification
Release 4.0.0	This command was introduced. This command replaces the ping mpls traffic-eng 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 **output interface** keyword specifies the output interface on which the MPLS echo request packets are sent. If the specified output interface is not part of the LSP, the packets are not transmitted.

In cases where the **sweep** keyword is used, values larger than the outgoing interface's MTU are not transmitted.

The **ping** command sends an echo request packet to an address, and then waits for a reply. Ping output helps you evaluate path-to-host reliability, delays over the path. It also helps you determine whether the host is reachable or is functioning.

Task ID

Task ID	Operation
mpls-te	read, write
mpls-ldp	read, write

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.
ping mpls traffic-eng tunnel-mte (P2MP)	Verifies the connectivity of the LSP path for the MPLS-TE P2MP tunnels.

ping mpls traffic-eng tunnel-mte (P2MP)

To specify the destination type as a Point-to-Multipoint (P2MP) for MPLS-TE tunnel and tunnel interface, use the **ping mpls traffic-eng tunnel-mte** command in EXEC mode.

```
ping mpls traffic-eng tunnel-mte tunnel-ID [ddmap {destination start-address end-address increment}]
[responder-id ipv4-address] [exp exp-bits] [interval min-send-delay] [jitter jitter-value] [lsp {active|reopt}]
[pad pattern] [repeat count] [reply {dscp dscp-value | mode {ipv4 | no-reply | router-alert}| pad-tlv}]
[size packet-size] [source source-address] [sweep min-value max-value increment] [timeout timeout] [ttl
value] [verbose]
```

Syntax Description

tunnel-mte <i>tunnel-ID</i>	Specifies the destination type as an MPLS traffic engineering (TE) P2MP tunnel and the tunnel interface number. The range for the tunnel interface number is 0 to 65535.
ddmap	(Optional) Indicates that a downstream detailed mapping TLV should be included in the LSP echo request.
destination <i>start-address end-address increment</i>	Specifies a network 127/8 address to be used as the destination address in the echo request packet. start-address Start of the network address. end-address End of the network address. address increment Incremental value of the network address, which is expressed as a decimal number value or IP address.
responder-id <i>ipv4-address</i>	(Optional) Specifies the responder IPv4 address.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
interval <i>min-send-delay</i>	(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.

jitter <i>jitter-value</i>	(Optional) Specifies a jitter value, in milliseconds. Range is 0 to 2147483647. Default is 200.
lsp { active reopt }	(Optional) Specifies the Label Switch Path (LSP) to use. active Active LSP. reopt Reoptimize LSP.
pad <i>pattern</i>	(Optional) Specifies the pad pattern for an echo request.
repeat <i>count</i>	(Optional) Specifies the number of times to resend a packet. Range is 1 to 2147483647. Default is 5.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.
mode [ipv4 router-alert no-reply]	(Optional) Specifies the reply mode for the echo request packet. no-reply Do not reply ipv4 Reply with an IPv4 UDP packet (this is the default) router-alert Reply with an IPv4 UDP packet with the IP router alert set
reply pad-tlv	(Optional) Indicates that a pad TLV should be included.
size <i>packet-size</i>	(Optional) Specifies the packet size or number of bytes in each MPLS echo request packet. Range is 100 to 17986. Default is 100.
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.

sweep <i>min-value max-value interval</i>	(Optional) Specifies a range of sizes for the echo packets sent. <i>min-value</i> Minimum or start size for an echo packet (range is 100 to 17986) <i>max-value</i> Maximum or end size for an echo packet(range is 100 to 17986) <i>interval</i> Number used to increment an echo packet size(range is 1 to 8993)
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255). Default is 255.
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp-bits*: 0
interval *min-send-delay*: 0
repeat *count*: 5
reply-mode: IPv4
timeout *timeout* : 2
lsp: active

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.

To ping for LSP reoptimization, ensure that the reoptimization timer for the tunnel is running by using the **show mpls traffic-eng tunnels reoptimized within-last** command.

Task ID

Task ID	Operation
basic-services	execute
mpls-te or mpls-ldp	read

Examples

The following example shows how to check connectivity by using the **ping mpls traffic-eng tunnel-mte** command with the **jitter** keyword:

```
RP/0/RP0/CPU0:router# ping mpls traffic-eng tunnel-mte 10 jitter 300
```

```
Mon Apr 12 12:13:00.630 EST
```

```
Sending 1, 100-byte MPLS Echos to tunnel-mte10,
    timeout is 2.3 seconds, send interval is 0 msec, jitter value is 300 msec:
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
        'L' - labeled output interface, 'B' - unlabeled output interface,
        'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
        'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
        'P' - no rx intf label prot, 'p' - premature termination of LSP,
        'R' - transit router, 'I' - unknown upstream index,
        'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP
```

Type escape sequence to abort.

```
Request #1
! reply addr 192.168.222.2
! reply addr 192.168.140.2
! reply addr 192.168.170.1
```

```
Success rate is 100 percent (3 received replies/3 expected replies),
    round-trip min/avg/max = 148/191/256 ms
```

The following example shows how to check connectivity by using the **ping mpls traffic-eng tunnel-mte** command with the **ddmap** keyword:

```
RP/0/RP0/CPU0:router# ping traffic-eng tunnel-mte 10 ddmap
```

```
Mon Apr 12 12:13:34.365 EST
```

```
Sending 1, 100-byte MPLS Echos to tunnel-mte10,
    timeout is 2.2 seconds, send interval is 0 msec, jitter value is 200 msec:
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
        'L' - labeled output interface, 'B' - unlabeled output interface,
        'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
        'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
        'P' - no rx intf label prot, 'p' - premature termination of LSP,
        'R' - transit router, 'I' - unknown upstream index,
        'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP
```

Type escape sequence to abort.

```
Request #1
! reply addr 192.168.222.2
! reply addr 192.168.140.2
! reply addr 192.168.170.1
```

```
Success rate is 100 percent (3 received replies/3 expected replies),
round-trip min/avg/max = 105/178/237 ms
```

The following example shows how to identify the LSP ID tunnel information by using the **show mpls traffic-eng tunnels p2mp** command, and then using the **lsp id** keyword with the **ping mpls traffic-eng tunnel-mte** command.

```
RP/0/RP0/CPU0:router# show mpls traffic-eng tunnels p2mp 10

Mon Apr 12 12:13:55.075 EST
Signalling Summary:
    LSP Tunnels Process: running
    RSVP Process: running
    Forwarding: enabled
    Periodic reoptimization: every 3600 seconds, next in 654 seconds
    Periodic FRR Promotion: every 300 seconds, next in 70 seconds
    Auto-bw enabled tunnels: 0 (disabled)

Name: tunnel-mte10
Status:
    Admin: up Oper: up (Up for 12w4d)

Config Parameters:
    Bandwidth: 0 kbps (CT0) Priority: 7 7 Affinity: 0x0/0xffff
    Metric Type: TE (default)
    Fast Reroute: Not Enabled, Protection Desired: None
    Record Route: Not Enabled

Destination summary: (3 up, 0 down, 0 disabled) Affinity: 0x0/0xffff
Auto-bw: disabled
Destination: 11.0.0.1
    State: Up for 12w4d
    Path options:
        path-option 1 dynamic [active]
Destination: 12.0.0.1
    State: Up for 12w4d
    Path options:
        path-option 1 dynamic [active]
Destination: 13.0.0.1
    State: Up for 12w4d
    Path options:
        path-option 1 dynamic [active]

History:
    Reopt. LSP:
        Last Failure:
            LSP not signalled, identical to the [CURRENT] LSP
            Date/Time: Thu Jan 14 02:49:22 EST 2010 [12w4d ago]

Current LSP:
    lsp-id: 10002 p2mp-id: 10 tun-id: 10 src: 10.0.0.1 extid: 10.0.0.1
    LSP up for: 12w4d
    Reroute Pending: No
    Inuse Bandwidth: 0 kbps (CT0)
    Number of S2Ls: 3 connected, 0 signaling proceeding, 0 down

S2L Sub LSP: Destination 11.0.0.1 Signaling Status: connected
    S2L up for: 12w4d
    Sub Group ID: 1 Sub Group Originator ID: 10.0.0.1
    Path option path-option 1 dynamic (path weight 1)
    Path info (OSPF 1 area 0)
        192.168.222.2
        11.0.0.1

S2L Sub LSP: Destination 12.0.0.1 Signaling Status: connected
    S2L up for: 12w4d
```

```

Sub Group ID: 2 Sub Group Originator ID: 10.0.0.1
Path option path-option 1 dynamic (path weight 2)
Path info (OSPF 1 area 0)
  192.168.222.2
  192.168.140.3
  192.168.140.2
  12.0.0.1

S2L Sub LSP: Destination 13.0.0.1 Signaling Status: connected
S2L up for: 12w4d
Sub Group ID: 3 Sub Group Originator ID: 10.0.0.1
Path option path-option 1 dynamic (path weight 2)
Path info (OSPF 1 area 0)
  192.168.222.2
  192.168.170.3
  192.168.170.1
  13.0.0.1

Reoptimized LSP (Install Timer Remaining 0 Seconds):
None
Cleaned LSP (Cleanup Timer Remaining 0 Seconds):
None
Displayed 1 (of 16) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

RP/0/RP0/CPU0:router# ping mpls traffic-eng tunnel-mte 10 lsp id 10002

Mon Apr 12 12:14:04.532 EST

Sending 1, 100-byte MPLS Echos to tunnel-mte10,
  timeout is 2.2 seconds, send interval is 0 msec, jitter value is 200 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
       'L' - labeled output interface, 'B' - unlabeled output interface,
       'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
       'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
       'P' - no rx intf label prot, 'p' - premature termination of LSP,
       'R' - transit router, 'I' - unknown upstream index,
       'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP

Type escape sequence to abort.

Request #1
! reply addr 192.168.222.2
! reply addr 192.168.170.1
! reply addr 192.168.140.2

Success rate is 100 percent (3 received replies/3 expected replies),
  round-trip min/avg/max = 128/153/167 ms

```

The following example shows how to use the **ping mpls traffic-eng tunnel-mte** command to check connectivity with a router's host address 13.0.0.1:

```

RP/0/RP0/CPU0:router# ping mpls traffic-eng tunnel-mte 10 egress 13.0.0.1

Mon Apr 12 12:15:34.205 EST

Sending 1, 100-byte MPLS Echos to tunnel-mte10,
  timeout is 2.2 seconds, send interval is 0 msec, jitter value is 200 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
       'L' - labeled output interface, 'B' - unlabeled output interface,
       'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
       'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
       'P' - no rx intf label prot, 'p' - premature termination of LSP,
       'R' - transit router, 'I' - unknown upstream index,
       'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP

Type escape sequence to abort.

Request #1

```

```
! reply addr 192.168.170.1
Success rate is 100 percent (1 received reply/1 expected reply),
  round-trip min/avg/max = 179/179/179 ms
```

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.

ping mpls mldp (P2MP)

To check data plane and control plane of MPLS for the Point-to-Multipoint (P2MP) label switch path, use the **ping mpls mldp p2mp** command in EXEC mode.

ping mpls mldp p2mp *root-address* {**IPv4** *source-ipv4-address group-ipv4-address*| **IPv6** *source-ipv6-address group-ipv6-address*| **vpn4** *AS-number* [*source-ipv4-address group-ipv4-address*]| **vpn6** *AS-number* [*source-ipv6-address group-ipv6-address*]| **mdt** *oui:vpn-index mdt-number*| **global-id** *lsp-id*} [**options**]

Syntax Description

mldp	Verifies the ping capability for multicast label distribution protocol (mldp).
p2mp	Indicates the Point-to-Multipoint (P2MP) label switch path.
<i>root-address</i>	Specifies the root address.
IPv4 <i>ipv4-address</i>	Defines IPv4 opaque encoding.
IPv6 <i>ipv6-address</i>	Defines IPv6 opaque encoding.
vpn4 <i>AS-number</i> [<i>source-ipv4-address group-ipv4-address</i>]	Defines VPNv4 opaque encoding.
vpn6 <i>AS-number</i> [<i>source-ipv6-address group-ipv6-address</i>]	Defines VPNv6 opaque encoding.
mdt <i>oui:vpn-index mdt number</i>	Defines VPN ID opaque encoding. Range of 3-byte OUI is 0 to 16777215. Range of <i>mdt-number</i> is 0 to 4294967295.
global-id <i>lsp-id</i>	Defines 4 byte global LSP ID opaque encoding.
<i>source-address</i>	Specifies the source address of target multicast address.
<i>group-address</i>	Specifies the target address of target multicast address.
<i>AS-number</i>	Specifies the Autonomous system number as follows: • 4-byte AS-number with asdot (X.Y) : aa.bb:cc format (for example, 11.22:33) • 2-byte AS-number or 4-byte AS-number: aa:bb format (for example, 11:22) • IPv4 address and index:aa.bb.cc.dd:ee format (for example, 11.22.33.44:55)

options

Specifies a set of various options:

ddmap

(Optional) Indicates that a downstream detailed mapping TLV (ddmap) should be included in the LSP echo request.

destination

(Optional) Specifies a network 127/8 address to be used as the destination address in the echo request packet.

start-address: Start of the network address.

end-address: End of the network address.

address increment: Incremental value of the network address, which is expressed as a decimal number value or IP address.

expexp-bits

(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.

flags

fec: (Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.

no-ttl: (Optional) Specifies not to add TTL expired flag in echo request.

force-explicit-null

(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.

interval *min-send-delay*

(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.

jitter

(Optional) Specifies a jitter value for a corresponding echo request, in milliseconds.

Range is 0 to 2147483647. Default is 200.

pad *pattern*

(Optional) Specifies the pad pattern for an echo request.

repeat *count*

(Optional) Specifies the number of times to resend a packet. Range is 1 to 2147483647. Default is 5.

reply dscp *dscp-value*

(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.

mode [*ipv4* | *router-alert*]

(Optional) Specifies the reply mode for the echo request packet.

ipv4

Reply with an IPv4 UDP packet (this is the default)

router-alert

Reply with an IPv4 UDP packet with the IP router alert set

responder-id *ipv4-address*

(Optional) Adds responder identifier into corresponding echo request.

size *packet size*

(Optional) Specifies the packet size or number of bytes in each MPLS echo request packet. Range is 100 to 17986. Default is 100.

source *ipv4-address*

(Optional) Specifies the source address used in the echo request packet.

sweep

(Optional)

timeout *timeout*

(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.

ttl

(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255). Default is 255.

verbose

(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 4.1.1	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	Operation
	basic-services	execute
	mpls-te	read
	mpls-ldp	read

Examples The following examples show how to check connectivity for P2MP by using the **ping mpls mldp p2mp** command.

```
RP/0/RP0/CPU0:router#ping mpls mldp p2mp 192.168.0.1 ipv4 2.2.2.2 232.1.1.1
```

```
Sending 1, 100-byte MPLS Echos to mldp p2mp 192.168.0.1 ipv4 (2.2.2.2, 232.1.1.1),
      timeout is 2.2 seconds, send interval is 0 msec, jitter value is 200 msec:
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
        'L' - labeled output interface, 'B' - unlabeled output interface,
        'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
        'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
        'P' - no rx intf label prot, 'p' - premature termination of LSP,
        'R' - transit router, 'I' - unknown upstream index,
        'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP
```

Type escape sequence to abort.

```
Request #1
! reply addr 11.11.11.3
! reply addr 12.12.12.4
```

Round-trip min/avg/max = 17/27/38 ms

```
RP/0/RP0/CPU0:router#ping mpls mldp p2mp 192.168.0.1 ipv4 2.2.2.2 232.1.1.1 ddmapped ttl 1
```

```
Sending 1, 100-byte MPLS Echos to mldp p2mp 192.168.0.1 ipv4 (2.2.2.2, 232.1.1.1),
      timeout is 2.2 seconds, send interval is 0 msec, jitter value is 200 msec:
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
        'L' - labeled output interface, 'B' - unlabeled output interface,
        'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
        'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
        'P' - no rx intf label prot, 'p' - premature termination of LSP,
        'R' - transit router, 'I' - unknown upstream index,
        'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP
```

Type escape sequence to abort.

```
Request #1
d reply addr 10.10.10.2
[L] DDMAP 0: 11.11.11.3 11.11.11.3 MRU 1500 [Labels: 16016 Exp: 0]
[L] DDMAP 1: 12.12.12.4 12.12.12.4 MRU 1500 [Labels: 16016 Exp: 0]
```

This table describes the significant fields shown in the display:

Opaque Type	Opaque Value	Supported Multicast Application	Signaling
IPv4	S, G	PIM-SSM transit of IPv4	In-Band
IPv6	S, G	PIM-SSM transit of IPv6	In-Band
MDT	VPN-ID, MDT#	mVPN Default-MDT (MDT# = 0) mVPN Data-MDT (MDT# > 0)	In-Band
Global ID	4 byte value	BGP Assigned LSPs	Out-of-Band
VPNv4	(S,G), VPN-ID	VPNv4	In-Band
VPNv6	(S,G), VPN-ID	VPNv6	In-Band

Related Commands

Command	Description
ping mpls mldp (MP2MP), on page 697	Verifies data plane and control plane for the Multipoint-to-Multipoint (MP2MP) label switch path.
traceroute mpls mldp (P2MP), on page 726	Verifies hop-by-hop fault localization and path tracing for the point-to-multipoint path.
traceroute mpls mldp (MP2MP), on page 732	Verifies hop-by-hop fault localization and path tracing for the multipoint-to-multipoint path.

ping mpls mldp (MP2MP)

To check data plane and control plane of MPLS for the Multipoint-to-Multipoint (MP2MP) label switch path, use the **ping mpls mldp mp2mp** command in exec mode.

ping mpls mldp mp2mp *root-address* { **IPv4** *source-ipv4-address group-ipv4-address* | **IPv6** *source-ipv6-address group-ipv6-address* | **vpn4** *AS-number* [*source-ipv4-address group-ipv4-address*] | **vpn6** *AS-number* [*source-ipv6-address group-ipv6-address*] | **mdt** *oui:vpn-index mdt-number* | **global-id** *lsp-id* } [**options**]

Syntax Description

mldp	Verifies the ping capability for multicast label distribution protocol (mldp).
mp2mp	Indicates the Multipoint-to-Multipoint (MP2MP) label switch path.
<i>root-address</i>	Specifies the root address.
IPv4 <i>ipv4-address</i>	Defines IPv4 opaque encoding.
IPv6 <i>ipv6-address</i>	Defines IPv6 opaque encoding.
vpn4 <i>AS-number</i> [<i>source-ipv4-address group-ipv4-address</i>]	Defines VPNv4 opaque encoding.
vpn6 <i>AS-number</i> [<i>source-ipv6-address group-ipv6-address</i>]	Defines VPNv6 opaque encoding.
mdt <i>oui:vpn-index mdt number</i>	Defines VPN ID opaque encoding. Range of 3-byte OUI is 0 to 16777215. Range of <i>mdt-number</i> is 0 to 4294967295.
global-id <i>lsp-id</i>	Defines 4 byte global LSP ID opaque encoding.
<i>source-address</i>	Specifies the source address of target multicast address.
<i>group-address</i>	Specifies the target address of target multicast address.
<i>AS-number</i>	Specifies the Autonomous system number as follows: • 4-byte AS-number with asdot (X.Y) : aa.bb.cc format (for example, 11.22:33) • 2-byte AS-number or 4-byte AS-number: aa.bb format (for example, 11:22) • IPv4 address and index:aa.bb.cc.dd:ee format (for example, 11.22.33.44:55)

options

Specifies a set of various options:

ddmap

(Optional) Indicates that a downstream detailed mapping TLV (ddmap) should be included in the LSP echo request.

destination

(Optional) Specifies a network 127/8 address to be used as the destination address in the echo request packet.

start-address: Start of the network address.

end-address: End of the network address.

address increment: Incremental value of the network address, which is expressed as a decimal number value or IP address.

expexp-bits

(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.

flags

fec: (Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.

no-ttl: (Optional) Specifies not to add TTL expired flag in echo request.

force-explicit-null

(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.

interval *min-send-delay*

(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.

jitter

(Optional) Specifies a jitter value for a corresponding echo request, in milliseconds.

Range is 0 to 2147483647. Default is 200.

pad *pattern*

(Optional) Specifies the pad pattern for an echo request.

repeat *count*

(Optional) Specifies the number of times to resend a packet. Range is 1 to 2147483647. Default is 5.

reply dscp *dscp-value*

(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.

mode [ipv4 | router-alert]

(Optional) Specifies the reply mode for the echo request packet.

ipv4

Reply with an IPv4 UDP packet (this is the default)

router-alert

Reply with an IPv4 UDP packet with the IP router alert set

responder-id *ipv4-address*

(Optional) Adds responder identifier into corresponding echo request.

size *packet size*

(Optional) Specifies the packet size or number of bytes in each MPLS echo request packet. Range is 100 to 17986. Default is 100.

source *ipv4-address*

(Optional) Specifies the source address used in the echo request packet.

sweep

(Optional)

timeout *timeout*

(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.

ttl

(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255). Default is 255.

verbose

(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 4.1.1	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	Operation
	basic-services	execute
	mpls-te	read
	mpls-ldp	read

Examples The following example shows how to check connectivity by using the **ping mpls mldp** command when a root address is present.

```
RP/0/RP0/CPU0:router#ping mpls mldp mp2mp 192.168.0.1 global-id 1
```

Mon Jul 11 15:35:50.294 JST

Sending 1, 100-byte MPLS Echos to mldp mp2mp 192.168.0.1 global-id 1,
timeout is 2.2 seconds, send interval is 0 msec, jitter value is 200 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP

Type escape sequence to abort.

Request #1
! reply addr 10.10.10.2
! reply addr 12.12.12.4
! reply addr 11.11.11.3

Round-trip min/avg/max = 72/112/135 ms

RP/0/RP0/CPU0:router#ping mpls mldp mp2mp 192.168.0.1 global-id 1 responder-id 11.11.11.3
Mon Jul 11 15:36:16.038 JST

Sending 1, 100-byte MPLS Echos to mldp mp2mp 192.168.0.1 global-id 1,
timeout is 2.2 seconds, send interval is 0 msec, jitter value is 200 msec:

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP

Type escape sequence to abort.

Request #1
! reply addr 11.11.11.3

Round-trip min/avg/max = 163/163/163 ms

This table describes the significant fields shown in the display:

Opaque Type	Opaque Value	Supported Multicast Application	Signaling
IPv4	S, G	PIM-SSM transit of IPv4	In-Band
IPv6	S, G	PIM-SSM transit of IPv6	In-Band
MDT	VPN-ID, MDT#	mVPN Default-MDT (MDT# = 0) mVPN Data-MDT (MDT# > 0)	In-Band
Global ID	4 byte value	BGP Assigned LSPs	Out-of-Band
VPNv4	(S,G), VPN-ID	VPNv4	In-Band
VPNv6	(S,G), VPN-ID	VPNv6	In-Band

Related Commands

Command	Description
ping mpls mldp (P2MP), on page 690	Verifies data plane and control plane for the point-to-multipoint (P2MP) label switch path.
traceroute mpls mldp (P2MP), on page 726	Verifies hop-by-hop fault localization and path tracing for the point-to-multipoint path.
traceroute mpls mldp (MP2MP), on page 732	Verifies hop-by-hop fault localization and path tracing for the multipoint-to-multipoint path.

show mpls oam

To display MPLS OAM information, use the **show mpls oam** command in EXEC mode.

show mpls oam {*client*| **counters** {*global*| *packet*}| **interface** *type interface-path-id*}

Syntax Description

client	Displays clients registered with LSPV server.
counters global	Displays LSP verification global counters.
counters packet	Displays LSP verification packet counters.
counters interface	Displays LSP verification information for a specific interface.
<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

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
mpls-te	read
mpls-ldp	read

Task ID	Operations
mpls-static	read

Examples

The following example shows how to display MPLS OAM client information:

```
RP/0/RP0/CPU0:router# show mpls oam client
```

```
Client Process: l2vpn_mgr Node: 0/0/SP Pid: 418014
Client Process: te_control Node: 0/0/SP Pid: 639227
```

This table describes the significant fields shown in the display.

Table 93: show mpls oam client Command Field Descriptions

Field	Description
Client Process	Process of client.

show mpls oam database

To display MPLS OAM database information, use the **show mpls oam database** command in EXEC mode.

show mpls oam database { **requests** | **tt-requests** } [**detail**] [**handle** *handle-value*]

Syntax Description

requests	Displays request database
tt-requests	Displays tree trace request database
detail	(Optional) Displays displayed information.
handle	(Optional) Displays handle information.
<i>handle-value</i>	Generic handle value. Range is from 0 to 4294967295.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 3.5.0	This command was introduced.
Release 3.9.0	The <i>handle-value</i> argument was added.
Release 4.0.0	The replies 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.

Task ID

Task ID	Operations
mpls-te	read
mpls-ldp	read
mpls-static	read

Examples

The following example shows how to display detailed MPLS OAM database information:

```
RP/0/RP0/CPU0:router# show mpls oam database request detail
```

traceroute mpls ipv4

To learn the routes that packets follow when traveling to their Label Distribution Protocol (LDP) IPv4 destination, use the **traceroute mpls** command in EXEC mode.

traceroute mpls ipv4*address/mask* [**destination** *start-address end-address address-increment*] [**exp** *exp-bits*] [**flags fec**] [**force-explicit-null**] [**output interface** *type interface-path-id*] [**nexthop** *nexthop-address*] [**reply** {**dscp** *dscp-value* | **reply mode** {**ipv4** | **router-alert**} }] [**revision** *version*] [**source** *source-address*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**] [**fec-type** {**bgp** | **generic** | **ldp**}]

Syntax Description

<i>address/mask</i>	Specifies the destination type as a label distribution protocol (LDP) prefix. Address prefix of the target and number of bits in the target address network mask.
destination <i>start-address end-address address-increment</i>	Specifies a network 127 address to be used as the destination address in the echo request packet. <i>start address</i> Start of the network address. <i>end address</i> End of the network address. <i>address increment</i> Incremental value of the network address.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
flags fec	(Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
output interface	(Optional) Specifies the output interface in which echo request packets are sent.
<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, use the question mark (?) online help function.

nexthop	(Optional) Specifies the IP address for the next hop.
<i>nexthop-address</i>	(Optional) IP address for the next hop.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.
reply mode { ipv4 router-alert }	(Optional) Specifies the reply mode for the echo request packet. ipv4 Reply with IPv4 UDP packet (this is the default) router-alert Reply with IPv4 UDP packet with router alert
revision <i>version</i>	(Optional) Specifies the Cisco extension TLV versioning field: • 1 draft-ietf-mpls-lsp-ping-03 (initial) • 2 draft-ietf-mpls-lsp-ping-03 (rev 1) • 3 draft-ietf-mpls-lsp-ping-03 (rev 2) • 4 draft-ietf-mpls-lsp-ping-09 (initial)
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
timeout <i>timeoutt</i>	(Optional) Specifies the timeout interval, in seconds. Range is from 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the maximum number of hops (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp-bits*: 0
reply mode: IPv4
timeout *timeout*: 2

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.

**Note**

The **traceroute mpls** command is not supported on optical LSPs. If an optical LSP is encountered along the LSPs path, it is treated as a physical interface.

For detailed configuration information about MPLS LSP trace operations, see *Cisco IOS XR System Monitoring Configuration Guide for the Cisco CRS-I Router*.

Task ID

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

Examples

The following example shows how to trace a destination:

```
RP/0/RP0/CPU0:router# traceroute mpls ipv4 140.140.140.140/32
destination 127.0.0.10 127.0.0.15.1
```

Tracing MPLS Label Switched Path to 140.140.140.140/32, timeout is 2 seconds

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0
```

Type escape sequence to abort.

Destination address 127.0.0.10

```
0 196.100.1.41 MRU 4470 [Labels: 19 Exp: 0]
L 1 196.100.1.42 MRU 4470 [Labels: 86 Exp: 0] 360 ms
2 196.100.1.50 MRU 4470 [Labels: implicit-null Exp: 0] 8 ms
! 3 196.100.1.18 9 ms
```

The following example shows how to trace a destination with FEC type specified as generic and verbose option:

```
RP/0/RP0/CPU0:router# traceroute mpls ipv4 11.11.11.11/32 fec-type generic output interface
gigabitEthernet 0/0/0/3
nexthop 172.40.103.2 verbose
```

Tracing MPLS Label Switched Path to 11.11.11.11/32, timeout is 2 seconds

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
```

'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

```
0 172.40.103.1 172.40.103.2 MRU 1500 [Labels: 16038 Exp: 0]
L 1 172.40.103.2 173.101.103.1 MRU 1500 [Labels: 16037 Exp: 0] 6 ms, ret code 8
L 2 173.101.103.1 11.101.11.11 MRU 1500 [Labels: implicit-null Exp: 0] 4 ms, ret code 8
! 3 11.101.11.11 6 ms, ret code 3
```

traceroute mpls multipath

To discover all possible paths of an LSP between the ingress and egress routers, use the **traceroute mpls multipath** command in EXEC mode.

traceroute mpls multipath ipv4 *address/mask* [**destination** *start-address end-address address-increment*] [**exp** *exp-bits*] [**flags** *fec*] [**force-explicit-null**] [**hashkey** *ipv4 bitmap bit-size*] [**interval** *min-send-delay*] [**output** *interface type interface-path-id*] [**nexthop** *nexthop-address*] [**reply** {**dscp** *dscp-value* | **reply mode** {**ipv4** | **router-alert**} }] [**retry-count** *count*] [**revision** *version*] [**source** *source-address*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**] [**fec-type** {**bgp** | **generic** | **ldp**}]

Syntax Description

ipv4	Specifies the destination type as a Label Distribution Protocol (LDP) IPv4 address.
<i>address/mask</i>	Address prefix of the target and number of bits in the target address network mask.
destination <i>start-address end-address address-increment</i>	(Optional) Specifies a network 127 address to be used as the destination address in the echo request packet. start-address Start of the network address. end-address End of the network address. address-increment Incremental value of the network address.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
flags <i>fec</i>	(Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
hashkey <i>ipv4 bitmap bit-size</i>	(Optional) Allows user control of the hash key/multipath settings. Range is 0 to 256. The default is 32.
interval <i>min-send-delay</i>	(Optional) Specifies a send interval, in milliseconds, between requests. Range is 0 to 3600000. Default is 0.
output <i>interface</i>	(Optional) Specifies the output interface where echo request packets are sent.

<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, use the question mark (?) online help function.
nexthop	(Optional) Specifies the IP address for the next hop.
<i>nexthop-address</i>	(Optional) IP address for the next hop.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.
reply mode [ipv4 router-alert]	(Optional) Specifies the reply mode for the echo request packet. ipv4 Reply with IPv4 UDP packet (this is the default) router-alert Reply with IPv4 UDP packet with router alert
retry-count <i>count</i>	(Optional) Specifies the number of retry attempts during multipath LSP traceroute. A retry is attempted if an outstanding echo request • times out waiting for the corresponding echo reply. • fails to find a valid destination address set to exercise a specific outgoing path. Range is 0 to 10. Default is 3.
revision <i>version</i>	(Optional) Specifies the Cisco extension TLV versioning field: • 1 draft-ietf-mpls-lsp-ping-03 (initial) • 2 draft-ietf-mpls-lsp-ping-03 (rev 1) • 3 draft-ietf-mpls-lsp-ping-03 (rev 2) • 4 draft-ietf-mpls-lsp-ping-09 (initial)
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is from 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the maximum number of hops (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp-bits* : 0
hashkey **ipv4** **bitmap** *bit-size*: 4
interval *min-send-delay*: 0
reply mode: IPv4
retry-count: 3
timeout *timeout* : 2

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.

The **hashkey ipv4 bitmap** keyword and *bit-size* value control how many addresses are encoded in the DSMAP multipath field. Larger values allow more coverage of equal cost multiple paths throughout the network, but with more processing at the head, mid, and tail routers.

Task ID

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

Examples

The following example shows how to specify the destination type as an LDP IPv4 prefix:

```
RP/0/RP0/CPU0:router# traceroute mpls multi ipv4 140.140.140.140/32 verbose
force-explicit-null
```

```
Starting LSP Path Discovery for 140.140.140.140/32
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0
```

```
Type escape sequence to abort.
```

```
LL!
```



```

Path 0 found,
output interface POS0/2/0/3 source 196.100.1.61 destination 127.0.0.1
0 196.100.1.61 196.100.1.62 MRU 4470 [Labels: 18/explicit-null Exp: 0/0] multipaths 0
L 1 196.100.1.62 196.100.1.10 MRU 4470 [Labels: 17/explicit-null Exp: 0/0] ret code 8
multipaths 1
L 2 196.100.1.10 196.100.1.18 MRU 4470 [Labels: implicit-null/explicit-null Exp: 0/0] ret
code 8 multipaths 1
! 3 196.100.1.1018, ret code 3 multipaths 0
LL!
Path 1 found,
output interface GigabitEthernet0/3/0/0 source 196.100.1.5 destination 127.0.0.1
0 196.100.1.5 196.100.1.37 6 MRU 1500 [Labels: 18/explicit-null Exp: 0/0] multipaths 0
L 1 196.100.1.6 196.100.1.10 MRU 4470 [Labels: 17/explicit-null Exp: 0/0] ret code 8
multipaths 1
L 2 10196.0100.21.5 1010 196.0100.21.10 18 MRU 4470 [Labels: implicit-null/explicit-null
Exp: 0/0] ret code 8 multipaths 1
! 3 10196.0100.21.1018, ret code 3 multipaths 0

Paths (found/broken/unexplored) (2/0/0)
Echo Request (sent/fail) (6/0)
Echo Reply (received/timeout) (6/0)
Total Time Elapsed 80 ms

```

The following example shows how to specify the FEC type as LDP with verbose option:

```

RP/0/RP0/CPU0:router# traceroute mpls multipath ipv4 11.11.11.11/32 fec-type ldp output
interface gigabitEthernet 0/0/0/3
nexthop 172.40.103.2 verbose

```

Starting LSP Path Discovery for 11.11.11.11/32

```

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0

```

Type escape sequence to abort.

```

LL!
Path 0 found,
output interface GigabitEthernet0/0/0/3 nexthop 172.40.103.2
source 172.40.103.1 destination 127.0.0.0
0 172.40.103.1 172.40.103.2 MRU 1500 [Labels: 16038 Exp: 0] multipaths 0
L 1 172.40.103.2 173.101.103.1 MRU 1500 [Labels: 16037 Exp: 0] ret code 8 multipaths 1
L 2 173.101.103.1 11.101.11.11 MRU 1500 [Labels: implicit-null Exp: 0] ret code 8 multipaths
1
! 3 11.101.11.11, ret code 3 multipaths 0

Paths (found/broken/unexplored) (1/0/0)
Echo Request (sent/fail) (3/0)
Echo Reply (received/timeout) (3/0)
Total Time Elapsed 21 ms

```

traceroute mpls traffic-eng

To specify the destination type as an MPLS traffic engineering (TE) tunnel, use the **traceroute mpls traffic-eng** command in EXEC mode.

traceroute mpls traffic-eng tunnel *tunnel-ID* [**destination** *start-address end-address address-increment increment-mask*] [**exp** *exp-bits*] [**flags fec**] [**force-explicit-null**] [**reply** {**dscp** *dscp-value* | **reply mode** {**ipv4** | **router-alert**} }] [**revision** *version*] [**source** *source-address*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**]

Syntax Description

tunnel	Specifies the MPLS-TE tunnel type.
<i>tunnel-ID</i>	Tunnel interface.
destination <i>start-address end-address address-increment increment-mask</i>	(Optional) Specifies a network 127 address to be used as the destination address in the echo request packet. <i>start-address</i> Start of the network address. <i>end-address</i> End of the network address. <i>address-increment</i> Incremental value of the network address. <i>increment-mask</i> Incremental mask of the network address.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
flags fec	(Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.

reply mode [ipv4 router-alert]	(Optional) Specifies the reply mode for the echo request packet. ipv4 Reply with IPv4 UDP packet (this is the default) router-alert Reply with IPv4 UDP packet with router alert
revision <i>version</i>	(Optional) Specifies the Cisco extension TLV versioning field: • 1 draft-ietf-mpls-lsp-ping-03 (initial) • 2 draft-ietf-mpls-lsp-ping-03 (rev 1) • 3 draft-ietf-mpls-lsp-ping-03 (rev 2) • 4 draft-ietf-mpls-lsp-ping-09 (initial)
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is from 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the maximum number of hops (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp-bits* : 0
reply mode: IPv4
timeout *timeout* : 2

Command Modes

EXEC

Command History

Release	Modification
Release 3.9.0	This command was introduced.
Release 4.0.0	This command was replaced by the traceroute mpls traffic-eng tunnel-te (P2P) 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.

Task ID

Task ID	Operation
mpls-te	read
mpls-ldp	read

Examples

The following example shows how to specify the destination as a MPLS-TE tunnel:

```
RP/0/RP0/CPU0:router# traceroute mpls traffic-eng tunnel 13

Tracing MPLS TE Label Switched Path on tunnel-te13, timeout is 2 seconds

Codes: '.' - success, 'Q' - request not sent, '.' - timeout,
       'L' - labeled output interface, 'B' - unlabeled output interface,
       'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
       'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
       'P' - no rx intf label prot, 'p' - premature termination of LSP,
       'R' - transit router, 'I' - unknown upstream index,
       'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

0 0.0.0.0 11.0.0.1 MRU 1500 [Labels: 16003 Exp: 0]
L 1 192.168.200.2 192.168.170.1 MRU 1500 [Labels: implicit-null Exp: 0] 110 ms
! 2 192.168.170.1 0.0.0.0 MRU 0 [No Label] 169 ms
```

Related Commands

Command	Description
ping mpls traffic-eng tunnel-te (P2P)	Displays information about MPLS-TE tunnel for a point-to-point connection.

traceroute mpls traffic-eng tunnel-te (P2P)

To specify the destination type as an MPLS traffic engineering (TE) tunnel for a point-to-point connection, use the **traceroute mpls traffic-eng tunnel-te (P2P)** command in EXEC mode.

traceroute mpls traffic-eng tunnel-te *tunnel-ID* [**destination** *start-address end-address address-increment increment-mask*] [**exp** *exp-bits*] [**flags fec**] [**force-explicit-null**] [**reply** {**dscp** *dscp-value* | **mode** {**ipv4** | **router-alert**} }] [**revision** *version*] [**source** *source-address*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**]

Syntax Description

tunnel-te	Specifies the MPLS-TE tunnel type.
<i>tunnel-ID</i>	Tunnel interface.
destination <i>start-address end-address address-increment increment-mask</i>	(Optional) Specifies a network 127 address to be used as the destination address in the echo request packet. <i>start-address</i> Start of the network address. <i>end-address</i> End of the network address. <i>address-increment</i> Incremental value of the network address. <i>increment-mask</i> Incremental mask of the network address.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
flags fec	(Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.
force-explicit-null	(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.
reply dscp <i>dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.

reply-mode [ipv4 router-alert]	(Optional) Specifies the reply mode for the echo request packet. ipv4 Reply with IPv4 UDP packet (this is the default) router-alert Reply with IPv4 UDP packet with router alert
revision <i>version</i>	(Optional) Specifies the Cisco extension TLV versioning field: • 1 draft-ietf-mpls-lsp-ping-03 (initial) • 2 draft-ietf-mpls-lsp-ping-03 (rev 1) • 3 draft-ietf-mpls-lsp-ping-03 (rev 2) • 4 draft-ietf-mpls-lsp-ping-09 (initial)
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is from 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the maximum number of hops (range is 1 to 255).
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp-bits* : 0
reply-mode: IPv4
timeout *timeout* : 2

Command Modes

EXEC

Command History

Release	Modification
Release 4.0.0	This command was introduced. This command replaces the traceroute mpls traffic-eng 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.

Task ID

Task ID	Operation
mpls-te	read
mpls-ldp	read

Examples

The following example shows how to specify the destination as a MPLS-TE tunnel:

```
RP/0/RP0/CPU0:router# traceroute mpls traffic-eng tunnel-te 13

Tracing MPLS TE Label Switched Path on tunnel-te13, timeout is 2 seconds

Codes: '.' - success, 'Q' - request not sent, '.' - timeout,
       'L' - labeled output interface, 'B' - unlabeled output interface,
       'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
       'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
       'P' - no rx intf label prot, 'p' - premature termination of LSP,
       'R' - transit router, 'I' - unknown upstream index,
       'X' - unknown return code, 'x' - return code 0

Type escape sequence to abort.

0 0.0.0.0 11.0.0.1 MRU 1500 [Labels: 16003 Exp: 0]
L 1 192.168.200.2 192.168.170.1 MRU 1500 [Labels: implicit-null Exp: 0] 110 ms
! 2 192.168.170.1 0.0.0.0 MRU 0 [No Label] 169 ms
```

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.
ping mpls traffic-eng tunnel-mte (P2MP)	Displays information about MPLS-TE tunnel for a point-to-multipoint connection.

traceroute mpls traffic-eng tunnel-mte (P2MP)

To specify the destination type as an MPLS traffic engineering (TE) tunnel for point-to-multipoint connection, use the **traceroute mpls traffic-eng tunnel-mte** command in EXEC mode.

traceroute mpls traffic-eng tunnel-mte *tunnel-ID* [**destination** *start-address end-address address-increment increment-mask*] [**responder-id** *ipv4-address*] [**exp** *exp-bits*] [**flags** *fec*] [**jitter** *jitter-value*] [**reply** {**dscp** *dscp-value* | **mode** {**ipv4** | **router-alert**} }] [**source** *source-address*] [**timeout** *timeout*] [**ttl** *value*] [**verbose**]

Syntax Description

tunnel-mte	Specifies the MPLS-TE P2MP tunnel type.
<i>tunnel-ID</i>	Tunnel interface.
destination <i>start-address end-address address-increment increment-mask</i>	(Optional) Specifies a network 127 address to be used as the destination address in the echo request packet. start-address Start of the network address. end-address End of the network address. address-increment Incremental value of the network address. increment-mask Incremental mask of the network address.
responder-id <i>ipv4-address</i>	(Optional) Specifies the responder-id IPv4 address.
exp <i>exp-bits</i>	(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.
flags <i>fec</i>	(Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.
jitter <i>jitter-value</i>	(Optional) Specifies the jitter value. Range is 0 to 2147483647.
reply <i>dscp dscp-value</i>	(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.

reply-mode [ipv4 router-alert]	(Optional) Specifies the reply mode for the echo request packet. ipv4 Reply with IPv4 UDP packet. (This is the default.) router-alert Reply with IPv4 UDP packet with router alert
source <i>source-address</i>	(Optional) Specifies the source address used in the echo request packet.
timeout <i>timeout</i>	(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.
ttl <i>value</i>	(Optional) Specifies the maximum number of hops. Range is 1 to 255. Default is 30.
verbose	(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default

exp *exp-bits* : 0
reply-mode: IPv4
timeout *timeout* : 2
ttl: 30

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
mpls-te	read

Task ID	Operation
mpls-ldp	read

Examples

The following example shows how to specify the maximum number of hops for the trace route to traverse by using the **ttl** keyword:

```
RP/0/RP0/CPU0:router# traceroute mpls traffic-eng tunnel-mte 10 ttl 4

Mon Apr 12 12:16:50.095 EST

Tracing MPLS MTE Label Switched Path on tunnel-mte10, timeout is 2.2 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP

Type escape sequence to abort.

! 1 192.168.222.2 186 ms [Estimated Role: Bud]
    [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
    [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]

! 2 192.168.222.2 115 ms [Estimated Role: Bud]
    [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
    [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 2 192.168.140.2 213 ms [Estimated Role: Egress]
! 2 192.168.170.1 254 ms [Estimated Role: Egress]

! 3 192.168.222.2 108 ms [Estimated Role: Bud]
    [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
    [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 3 192.168.170.1 164 ms [Estimated Role: Egress]
! 3 192.168.140.2 199 ms [Estimated Role: Egress]

! 4 192.168.170.1 198 ms [Estimated Role: Egress]
! 4 192.168.222.2 206 ms [Estimated Role: Bud]
    [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
    [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 4 192.168.140.2 266 ms [Estimated Role: Egress]
```

The following example shows how to specify the egress host address by using the **egress** keyword:

```
RP/0/RP0/CPU0:router# traceroute mpls traffic-eng tunnel-mte 10 egress 13.0.0.1

Mon Apr 12 12:18:01.994 EST

Tracing MPLS MTE Label Switched Path on tunnel-mte10, timeout is 2.2 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
'L' - labeled output interface, 'B' - unlabeled output interface,
'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
'P' - no rx intf label prot, 'p' - premature termination of LSP,
'R' - transit router, 'I' - unknown upstream index,
'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP

Type escape sequence to abort.

d 1 192.168.222.2 113 ms [Estimated Role: Branch]
    [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
    [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]

d 2 192.168.222.2 118 ms [Estimated Role: Branch]
```

```

      [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
      [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 2 192.168.170.1 244 ms [Estimated Role: Egress]

d 3 192.168.222.2 141 ms [Estimated Role: Branch]
      [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
      [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 3 192.168.170.1 204 ms [Estimated Role: Egress]

d 4 192.168.222.2 110 ms [Estimated Role: Branch]
      [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
      [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 4 192.168.170.1 174 ms [Estimated Role: Egress]

```

The following example shows how to specify the egress host address, the maximum number of hops, and jitter in the tunnel:

```
RP/0/RP0/CPU0:router# traceroute mpls traffic-eng tunnel-mte 10 egress 13.0.0.1 ttl 4 jitter 500
```

Mon Apr 12 12:19:00.292 EST

Tracing MPLS MTE Label Switched Path on tunnel-mte10, timeout is 2.5 seconds

Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
 'L' - labeled output interface, 'B' - unlabeled output interface,
 'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
 'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
 'P' - no rx intf label prot, 'p' - premature termination of LSP,
 'R' - transit router, 'I' - unknown upstream index,
 'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP

Type escape sequence to abort.

```

d 1 192.168.222.2 238 ms [Estimated Role: Branch]
      [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
      [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]

d 2 192.168.222.2 188 ms [Estimated Role: Branch]
      [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
      [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 2 192.168.170.1 290 ms [Estimated Role: Egress]

d 3 192.168.222.2 115 ms [Estimated Role: Branch]
      [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
      [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 3 192.168.170.1 428 ms [Estimated Role: Egress]

d 4 192.168.222.2 127 ms [Estimated Role: Branch]
      [L] DDMAP 0: 192.168.140.2 192.168.140.2 MRU 1500 [Labels: 16001 Exp: 0]
      [L] DDMAP 1: 192.168.170.1 192.168.170.1 MRU 1500 [Labels: 16000 Exp: 0]
! 4 192.168.170.1 327 ms [Estimated Role: Egress]

```

Related Commands

Command	Description
show mpls traffic-eng tunnels	Displays information about MPLS-TE tunnels.
ping mpls traffic-eng tunnel-te (P2P)	Displays information about MPLS-TE tunnel for a point-to-point connection.

traceroute mpls mldp (P2MP)

To verify hop-by-hop fault localization and path tracing for the point-to-multipoint path, use the **traceroute mpls mldp p2mp** command in EXEC mode.

traceroute mpls mldp p2mp *root-address* { **IPv4** *source-ipv4-address group-ipv4-address* | **IPv6** *source-ipv6-address group-ipv6-address* | **vpn4** *AS-number* [*source-ipv4-address group-ipv4-address*] | **vpn6** *AS-number* [*source-ipv6-address group-ipv6-address*] | **mdt** *oui:vpn-index mdt-number* | **global-id** *lsp-id* } [**options**]

Syntax Description

mldp	Verifies the ping capability for multicast label distribution protocol (mldp).
p2mp	Indicates the Point-to-Multipoint (P2MP) label switch path.
<i>root-address</i>	Specifies the root address.
IPv4 <i>ipv4-address</i>	Defines IPv4 opaque encoding.
IPv6 <i>ipv6-address</i>	Defines IPv6 opaque encoding.
vpn4 <i>AS-number</i> [<i>source-ipv4-address group-ipv4-address</i>]	Defines VPNv4 opaque encoding.
vpn6 <i>AS-number</i> [<i>source-ipv6-address group-ipv6-address</i>]	Defines VPNv6 opaque encoding.
mdt <i>oui:vpn-index mdt number</i>	Defines VPN ID opaque encoding. Range of 3-byte OUI is 0 to 16777215. Range of <i>mdt-number</i> is 0 to 4294967295.
global-id <i>lsp-id</i>	Defines 4 byte global LSP ID opaque encoding.
<i>source-address</i>	Specifies the source address of target multicast address.
<i>group-address</i>	Specifies the target address of target multicast address.
<i>AS-number</i>	Specifies the Autonomous system number as follows: • 4-byte AS-number with asdot (X.Y) : aa.bb:cc format (for example, 11.22:33) • 2-byte AS-number or 4-byte AS-number: aa:bb format (for example, 11:22) • IPv4 address and index:aa.bb.cc.dd:ee format (for example, 11.22.33.44:55)

options

Specifies a set of various options:

destination

(Optional) Specifies a network 127/8 address to be used as the destination address in the echo request packet.

start-address: Start of the network address.

end-address: End of the network address.

address increment: Incremental value of the network address, which is expressed as a decimal number value or IP address.

expexp-bits

(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.

flags

fec: (Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.

no-ttl: (Optional) Specifies not to add TTL expired flag in echo request.

force-explicit-null

(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.

jitter

(Optional) Specifies a jitter value for a corresponding echo request, in milliseconds. Range is 0 to 2147483647. Default is 200.

reply dscp dscp-value

(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.

mode [ipv4 | router-alert]

(Optional) Specifies the reply mode for the echo request packet.

ipv4

Reply with an IPv4 UDP packet (this is the default)

router-alert

Reply with an IPv4 UDP packet with the IP router alert set

responder-id *ipv4-address*

(Optional) Adds responder identifier into corresponding echo request.

source *ipv4-address*

(Optional) Specifies the source address used in the echo request packet.

timeout *timeout*

(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.

ttl

(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255). Default is 255.

verbose

(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default No default behavior or values

Command Modes EXEC

Command History	Release	Modification
	Release 4.1.1	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	Operation
basic-services	execute
mpls-te or mpls-ldp	read

Examples

The following examples show how to verify path tracing for P2MP by using the **traceroute mpls mldp p2mp** command.

```
RP/0/RP0/CPU0:router#traceroute mpls mldp p2mp 192.168.0.1 ipv4 2.2.2.2 232.1.1.1 ttl 4
Mon Jul 11 15:36:42.299 JST
```

```
Tracing MPLS Label Switched Path to mldp p2mp 192.168.0.1 ipv4 (2.2.2.2, 232.1.1.1),
    timeout is 2.2 seconds, jitter value is 200 msec
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
        'L' - labeled output interface, 'B' - unlabeled output interface,
        'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
        'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
        'P' - no rx intf label prot, 'p' - premature termination of LSP,
        'R' - transit router, 'I' - unknown upstream index,
        'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP
```

Type escape sequence to abort.

```
d 1 10.10.10.2 54 ms [Estimated Role: Branch]
    [L] DDMAP 0: 11.11.11.3 11.11.11.3 MRU 1500 [Labels: 16016 Exp: 0]
    [L] DDMAP 1: 12.12.12.4 12.12.12.4 MRU 1500 [Labels: 16016 Exp: 0]

! 2 11.11.11.3 47 ms [Estimated Role: Egress]
! 2 12.12.12.4 68 ms [Estimated Role: Egress]
. 3 *
. 4 *
```

```
RP/0/RP0/CPU0:router#traceroute mpls mldp p2mp 192.168.0.1 ipv4 2.2.2.2 232.1.1.1 ttl 4
jitter 300
Mon Jul 11 15:37:18.976 JST
```

```
Tracing MPLS Label Switched Path to mldp p2mp 192.168.0.1 ipv4 (2.2.2.2, 232.1.1.1),
    timeout is 2.3 seconds, jitter value is 300 msec
```

```
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
        'L' - labeled output interface, 'B' - unlabeled output interface,
        'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
        'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
        'P' - no rx intf label prot, 'p' - premature termination of LSP,
        'R' - transit router, 'I' - unknown upstream index,
        'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP
```

Type escape sequence to abort.

```
d 1 10.10.10.2 77 ms [Estimated Role: Branch]
    [L] DDMAP 0: 11.11.11.3 11.11.11.3 MRU 1500 [Labels: 16016 Exp: 0]
    [L] DDMAP 1: 12.12.12.4 12.12.12.4 MRU 1500 [Labels: 16016 Exp: 0]

! 2 12.12.12.4 15 ms [Estimated Role: Egress]
```



```
! 2 11.11.11.3 114 ms [Estimated Role: Egress]
. 3 *
. 4 *
```

Related Commands

Command	Description
ping mpls mldp (P2MP), on page 690	Verifies data plane and control plane for the point-to-multipoint (P2MP) label switch path.
traceroute mpls mldp (MP2MP), on page 732	Verifies hop-by-hop fault localization and path tracing for the multipoint-to-multipoint path.

traceroute mpls mldp (MP2MP)

To verify hop-by-hop fault localization and path tracing for the multipoint-to-multipoint path (MP2MP), use the **traceroute mpls mldp mp2mp** command in EXEC mode.

traceroute mpls mldp mp2mp *root-address* {**IPv4** *source-ipv4-address group-ipv4-address*| **IPv6** *source-ipv6-address group-ipv6-address*| **vpn4** *AS-number* [*source-ipv4-address group-ipv4-address*]| **vpn6** *AS-number* [*source-ipv6-address group-ipv6-address*]| **mdt** *oui:vpn-index mdt-number*| **global-id** *lsp-id*} [**options**]

Syntax Description

mldp	Verifies the ping capability for multicast label distribution protocol (mldp).
mp2mp	Indicates the Multipoint-to-Multipoint (MP2MP) label switch path.
<i>root-address</i>	Specifies the root address.
IPv4 <i>ipv4-address</i>	Defines IPv4 opaque encoding.
IPv6 <i>ipv6-address</i>	Defines IPv6 opaque encoding.
vpn4 <i>AS-number</i> [<i>source-ipv4-address group-ipv4-address</i>]	Defines VPNv4 opaque encoding.
vpn6 <i>AS-number</i> [<i>source-ipv6-address group-ipv6-address</i>]	Defines VPNv6 opaque encoding.
mdt <i>oui:vpn-index mdt number</i>	Defines VPN ID opaque encoding. Range of 3-byte OUI is 0 to 16777215. Range of <i>mdt-number</i> is 0 to 4294967295.
global-id / <i>lsp-id</i>	Defines 4 byte global LSP ID opaque encoding.
<i>source-address</i>	Specifies the source address of target multicast address.
<i>group-address</i>	Specifies the target address of target multicast address.
<i>AS-number</i>	Specifies the Autonomous system number as follows: • 4-byte AS-number with asdot (X.Y) : aa.bb:cc format (for example, 11.22:33) • 2-byte AS-number or 4-byte AS-number: aa:bb format (for example, 11:22) • IPv4 address and index:aa.bb.cc.dd:ee format (for example, 11.22.33.44:55)

options

Specifies a set of various options:

destination

(Optional) Specifies a network 127/8 address to be used as the destination address in the echo request packet.

start-address: Start of the network address.

end-address: End of the network address.

address increment: Incremental value of the network address, which is expressed as a decimal number value or IP address.

expexp-bits

(Optional) Specifies the MPLS experimental field value in the MPLS header for echo replies. Range is 0 to 7. Default is 0.

flags

fec: (Optional) Specifies that forwarding equivalent class (FEC) stack checking is to be performed at transit routers.

no-ttl: (Optional) Specifies not to add TTL expired flag in echo request.

force-explicit-null

(Optional) Forces an unsolicited explicit null label to be added to the MPLS label stack and allows LSP ping to be used to detect LSP breakages at the penultimate hop.

jitter

(Optional) Specifies a jitter value for a corresponding echo request, in milliseconds. Range is 0 to 2147483647. Default is 200.

reply dscp-value

(Optional) Specifies the differentiated service codepoint value for an MPLS echo reply.

mode [ipv4 | router-alert]

(Optional) Specifies the reply mode for the echo request packet.

ipv4

Reply with an IPv4 UDP packet (this is the default)

router-alert

Reply with an IPv4 UDP packet with the IP router alert set

responder-id *ipv4-address*

(Optional) Adds responder identifier into corresponding echo request.

source *ipv4-address*

(Optional) Specifies the source address used in the echo request packet.

timeout *timeout*

(Optional) Specifies the timeout interval, in seconds. Range is 0 to 3600. Default is 2.

ttl

(Optional) Specifies the TTL value to be used in the MPLS labels (range is 1 to 255). Default is 255.

verbose

(Optional) Enables verbose output information, including MPLS echo reply, sender address of the packet, and return codes.

Command Default	t tl255 j itter200

Command Modes	EXEC

Command History	Release	Modification
	Release 4.1.1	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	Operation
basic-services	execute
mpls-te or mpls-ldp	read

Examples

The following examples show how to verify path tracing for MP2MP by using the **traceroute mpls mldp mp2mp** command.

```
RP/0/RP0/CPU0:router#traceroute mpls mldp mp2mp 192.168.0.1 global-id 1 ttl 4
```

```
Tracing MPLS Label Switched Path to mldp mp2mp 192.168.0.1 global-id 1,
    timeout is 2.2 seconds, jitter value is 200 msec
```

```
Codes: '.' - success, 'Q' - request not sent, '.' - timeout,
        'L' - labeled output interface, 'B' - unlabeled output interface,
        'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
        'M' - malformed request, 'm' - unsupported tlvs, 'N' - no rx label,
        'P' - no rx intf label prot, 'p' - premature termination of LSP,
        'R' - transit router, 'I' - unknown upstream index,
        'X' - unknown return code, 'x' - return code 0, 'd' - DDMAP
```

Type escape sequence to abort.

```
! 1 10.10.10.2 41 ms [Estimated Role: Bud]
    [L] DDMAP 0: 11.11.11.3 11.11.11.3 MRU 1500 [Labels: 16020 Exp: 0]
    [L] DDMAP 1: 12.12.12.4 12.12.12.4 MRU 1500 [Labels: 16020 Exp: 0]

! 2 11.11.11.3 16 ms [Estimated Role: Egress]
! 2 12.12.12.4 17 ms [Estimated Role: Egress]
. 3 *
. 4 *
```

Related Commands

Command	Description
ping mpls mldp (MP2MP), on page 697	Verifies data plane and control plane for the multipoint-to-multipoint (MP2MP) label switch path.
traceroute mpls mldp (P2MP), on page 726	Verifies hop-by-hop fault localization and path tracing for the point-to-multipoint path.



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