match cos through mpls ldp atm control-mode

match cos

To match a packet on the basis of a Layer 2 class of service (CoS)/Inter-Switch Link (ISL) marking, use the **matchcos** command in class-map configuration or policy inline configuration mode. To remove a specific Layer 2 CoS/ISL marking as a match criterion, use the **no** form of this command.

match cos cos-value [**cos-value** [**cos-value [cos-value]**]]

no match cos cos-value [**cos-value** [**cos-value [cos-value]**]]

Syntax Description

Supported Platforms Other Than the Cisco 10000 Series Routers	
cos-value	Specific IEEE 802.1Q/ISL CoS value. The *cos-value* is from 0 to 7; up to four CoS values, separated by a space, can be specified in one **matchcos** statement.
Cisco 10000 Series Routers	
cos-value	Specific packet CoS bit value. Specifies that the packet CoS bit value must match the specified CoS value. The *cos-value* is from 0 to 7; up to four CoS values, separated by a space, can be specified in one **matchcos** statement.

Command Default

Packets are not matched on the basis of a Layer 2 CoS/ISL marking.

Command Modes

Class-map configuration (config-cmap) Policy inline configuration (config-if-spolicy-inline)

Command History

Release	Modification
12.1(5)T	This command was introduced.
12.0(25)S	This command was integrated into Cisco IOS Release 12.0(25)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series routers.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Release	Modification
12.2(33)SRC	This command was integrated into Cisco IOS Release 12.2(33)SRC and support for the Cisco 7600 series routers was added.
12.4(15)T2	This command was integrated into Cisco IOS Release 12.4(15)T2.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB and support for the Cisco 7300 series router was added.
15.1(3)T	This command was integrated into Cisco IOS Release 15.1(3)T for Cisco Performance Monitor. Support was added for policy inline configuration mode.
12.2(58)SE	This command was integrated into Cisco IOS Release 12.2(58)SE for Cisco Performance Monitor.
12.2(33)SCF	This command was integrated into Cisco IOS Release 12.2(33)SCF.
3.2SE	This command was integrated into Cisco IOS XE Release 3.2SE.
15.1(2)SNG	This command was integrated into Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

This command can be used with both Flexible NetFlow and Performance Monitor. These products use different commands to enter the configuration mode in which you issue this command.

Cisco Performance Monitor in Cisco IOS Release 15.1(3)T and 12.2(58)SE

You must first enter the **service-policytypeperformance-monitorinline**command.

Examples

In the following example, the CoS values of 1, 2, and 3 are successful match criteria for the interface that contains the classification policy named cos:

```
Router(config)# class-map cos
Router(config-cmap)# match cos 1 2 3
```

In the following example, classes named voice and video-n-data are created to classify traffic based on the CoS values. QoS treatment is then given to the appropriate packets in the CoS-based-treatment policy map (in this case, the QoS treatment is priority 64 and bandwidth 512). The service policy configured in this example is attached to all packets leaving Fast Ethernet interface 0/0.1. The service policy can be attached to any interface that supports service policies.

```
Router(config)# class-map voice
Router(config-cmap)# match cos 7
Router(config)# class-map video-n-data
Router(config-cmap)# match cos 5
Router(config)# policy-map cos-based-treatment
Router(config-pmap)# class voice
Router(config-pmap-c)# priority 64
Router(config-pmap-c)# exit
Router(config-pmap)# class video-n-data
Router(config-pmap-c)# bandwidth 512
Router(config-pmap-c)# exit
Router(config-pmap)# exit
```

```
Router(config)# interface fastethernet0/0.1
Router(config-if)# service-policy output cos-based-treatment
```

Examples

The following example shows how to use the policy inline configuration mode to configure a service policy for Performance Monitor. The policy specifies that packets traversing Ethernet interface 0/0 that match the criteria of a CoS value of 2 will be monitored based on the parameters specified in the flow monitor configuration named**fm-2**:

```
Router(config)# interface ethernet 0/0
Router(config-if)# service-policy type performance-monitor inline input
Router(config-if-spolicy-inline)# match cos 2
Router(config-if-spolicy-inline)# flow monitor fm-2
Router(config-if-spolicy-inline)# exit
```

Examples

The following example shows how to match traffic classes for the 802.1p domain with packet CoS values:

```
Router> enable
Router# config terminal
Router(config)# class-map cos7
Router(config-cmap)# match cos 2
Router(config-cmap)# exit
```

Related Commands

Command	Description
class-map	Creates a class map to be used for matching packets to a specified class.
service-policy type performance-monitor	Associates a Performance Monitor policy with an interface.
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
set cos	Sets the Layer 2 CoS value of an outgoing packet.
show class-map	Displays all class maps and their matching criteria.

match mpls experimental topmost

To match the experimental (EXP) value in the topmost label header, use the **matchmplsexperimentaltopmost**command in class-map configuration or policy inline configuration mode. To remove the EXP match criterion, use the no form of this command.

match mpls experimental topmost number

no match mpls experimental topmost number

Syntax Description

number	Multiprotocol Label Switching (MPLS) EXP field in the topmost label header. Valid values are 0 to 7.

Command Default

No EXP match criterion is configured for the topmost label header.

Command Modes

Class-map configuration (config-cmap) Policy inline configuration (config-if-spolicy-inline)

Command History

Release	Modification
12.2(13)T	This command was introduced.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.
Cisco IOS XE Release 2.3	This command was integrated into Cisco IOS XE Release 2.3.
15.1(3)T	This command was integrated into Cisco IOS Release 15.1(3)T for Cisco Performance Monitor. Support was added for policy inline configuration mode.
12.2(58)SE	This command was integrated into Cisco IOS Release 12.2(58)SE for Cisco Performance Monitor.
12.2(33)SCF	This command was integrated into Cisco IOS Release 12.2(33)SCF.

Usage Guidelines

This command can be used with both Flexible NetFlow and Performance Monitor. These products use different commands to enter the configuration mode in which you issue this command.

You can enter this command on the input interfaces and the output interfaces. It will match only on MPLS packets.

Cisco Performance Monitor in Cisco IOS Release 15.1(3)T and 12.2(58)SE

You must first enter the **service-policytypeperformance-monitorinline**command.

Examples

The following example shows that the EXP value 3 in the topmost label header is matched:

```
Router(config)# class-map mpls exp
Router(config-cmap)# match mpls experimental topmost 3
```

Examples

The following example shows how to use the policy inline configuration mode to configure a service policy for Performance Monitor. The policy specifies that packets traversing Ethernet interface 0/0 that match the criteria of a EXP value of 3 in the topmost label header will be monitored based on the parameters specified in the flow monitor configuration named**fm-2**:

```
Router(config)# interface ethernet 0/0
Router(config-if)# service-policy type performance-monitor inline input
Router(config-if-spolicy-inline)# match mpls experimental topmost 3
Router(config-if-spolicy-inline)# flow monitor fm-2
Router(config-if-spolicy-inline)# exit
```

Related Commands

Command	Description
class-map	Creates a class map to be used for matching packets to a specified class.
service-policy type performance-monitor	Associates a Performance Monitor policy with an interface.
set mpls experimental topmost	Sets the MPLS EXP field value in the topmost MPLS label header at the input or output interfaces.

match mpls-label

To redistribute routes that include Multiprotocol Label Switching (MPLS) labels if the routes meet the conditions specified in the route map, use the **match mpls-label** command in route-map configuration mode. To disable this function, use the **no** form of this command.

match mpls-label

no match mpls-label

Syntax Description

This command has no arguments or keywords.

Command Default

Routes with MPLS labels are not redistributed.

Command Modes

Route-map configuration

Command History

Release	Modification
12.0(21)ST	This command was introduced.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(11)S	This command was integrated into Cisco IOS Release 12.2(11)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI.

Usage Guidelines

A route map that includes this command can be used in the following instances:

- With the **neighbor route-map in** command to manage inbound route maps in BGP
- With the **redistribute bgp** command to redistribute route maps in an IGP

Use the route-map global configuration command, and the **match** and **set** route map configuration commands, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the match criteria--the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the set actions--the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **match route-map**configuration command has multiple formats. The **match** commands can be given in any order, and all **match** commands must "pass" to cause the route to be redistributed according to the set actions given with the **set** commands. The **no** forms of the **match** commands remove the specified match criteria.

When you are passing routes through a route map, a route map can have several parts. Any route that does not match at least one match clause relating to a **route-map** command will be ignored; that is, the route will not be advertised for outbound route maps and will not be accepted for inbound route maps. If you want to modify only some data, you must configure a second route map section with an explicit match specified.

Examples

The following example shows how to create a route map that redistributes routes if the following conditions are met:

- The IP address of the route matches an IP address in access control list 2.
- The route includes an MPLS label.

```
Router(config-router)# route-map incoming permit 10
Router(config-route-map)# match ip address 2
Router(config-route-map)# match mpls-label
```

Related Commands

Command	Description
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set mpls-label	Enables a route to be distributed with an MPLS label if the route matches the conditions specified in the route map.

maximum routes

To limit the maximum number of routes in a Virtual Private Network (VPN) routing and forwarding (VRF) instance to prevent a provider edge (PE) router from importing too many routes, use the **maximum routes** command in VRF configuration mode or in VRF address family configuration mode. To remove the limit on the maximum number of routes allowed, use the **no** form of this command.

maximum routes *limit* {**warning-only**| *warn-threshold* [**reinstall** *reinstall-threshold*]}

no maximum routes

Syntax Description

limit	The maximum number of routes allowed in a VRF. The range is 1 to 4294967295 routes. All values within this range can be configured for IPv4. For IPv6, however, only values greater than the current number of IPv6 routes present in the Routing Information Base (RIB) for the specified VRF is allowed.
warn-threshold	The warning threshold value expressed as a percentage (from 1 to 100) of the *limit* value. When the number of routes reaches the specified percentage of the limit, a warning message is generated.
warning-only	Issues a system message logging (syslog) error message when the maximum number of routes allowed for a VRF exceeds the threshold. However, additional routes are still allowed.
reinstall *reinstall-threshold*	(Optional) Specifies reinstallation of a route previously rejected because the maximum route limit was exceeded. The *reinstall-threshold* is expressed as a percentage (from 1 to 100) of the *limit* value, but it does not take effect until the limit has been reached. When the number of routes reaches the specified percentage of the limit, a warning message is generated, but routes are still accepted. When the number of routes reaches the limit, the router rejects new routes and does not accept any more until the number of routes drops below the specified percentage of the *reinstall-threshold*.

Command Default

No limit is set on the maximum number of routes allowed.

Command Modes

VRF address family configuration (config-vrf-af) VRF configuration (config-vrf)

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.2(13)T	Support for Simple Network Management Protocol (SNMP) notifications was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA. The **reinstall** *reinstall-threshold* keyword and argument were added.
12.2(33)SRB	Support for IPv6 was added.
12.2(33)SRC	Support for this command was added for IPv6 address families under the **vrf definition** command.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI.
Cisco IOS XE Release 3.1S	This command was integrated into Cisco IOS XE Release 3.1S.

Usage Guidelines

All values within the range for the *limit* argument can be configured for IPv4. For IPv6, however, only values greater than the current number of IPv6 routes present in the RIB for the specified VRF is allowed.

The **maximum routes** command can be configured in one of two ways:

- Generate a warning message when the *limit* value is exceeded
- Generate a warning message when the *warn-threshold* value is reached

To limit the number of routes allowed in the VRF, use the **maximum routes** *limit* command with the *warn-threshold* argument. The *warn-threshold* argument generates a warning and does not allow the addition of routes to the VRF when the maximum number set by the *limit* argument is reached. The software generates a warning message every time a route is added to a VRF when the VRF route count is above the warning threshold. The software also generates a route rejection notification when the maximum threshold is reached and every time a route is rejected after the limit is reached.

To set a number of routes at which you receive a notification, but which does not limit the number of routes that can be imported into the VRF, use the **maximum routes** *limit* command with the **warn-only** keyword.

To configure the router to generate SNMP notifications (traps or informs) for these values, use the **snmp-server enable traps mpls vpn** command in global configuration mode.

Examples

The following example shows how to set a limit threshold of VRF routes to 1000. When the number of routes for the VRF reaches 1000, the router issues a syslog error message, but continues to accept new VRF routes.

```
Router(config)# ip vrf vrf1
Router(config-vrf)# rd 100:1
Router(config-vrf)# route-target import 100:1
Router(config-vrf)# maximum routes 1000 warning-only
```

The following example shows how to set the maximum number of VRF routes allowed to 1000 and set the warning threshold at 80 percent of the maximum. When the number of routes for the VRF reaches 800, the router issues a warning message. When the number of routes for the VRF reaches 1000, the router issues a syslog error message and rejects any new routes.

```
Router(config)# ip vrf vrf2
Router(config-vrf)# rd 200:1
Router(config-vrf)# route-target import 200:1
Router(config-vrf)# maximum routes 1000 80
```

The following example shows how to use the **reinstall** keyword to control the maximum number of VRF routes allowed. In this example, the router issues a warning when the number of routes exceeds 800 (80% of 1000 routes), but it still accept routes. When the number of new routes reaches 1000 (the limit), the router rejects them and does not accept more until the number of routes drops below 900 (90% of 1000) installed routes.

```
Router(config)# ip vrf vrf2
Router(config-vrf)# rd 200:1
Router(config-vrf)# route-target import 200:1
Router(config-vrf)# maximum routes 1000 80 reinstall 90
```

The following example for an IPv6 address family defined under the **vrf definition** command shows how to set the maximum number of VRF routes allowed to 500 and set the warning threshold at 50 percent of the maximum. When the number of routes for the VRF reaches 250, the router issues a warning message. When the number of routes for the VRF reaches 500, the router issues a syslog error message and rejects any new routes.

```
Router(config)# vrf definition vrf1
Router(config-vrf)# address-family ipv6
Router(config-vrf-af)# maximum routes 500 50
```

Related Commands

Command	Description
address-family (VRF)	Selects an address family type for a VRF table and enters VRF address family configuration mode.
import map	Configures an import route map for a specified VRF for more control over routes imported into the VRF.
ip vrf	Specifies a name for a VRF routing table and enters VRF configuration mode (for IPv4 only).
rd	Creates VRF routing and forwarding tables and specifies the default route distinguisher for a VPN.

Command	Description
route-target	Configures a VRF route target community for importing and exporting extended community attributes.
snmp-server enable traps mpls vpn	Enables the router to send MPLS VPN-specific SNMP notifications (traps and informs).
vrf definition	Configures a VRF routing table instance and enters VRF configuration mode.

medium p2p

To configures the interface as point-to-point, use the **medium p2p** command in interface configuration mode. To return the interface to its normal mode, use the **no** form of this command.

medium p2p

no medium p2p

Syntax Description

This command has no arguments or keywords.

Command Default

Interfaces are configured to connect to multiple devices.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
15.1(1)SA	This command was introduced.
15.1(3)S	This command was integrated.

Usage Guidelines

This command allows the router to send and receive all Multiprotocol Label Switching (MPLS) transport profile (TP) packets using a common multicast MAC address knowing that it is communicating with only one other device.

Examples

The following example configures the interface as point-to-point:

```
Router(config)# interface eth0/0
Router(config-if)# medium p2p
```

Related Commands

Command	Description
mpls tp link	Configures MPLS-TP link parameters.

member (l2vpn vfi)

To specify the devices that form a point-to-point Layer 2 VPN (L2VPN) virtual forwarding interface (VFI) connection, use the **member** command in L2 VFI configuration mode. To disconnect the devices, use the **no** form of this command.

member {*ip-address* [*vc-id*] {**encapsulation mpls**| **template** *name*}| **pseudowire** *pw-int-number* [*ip-address* [*vc-id*] {**encapsulation mpls**| **template** *name*}]}

no member {*ip-address* [*vc-id*] {**encapsulation mpls**| **template** *name*}| **pseudowire** *pw-int-number* [*ip-address* [*vc-id*] {**encapsulation mpls**| **template** *name*}]}

Syntax Description

ip-address	IP address of the VFI neighbor.
vc-id	(Optional) Virtual circuit (VC) identifier.
encapsulation mpls	Specifies Multiprotocol Label Switching (MPLS) as the encapsulation type.
template *name*	Specifies the template name.
pseudowire *pw-int-number*	Specifies the pseudowire interface number.

Command Default

Devices that form a point-to-point L2VPN VFI connection are not specified.

Command Modes

L2 VFI configuration (config-vfi)

Command History

Release	Modification
Cisco IOS XE Release 3.7S	This command was introduced as part of the Multiprotocol Label Switching (MPLS)-based L2VPN command modifications for cross-OS support. This command will replace the **neighbor (VPLS)** command in future releases.
15.3(1)S	This command was integrated in Cisco IOS Release 15.3(1)S.

Examples

The following example shows how to configure an L2VPN VFI connection:

```
Device(config)# l2vpn vfi context vfi1
Device(config-vfi)# member 10.10.10.10 1 encapsulation mpls
```

Related Commands

Command	Description
neighbor (VPLS)	Specifies the type of tunnel signaling and encapsulation mechanism for each VPLS peer.

member (bridge-domain)

To bind a service instance to a bridge domain instance, use the **member** command in bridge-domain configuration mode. To unbind a service instance from a bridge domain instance, use the **no** form of this command.

member *interface-type-number* **service-instance** *service-id* [**split-horizon group** *group-id*]

no member *interface-type-number* **service-instance** *service-id* [**split-horizon group** *group-id*]

Syntax Description

interface-type-number	Interface type and number. The accepted values are any of the following interfaces support Ethernet Virtual Connection (EVC) service instances: • Physical interface • Port-channel • Mac-tunnel • Overlay interface • Layer 2 virtual forwarding interface (L2 VFI)
service-instance	Configures the service instance.
service-id	Numerical identifier of the service instance. The range is from 1 to 8000.
split-horizon	(Optional) Configures a port or service instance as a member of a split-horizon group.
group	(Optional) Defines the split-horizon group.
group-id	(Optional) Identifier for the split-horizon group. The range is from 1 to 65533. • On the Cisco ASR 1000 Series Routers, the only values supported are **0** and **1**.

Command Default

Service instances are not bound to a bridge domain instance.

Command Modes

Bridge-domain configuration (config-bdomain)

Command History

Release	Modification
Cisco IOS XE Release 3.7S	This command was introduced as part of the Multiprotocol Label Switching (MPLS)-based L2VPN command modifications for cross-OS support. This command will replace the **bridge-domain (service instance)** command in future releases.
15.3(1)S	This command was integrated in Cisco IOS Release 15.3(1)S.

Usage Guidelines

Use either the **bridge-domain (service instance)** command in service instance configuration mode or the **member** command in bridge-domain configuration mode to configure a bridge domain service. The commands cannot be used in combination for the same bridge domain.

Use the **member** command to bind a service instance to a bridge domain instance. Bridge domains cannot be configured for a service instance without encapsulation also being configured. The **bridge-domain** command configures components on a bridge domain.

When you use the **no** form of this command, a service instance is unbound from a bridge domain instance. However, the service instance and encapsulation configuration are retained.

Examples

The following example shows how to bind a service instance to a bridge domain instance:

```
Device(config)# interface gigabitethernet 2/0/0
Device(config-if)# service instance 100 ethernet
Device(config-if-srv)# exit
Device(config)# bridge-domain 200
Device(config-bdomain)# member gigabitethernet0/0/0 service-instance 1000 split-horizon
group 0
```

Related Commands

Command	Description
bridge-domain (**config**)	Configures components on a bridge domain.
bridge-domain (service instance)	Binds a service instance or a MAC tunnel to a bridge domain instance.
ethernet evc	Defines an EVC and enters EVC configuration mode.
ethernet service instance	Configures an Ethernet service instance on an interface and enters service instance configuration mode.

member (xconnect)

To specify devices that form a Layer 2 VPN (L2VPN) cross connect, use the **member** command in xconnect configuration mode. To disconnect the devices, use the **no** form of this command.

member *ip-address vc-id* {**encapsulation mpls**| **template** *template-name*} [**group** *group-name* [**priority** *number*]]

Pseudowire Interfaces

member pseudowire *interface-number* [*ip-address vc-id* {**encapsulation mpls**| **template** *template-name*}] [**group** *group-name* [**priority** *number*]]

Gigabit Ethernet and Port-channel Interfaces

member{**gigabitethernet**| **port-channel**} *interface-number*[**service-instance** *id*] [**group** *group-name* [**priority** *number*]]

ATM Interfaces

member atm *interface-number* [**pvc** {*vpi-value*| *vpi-value/vci-value*}| **pvp** *vpi-value*] [**group** *group-name* [**priority** *number*]]

POS and CEM Interfaces

member {**pos** *interface-number*| **cem** *interface-number circuit-id*} [**group** *group-name* [**priority** *number*]]

Syntax Description

ip-address	IP address of the peer.
vcid	Specifies the virtual circuit (VC) ID. The range is from 1 to 4294967295.
encapsulation mpls	Specifies Multiprotocol Label Switching (MPLS) as the data encapsulation method.
template *template-name*	(Optional) Specifies the template to be used for encapsulation and protocol configuration. The maximum size is 32 characters.
group *group-name*	(Optional) Specifies the cross-connect member redundancy group name.
priority *number*	(Optional) Specifies the cross-connect member priority. The range is from 0 to 16. The highest priority is 0. Lowest priority is 16.
pseudowire	Specifies pseudowire as the attachment circuit type.
interface-number	Specifies the interface number.

gigabitethernet	Specifies Gigabit Ethernet interface as the attachment circuit type.
port-channel	Specifies port-channel interface as the attachment circuit type.
service-instance *id*	(Optional) Specifies the service instance identifier.
pvc	(Optional) Specifies the ATM permanent virtual circuit (PVC) parameters.
vpi-value	Virtual Path Identifier (VPI) value. The range is from 0 to 255.
vpi-value/*vci-value*	VPI/virtual circuit identifier (VCI) identifier. The range is from 0 to 255.
pvp	(Optional)Specifies the ATM permanent virtual path (PVP) parameters.
pos *interface-number*	Specifies packet-over-sonet (POS) as the attachment circuit type.
cem *interface-number circuit-id*	Specifies circuit emulation (CEM) as the attachment circuit type.

Command Default

Devices that form an L2VPN cross connect are not specified.

Command Modes

Xconnect configuration (config-xconnect)

Command History

Release	Modification
Cisco IOS XE Release 3.7S	This command was introduced as part of the Multiprotocol Label Switching (MPLS)-based Layer 2 VPN (L2VPN) command modifications for cross-OS support.

Usage Guidelines

The **member** command specifies the two members of the Virtual Private Wired Service (VPWS), multisegment pseudowire, or local connect services. For VPWS, one member is an attachment circuit and the other member is a pseudowire interface. For a multisegment pseudowire, both members are pseudowire interfaces. For local connect, both members are active interfaces.

When both pseudowire interface and peer information are specified, it dynamically creates the interface using the pseudowire number specified using the **pseudowire** *pw-interface-number* keyword-argument pair.

Configure the group name to specify which of the two possible groups the member belongs to. The group name must be configured if the member has an associated redundant member belonging to a redundant member group. You can also configure the group name even if there are no backup members so that the member can be given an easy-to-understand descriptive name.

Configure a priority for each member so that the active member can be chosen based on the priority when there are multiple redundant members. The default priority for a member is 0 (highest). Each member in the same group must have a unique priority.

There can only be two groups, with a maximum of four members in one group and exactly one member in the other group for redundancy (one member is for active redundancy and the other three are for backup redundancy). If the group name is not specified, only two members can be configured in the L2VPN cross-connect context.

Examples

The following example shows a typical configuration of a Layer 2 cross connect:

```
Device(config)# l2vpn xconnect context con1
Device(config-xconnect)# member 10.1.1.1 200 encapsulation mpls
```

Related Commands

Command	Description
connect (l2vpn local switching)	Creates Layer 2 data connections between two ports on the same device.
l2 vfi point-to-point	Establishes a point-to-point Layer 2 VFI between two separate networks.
xconnect	Binds an attachment circuit to a pseudowire and configures an AToM static pseudowire.

metric-style narrow

To configure a router running Intermediate System-to-Intermediate System (IS-IS) so that it generates and accepts old-style type, length, and value objects (TLVs), use the **metric-style narrow** command in router configuration mode. To disable this function, use the **no** form of this command.

metric-style narrow [transition] [**level-1**| **level-2**| **level-1-2**]

no metric-style narrow [transition] [**level-1**| **level-2**| **level-1-2**]

Syntax Description

transition	(Optional) Instructs the router to use both old- and new-style TLVs.
level-1	(Optional) Enables this command on routing level 1.
level-2	(Optional) Enables this command on routing level 2.
level-1-2	(Optional) Enables this command on routing levels 1 and 2.

Command Default

The Multiprotocol Label Switching (MPLS) traffic engineering image generates only old-style TLVs. To do MPLS traffic engineering, a router must generate new-style TLVs that have wider metric fields.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
12.0(5)S	This command was introduced.
12.1(3)T	This command was integrated into Cisco IOS Release 12.1(3)T.
12.0(10)ST	This command was integrated into Cisco IOS Release 12.0(10)ST.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
Cisco IOS XE Release 2.3	This command was integrated into Cisco IOS XE Release 2.3.

Examples

The following example shows how to configure the router to generate and accept old-style TLVs on router level 1:

```
Router(config-router)# metric-style narrow level-1
```

Related Commands

Command	Description
metric-style transition	Configures a router to generate both old-style and new-style TLVs.
metric-style wide	Configures a router to generate and accept only new-style TLVs.

metric-style transition

To configure a router running Intermediate System-to-Intermediate System (IS-IS) so that it generates and accepts both old-style and new-style type, length, and value objects (TLVs), use the **metric-style transition** command in router configuration mode. To disable this function, use the **no** form of this command.

metric-style transition [**level-1**| **level-2**| **level-1-2**]

no metric-style transition [**level-1**| **level-2**| **level-1-2**]

Syntax Description

level-1	(Optional) Enables this command on routing level 1.
level-2	(Optional) Enables this command on routing level 2.
level-1-2	(Optional) Enables this command on routing levels 1 and 2.

Command Default

The Multiprotocol Label Switching (MPLS) traffic engineering image generates only old-style TLVs. To do MPLS traffic engineering, a router must generate new-style TLVs that have wider metric fields.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
12.0(5)S	This command was introduced.
12.1(3)T	This command was integrated into Cisco IOS Release 12.1(3)T.
12.0(10)ST	This command was integrated into Cisco IOS Release 12.0(10)ST.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
Cisco IOS XE Release 2.3	This command was integrated into Cisco IOS XE Release 2.3.

Examples

The following example shows how to configure a router to generate and accept both old-style and new-style TLVs on router level 2:

```
Router(config-router)# metric-style transition level-2
```

Related Commands

Command	Description
metric-style narrow	Configures a router to generate and accept old-style TLVs.
metric-style wide	Configures a router to generate and accept only new-style TLVs.

metric-style wide

To configure a router running Intermediate System-to-Intermediate System (IS-IS) so that it generates and accepts only new-style type, length, value objects (TLVs), use the **metric-style wide** command in router configuration mode. To disable this function, use the **no** form of this command.

metric-style wide [transition] [**level-1**| **level-2**| **level-1-2**]

no metric-style wide [transition] [**level-1**| **level-2**| **level-1-2**]

Syntax Description

transition	(Optional) Instructs the router to accept both old- and new-style TLVs.
level-1	(Optional) Enables this command on routing level 1.
level-2	(Optional) Enables this command on routing level 2.
level-1-2	(Optional) Enables this command on routing levels 1 and 2.

Command Default

The Multiprotocol Label Switching (MPLS) traffic engineering image generates only old-style TLVs. To do MPLS traffic engineering, new-style TLVs that have wider metric fields must be generated.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
12.0(5)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release train depends on your feature set, platform, and platform hardware.
Cisco IOS XE Release 2.1	This command was implemented on Cisco ASR 1000 Series Aggregation Services Routers.
15.1(2)S	This command was integrated into Cisco IOS Release 15.1(2)S.
15.2(3)T	This command was integrated into Cisco IOS Release 15.2(3)T.

Usage Guidelines

If you enter the **metric-style wide** command, a router generates and accepts only new-style TLVs. Therefore, the router uses less memory and other resources than it would if it generated both old-style and new-style TLVs.

This style is appropriate for enabling MPLS traffic engineering across an entire network.

Note This discussion of metric styles and transition strategies is oriented toward traffic engineering deployment. Other commands and models could be appropriate if the new-style TLVs are desired for other reasons. For example, a network might require wider metrics, but might not use traffic engineering.

Examples

The following example shows how to configure a router to generate and accept only new-style TLVs on level 1:

```
Router(config-router)# metric-style wide level-1
```

Related Commands

Command	Description
metric-style narrow	Configures a router to generate and accept old-style TLVs.
metric-style transition	Configures a router to generate and accept both old-style and new-style TLVs.

mls ipv6 vrf

To enable IPv6 globally in a virtual routing and forwarding (VRF) instance, use the mls ipv6 vrf command in global configuration mode. To remove this functionality, use the no form of the command.

mls ipv6 vrf

no mls ipv6 vrf

Syntax Description

This command has no arguments or keywords.

Command Default

VRFs are supported only for IPv4 addresses.

Command Modes

Global configuration

Command History

Release	Modification
12.2(33)SRB1	This command was introduced on the Cisco 7600 series routers.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI and implemented on the Catalyst 6500 series switches.
Cisco IOS XE Release 3.1S	This command was introduced on Cisco ASR 1000 series routers.

Usage Guidelines

You must enable the mls ipv6 vrf command in global configuration mode in order to enable IPv6 in a VRF. If this command is not used, a VRF is supported only for the IPv4 address family.

Configuring the mls ipv6 vrf command makes the router reserve the lower 255 hardware IDs for IPv6 regardless of whether IPv6 is enabled. Other applications that make use of these hardware IDs then cannot use that space.

To remove the **mls ipv6 vrf** command from the running configuration, the user needs to remove all IPv6 VRFs from the router and reload the system.

Examples

The following example shows how to enable IPv6 in a VRF globally:

```
Router(config)# mls ipv6 vrf
```

Related Commands

Command	Description
vrf definition	Configure a VRF routing table instance and enters VRF configuration mode.

Command	Description
show running-config vrf	Displays the subset of the running configuration of a router that is linked to a specific VRF instance or to all VRFs configured on the router.

mls mpls

To enable Multiprotocol Label Switching (MPLS) recirculation, use the **mls mpls** command in global configuration mode. To disable MPLS recirculation, use the **no** form of this command.

mls mpls {**recir-agg**| **tunnel-recir**}

no mls mpls {**recir-agg**| **tunnel-recir**}

Syntax Description

recir-agg	Recirculates the MPLS aggregated-label packets (only new aggregated labels are impacted).
tunnel-recir	Recirculates the tunnel-MPLS packets.

Command Default

MPLS recirculation is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.2(17b)SXA	This command was introduced.
12.2(18)SXE	This command was integrated into Cisco IOS 12.2(18)SXE.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

If you do not enable tunnel-MPLS recirculation, the IPv4 and IPv4-tunneled packets that have to be labeled (for example, the packets that are encapsulated with an MPLS header) will be corrupted when they are transmitted from the Cisco 7600 series router.

Use the **mls mpls recir-agg** command to switch off the VPN-CAM use for the VRF lookups and to allocate the reserved VLAN for every VRF instance configured on the Cisco 7600 series routers. This command is a pre-requisite to ensure that the egress features (ACL, Netflow, or QoS) work properly in scenarios where a VRF route is reachable through a static global route through a non-VRF interface.

Examples

The following example shows how to enable aggregated-label MPLS recirculation:

```
Router(config)# mls mpls recir-agg
```

The following example shows how to enable tunnel-MPLS recirculation:

```
Router(config)# mls mpls tunnel-recir
```

The following example shows how to disable aggregated-label MPLS recirculation:

```
Router(config)# no mls mpls recir-agg
```

The following example shows how to disable tunnel-MPLS recirculation:

```
Router(config)# no mls mpls tunnel-recir
```

mls mpls (guaranteed bandwidth traffic engineering)

To configure the guaranteed bandwidth traffic engineering flow parameters globally, use the **mls mpls** command in global configuration mode. To return to the default settings, use the **no** form of this command.

mls mpls {**gb-te-burst** *burst*| **gb-te-cir-ratio** *ratio*| **gb-te-dscp** *dscp-value* **[markdown]**| **gb-te-enable [global-pool]**}

no mls mpls {**gb-te-burst** *burst*| **gb-te-cir-ratio** *ratio*| **gb-te-dscp** *dscp-value* **[markdown]**| **gb-te-enable [global-pool]**}

Syntax Description

gb-te-burst *burst*	Specifies the burst duration for the guaranteed bandwidth traffic engineering flows; the range is 100 to 30000 milliseconds.
gb-te-cir-ratio *ratio*	Specifies the ratio for the committed information rate policing; the range is 1 to 100 percent.
gb-te-dscp *dscp-value*	Specifies the differentiated services code point (DSCP) map for the guaranteed bandwidth traffic engineering flows; the range is 0 to 63.
markdown	(Optional) Marks down or drops the nonconforming flows.
gb-te-enable	Enables the guaranteed bandwidth traffic engineering flow policing.
global-pool	(Optional) Specifies using resources allocated from the global pool to the police traffic engineering flows.

Command Default

The default settings are as follows:

- *burst* is 1000 milliseconds.
- *ratio* is 1 percent.
- *dscp-value* is 40.

Command Modes

Global configuration

Command History

Release	Modification
12.2(18)SXE	This command was introduced on the Supervisor Engine 720.

Release	Modification
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

Use the **mls qos map dscp-exp** command to reset the Exp value of the Multiprotocol Label Switching (MPLS) packet when the out-label gets swapped.

If you do not enable tunnel-MPLS recirculation, the IPv4 and IPv4-tunneled packets that need to be labeled (for example, the packets that are encapsulated with an MPLS header) will be corrupted when they are transmitted from the Cisco 7600 series router.

Use the **show erm statistics** command to display the Forwarding Information Base (FIB) Ternary Content Addressable Memory (TCAM) exception status for IPv4, IPv6, and MPLS protocols.

Examples

This example shows how to specify the burst duration for the guaranteed bandwidth traffic engineering flows:

```
Router(config)# mls mpls gb-te-burst 2000
Router(config)#
```

This example shows how to specify the ratio for CIR policing:

```
Router(config)# mls mpls gb-te-ratio 30
Router(config)#
```

This example shows how to specify the DSCP map for the guaranteed bandwidth traffic engineering flows and to drop the nonconforming flows:

```
Router(config)# mls mpls gb-te-dscp 25 markdown
Router(config)#
```

This example shows how to enable the guaranteed bandwidth traffic engineering flow policing:

```
Router(config)# mls mpls gb-te-enable
Router(config)#
```

Related Commands

Command	Description
show erm statistics	Displays the FIB TCAM exception status for IPv4, IPv6, and MPLS protocols.

mls mpls (recirculation)

To enable Multiprotocol Label Switching (MPLS) recirculation, use the **mls mpls** command in global configuration mode. To disable MPLS recirculation, use the **no** form of this command.

mls mpls {**recir-agg**| **tunnel-recir**}

no mls mpls {**recir-agg**| **tunnel-recir**}

Syntax Description

recir-agg	Recirculates the MPLS aggregated-label packets (new aggregated labels are impacted only).
tunnel-recir	Recirculates the tunnel-MPLS packets.

Command Default

Disabled

Command Modes

Global configuration

Command History

Release	Modification
12.2(18)SXE	This command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

Use the **mls mpls tunnel-recirc** command and keyword combination to enable tunnel-MPLS recirculation to avoid packet corruption when any IPv6 or IPv4 payload is tunneled on a Cisco 7600 series router.

Use the **show erm statistics** command to display the Forwarding Information Base (FIB) Ternary Content Addressable Memory (TCAM) exception status for IPv4, IPv6, and MPLS protocols.

Examples

This example shows how to enable the aggregated-label MPLS recirculation:

```
Router(config)# mls mpls recir-agg
Router(config)#
```

This example shows how to enable the tunnel-MPLS recirculation:

```
Router(config)# mls mpls tunnel-recir
Router(config)#
```

This example shows how to disable the aggregated-label MPLS recirculation:

```
Router(config)# no mls mpls recir-agg
Router(config)#
```

This example shows how to disable the tunnel-MPLS recirculation:

```
Router(config)# no mls mpls tunnel-recir
Router(config)#
```

Related Commands

Command	Description
show erm statistics	Displays the FIB TCAM exception status for IPv4, IPv6, and MPLS protocols.

mls mpls qos input uniform-mode

To enable Multiprotocol Label Switching (MPLS) quality of service (QoS) marking of ingress packets to be copied into the differentiated services code point (DSCP) field of the ingress packet, use the **mls mpls qos input uniform-mode** command in interface configuration mode. To disable the copying operation, use the **no** form of this command.

mls mpls qos input uniform-mode

no mls mpls qos input uniform-mode

Syntax Description

This command has no arguments or keywords.

Command Default

No marking operation is performed on the incoming packets or the GRE headers.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SXI	This command was introduced.

Usage Guidelines

This command is supported only in PFC3C mode or PFC3CXL mode.

Enter the **show mls qos** command to verify the configuration.

Examples

The following example shows how to enable the original QoS marking of ingress packets to be copied into the DSCP field and copied in the GRE header:

```
Router(config-if)# mls mpls qos input uniform-mode
```

Related Commands

Command	Description
show mls qos	Displays MLS QoS information.

monitor event-trace (EXEC)

To monitor and control the event trace function for a specified Cisco IOS software subsystem component, use the **monitor event-trace** command in privileged EXEC mode.

monitor event-trace *facility* {**clear**| **continuous [cancel]**| **disable**| **dump [pretty] [WORD]**| **enable**| **one-shot**}

Syntax Description

facility	Name of the Cisco IOS software subsystem component that is the subject of the event trace. To get a list of components that support event tracing, use the **monitor event-trace ?** command. The facility may consist of multiple keywords (for example, **monitor event-trace atom event** ...).
clear	Clears existing trace messages from the memory on the networking device.
continuous	Continuously displays the latest event trace entries.
disable	Disables event tracing for the specified component.
dump	Writes the event trace results to the file configured using the **monitor event-trace** command in global configuration mode. The trace messages are saved in binary format.
pretty	(Optional) Saves the event trace message in ASCII format.
WORD	URL to store event data.
enable	Enables event tracing.
one-shot	Clears any existing trace information from memory, starts event tracing again, and disables the trace when the trace reaches the size specified using the **monitor event-trace** command in global configuration mode.

Command Default

Event trace monitoring is disabled.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Release 3.7S	This command was introduced as part of the Multiprotocol Label Switching (MPLS)-based Layer 2 VPN (L2VPN) command modifications for cross-OS support.
15.3(1)S	This command was integrated in Cisco IOS Release 15.3(1)S.
15.3(2)S	This command was integrated in Cisco IOS Release 15.3(2)S.
Cisco IOS XE Release 3.9S	This command was integrated in Cisco IOS XE Release 3.9S.

Usage Guidelines

Use the **monitor event-trace** command to control what, when, and how event trace data is collected. Use this command after you have configured the event trace functionality on the networking device using the **monitor event-trace** command in global configuration mode.

Note The amount of data collected from the trace depends on the trace message size configured using the **monitor event-trace** command in global configuration mode for each instance of a trace.

The Cisco IOS software allows for the subsystem components to define whether support for event tracing is enabled or disabled at boot time. You can enable or disable event tracing in two ways: using the **monitor event-trace** command in privileged EXEC mode or using the **monitor event-trace**command in global configuration mode. To disable event tracing, you would enter either of these commands with the **disable** keyword. To enable event tracing again, you would enter either of these commands with the **enable** keyword.

To determine whether you can enable event tracing on a subsystem, use the **monitor event-trace ?** command to get a list of software components that support event tracing. To determine whether event tracing is enabled by default for the subsystem, use the **show monitor event-trace** command to display trace messages.

Use the **show monitor event-trace** command to display trace messages. Use the **monitor event-trace** *facility* **dump** command to save trace message information for a single event. By default, trace information is saved in binary format. If you want to save trace messages in ASCII format, for additional application processing, use the **monitor event-trace** *facility* **dump pretty** command.

To write the trace messages for all events that are currently enabled on a networking device to a file, enter the **monitor event-trace dump** command.

To configure the file to which you want to save trace information, use the **monitor event-trace** command in global configuration mode. The trace messages are saved in a binary format.

Examples

The following example shows the privileged EXEC commands to stop event tracing, clear the current contents of memory, and reenable the trace function for the interprocess communication (IPC) component. This example assumes that the tracing function is configured and enabled on the networking device.

```
Device# monitor event-trace ipc disable
Device# monitor event-trace ipc clear
Device# monitor event-trace ipc enable
```

Examples

The following example shows how the **monitor event-trace one-shot** command accomplishes the same function as the previous example except in one command. In this example, once the size of the trace message file has been exceeded, the trace is terminated.

```
Device# monitor event-trace ipc one-shot
```

Examples

The following example shows the command for writing trace messages for an event in binary format. In this example, the trace messages for the IPC component are written to a file.

```
Device# monitor event-trace ipc dump
```

Examples

The following example shows the command for writing trace messages for an event in ASCII format. In this example, the trace messages for the MBUS component are written to a file.

```
Device# monitor event-trace mbus dump pretty
```

Examples

This example shows how to stop event tracing, clear the current contents of memory, and reenable the trace function for the SPA component. This example assumes that the tracing function is configured and enabled on the networking device.

```
Device# monitor event-trace spa disable
Device# monitor event-trace spa clear
Device# monitor event-trace spa enable
```

Related Commands

Command	Description
monitor event-trace (global)	Configures event tracing for a specified Cisco software subsystem component.
monitor event-trace dump-traces	Saves trace messages for all event traces currently enabled on the networking device.
show monitor event-trace	Displays event trace messages for Cisco software subsystem components.

monitor event-trace (global)

To configure event tracing for a specified Cisco IOS software subsystem component, use the **monitor event-trace** command in global configuration mode.

monitor event-trace *facility* [**dump-file** *WORD*| {**exclude| include**} *subset1* [*subset2 ...*]| **size** *numbers* | **stacktrace** [*depth*]]

Syntax Description

facility	Name of the Cisco IOS software subsystem component that is the subject of the event trace. To get a list of components that support event tracing, use the **monitor event-trace ?** command. The facility may consist of multiple keywords (for example, **monitor event-trace atom event** ...).
disable	Disables event tracing for the specified component.
dump-file *WORD*	Specifies the file where event trace messages are written from memory on the networking device. The maximum length of the filename (path and filename) is 100 characters, and the path can point to flash memory on the networking device or to a TFTP or FTP server.
exclude *subset1* [*subset2...]*	Excludes a subset of debug types.
include *subset1* [*subset2...]*	Includes a subset of debug types.
size *numbers*	Sets the number of messages that can be written to memory for a single instance of a trace. Valid values are from1 to 65536. Note that some Cisco IOS software subsystem components set the size by default. To display the size parameter, use the **show monitor event-trace** *component* **parameters** command. When the number of event trace messages in memory exceeds the configured size, new messages will begin to overwrite the older messages in the file.
stacktrace*[depth]*	Enables the stack trace at tracepoints and specifies the depth of the stack trace stored. Valid values are from 1 to 16.

Command Default

Event tracing is enabled or disabled depending on the software component.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Release 3.7S	This command was introduced as part of the Multiprotocol Label Switching (MPLS)-based Layer 2 VPN (L2VPN) command modifications for cross-OS support.
15.3(1)S	This command was integrated in Cisco IOS Release 15.3(1)S.
15.3(2)S	This command was integrated in Cisco IOS Release 15.3(2)S.
Cisco IOS XE Release 3.9S	This command was integrated in Cisco IOS XE Release 3.9S.

Usage Guidelines

Use the **monitor event-trace** command to enable or disable event tracing and to configure event trace parameters for Cisco IOS software subsystem components.

Note Event tracing is intended for use as a software diagnostic tool and should be configured only under the direction of a Technical Assistance Center (TAC) representative. In Cisco IOS software images that do not provide subsystem support for the event trace function, the **monitor event-trace** command is not available.

The Cisco IOS software allows the subsystem components to define whether support for event tracing is enabled or disabled by default. The command interface for event tracing allows you to change the default two ways: using the **monitor event-trace** command in privileged EXEC mode or using the **monitor event-trace** command in global configuration mode.

Additionally, default settings do not show up in the configuration file. If the subsystem software enables event tracing by default, the **monitor event-trace** *component* **enable** command does not show up in the configuration file of the networking device; however, disabling event tracing that has been enabled by default by the subsystem creates a command entry in the configuration file.

Note The amount of data collected from the trace depends on the trace message size configured using the **monitor event-trace** command for each instance of a trace.

To determine whether you can enable event tracing on a subsystem, use the **monitor event-trace ?** command to get a list of software components that support event tracing.

To determine whether event tracing is enabled by default for the subsystem, use the **show monitor event-trace** command to display trace messages.

To specify the trace call stack at tracepoints, you must first clear the trace buffer.

Examples

The following example shows how to enable event tracing for the interprocess communication (IPC) subsystem component in Cisco IOS software and configure the size to 4096 messages. The trace messages file is set to ipc-dump in slot0 (flash memory).

```
Device> configure terminal
Device# monitor event-trace ipc enable

Device# monitor event-trace ipc dump-file slot0:ipc-dump

Device# monitor event-trace ipc size 4096
```

Examples

When you select Cisco Express Forwarding as the component for which to enable event tracing, you can use the following additional arguments and keywords: **monitor event-trace cef** [**events** | **interface** | **ipv6** | **ipv4**] [**all**]

The following example shows how to enable event tracing for IPv4 or IPv6 events of the Cisco Express Forwarding component in Cisco IOS software:

```
Device> configure terminal
Device# monitor event-trace cef ipv4 enable

Device> configure terminal
Device# monitor event-trace cef ipv6 enable
```

Examples

The following example shows what happens when you try to enable event tracing for a component (in this case, adjacency events) when it is already enabled:

```
Device> configure terminal
Device# monitor event-trace adjacency enable
%EVENT_TRACE-6-ENABLE: Trace already enabled.
```

Related Commands

Command	Description
monitor event-trace (EXEC)	Controls the event trace function for a specified Cisco IOS software subsystem component.
monitor event-trace dump-traces	Saves trace messages for all event traces currently enabled on the networking device.
show monitor event-trace	Displays event trace messages for Cisco software subsystem components.

monitor peer bfd

To enable pseudowire fast-failure detection capability in a bidirectional forwarding detection (BFD) configuration, use the **monitor peer bfd** command in the appropriate configuration mode. To disable pseudowire fast-failure detection, use the **no** form of this command.

monitor peer bfd [**local interface** *interface-type*]

no monitor peer bfd [**local interface**]

Syntax Description

local interface *interface-type*	(Optional) Specifies the local interface for the source address to use when locating a BFD configuration.

Command Default

Pseudowire fast-failure detection is disabled.

Command Modes

Interface configuration (config-if)

Pseudowire class configuration (config-pw-class)

Template configuration (config-template)

Command History

Release	Modification
15.1(3)S	This command was introduced.
Cisco IOS XE Release 3.6S	This command was integrated into a release prior to Cisco IOS XE Release 3.6S.
Cisco IOS XE Release 3.7S	This command was modified as part of the MPLS-based Layer 2 VPN (L2VPN) command modifications for cross-OS support. This command was made available in interface configuration and template configuration modes.

Examples

The following example shows how to enable pseudowire fast-failure detection capability:

```
Device(config)# interface Loopback0
Device(config-if)# ip address 10.1.1.1 255.255.255.255
Device(config-if)# exit
Device(config)# pseudowire-class mpls
Device(config-pw-class)# encapsulation mpls
Device(config-pw-class)# monitor peer bfd local interface Loopback0
```

The following example shows how to enable pseudowire fast-failure detection capability in interface configuration mode:

```
Device(config)# interface pseudowire 100
Device(config-if)# encapsulation mpls
Device(config-if)# monitor peer bfd local interface gigabitethernet0/0/0
```

The following example shows how to enable pseudowire fast-failure detection capability in template configuration mode:

```
Device(config)# template type pseudowire 1
Device(config-template)# encapsulation mpls
Device(config-template)# monitor peer bfd local interface gigabitethernet0/0/0
```

Related Commands

Command	Description
bfd map	Configures a BFD map that associates timers and authentication with multihop templates.
bfd-template	Creates a BFD template and enters BFD configuration mode.
encapsulation (Any Transport over MPLS)	Configures the AAL encapsulation for AToM.
encapsulation (pseudowire)	Specifies an encapsulation type for tunneling Layer 2 traffic over a pseudowire.
pseudowire-class	Specifies the name of a Layer 2 pseudowire class.

mpls atm control-vc

Note Effective with Cisco IOS Release 12.4(20)T, the **mpls atm control-vc** command is not available in Cisco IOS software.

To configure the control-VC virtual path identifier (VPI) and virtual circuit identifier (VCI) values for the initial link to the Multiprotocol Label Switching (MPLS) peer, use the **mpls atm control-vc** command in interface configuration mode. To unconfigure the values, use the **no** form of this command.

mpls atm control-vc *vpi vci*

no mpls atm control-vc *vpi vci*

Syntax Description

vpi	Virtual path identifier, in the range of 0 to 4095.
vci	Virtual circuit identifier, in the range of 0 to 65535.

Command Default

0/32

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.2(4)T	This command was updated to reflect the MPLS IETF terminology. The VPI range of values was extended to 4095.
12.4(20)T	This command was removed.

Usage Guidelines

Use this command to establish the LDP session and to carry non-IP traffic. The default VPI VCI for the control VC is (0, 32). If for any reason you need to have a different control-VC, use the **mpls atm control-vc** command to configure any VPI VCI allowed by the vpi and vci arguments for the control VC.

Examples

The following example shows how to create an MPLS subinterface on a router and select VPI 1 and VCI 34 as the control VC:

```
Router(config)# interface atm4/0.1 mpls
```

```
Router(config-if)# mpls ip
Router(config-if)# mpls atm control-vc 1 34
```

Related Commands

Command	Description
mpls ip (interface)	Enables label switching of IPv4 packets on an interface.

mpls atm cos

Note Effective with Cisco IOS Release 12.4(20)T, the **mpls atm cos** command is not available in Cisco IOS software.

To change the configured bandwidth allocation for class of service (CoS), use the **mpls atm cos** command in global configuration mode.

mpls atm cos {**available**| **standard**| **premium**| **control**} *weight*

Syntax Description

available	The weight for the available class. This is the lowest class priority.
standard	The weight for the standard class. This is the next lowest class priority.
premium	The weight for the premium class. This is the next highest class priority.
control	The weight for the control class. This is the highest class priority.
weight	The total weight for all CoS traffic classes. The range is 0 to 100.

Command Default

Available 50%, control 50%

Command Modes

Global configuration (config)

Command History

Release	Modifications
12.0(5)T	This command was introduced.
12.2(4)T	This command was updated to reflect the MPLS IETF terminology.
12.4(20)T	This command was removed.

Examples

The following example shows how to configure the XTagATM interface for CoS traffic:

```
Router(config)# interface xtagatm12
Router(config-if)# extended-port atm1/0 descriptor 1.2
Router(config-if)# mpls ip
Router(config-if)# mpls atm cos available 49
Router(config-if)# mpls atm cos standard 50
Router(config-if)# mpls atm cos premium 0
Router(config-if)# mpls atm cos control 1
```

mpls atm disable-headend-vc

Note Effective with Cisco IOS Release 12.4(20)T, the **mpls atm disable-headend-vc** command is not available in Cisco IOS software.

To remove all headend virtual circuits (VCs) from the Multiprotocol Label Switching (MPLS) Label Switch Controller (LSC) and disable its ability to function as an edge label switch router (LSR), use the **mpls atm disable-headend-vc** command in global configuration mode. To restore the headend VCs of the MPLS LSC and restore full edge LSR functionality, use the **no** form of this command.

mpls atm disable-headend-vc

no mpls atm disable-headend-vc

Syntax Description

This command has no arguments or keywords.

Command Default

Edge LSR is enabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.0(7)DC	This command was introduced.
12.2(4)T	This command was updated to reflect the MPLS IETF terminology.
12.4(20)T	This command was removed.

Usage Guidelines

This command prevents the LSC from initiating headend label VCs (LVCs), and thus reduces the number of LVCs used in the network.

Examples

The following example shows how to disable the MPLS LSC from acting like an edge LSR and therefore cannot create headend LVCs:

```
mpls atm disable-headend-vc
```

mpls atm multi-vc

Note Effective with Cisco IOS Release 12.4(20)T, the **mpls atm multi-vc** command is not available in Cisco IOS software.

To configure a router subinterface to create one or more label virtual circuits (VCs) over which packets of different classes are sent, use the **mpls atm multi-vc** command in ATM subinterface submode. To remove the label virtual circuits, use the **no** form of this command.

mpls atm multi-vc

no mpls atm multi-vc

Syntax Description

This command has no arguments or keywords.

Command Modes

ATM subinterface submode (config-subif)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(10)ST	This command was modified to reflect Multiprotocol Label Switching (MPLS) Internet Engineering Task Force (IETF) syntax and terminology.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.4(20)T	This command was removed.

Usage Guidelines

This command is valid only on ATM MPLS subinterfaces.

Examples

The following example shows how to configure interface ATM2/0/0.1 on the networking device for MPLS quality of service (QoS) multi-VC mode:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface ATM2/0/0.1 mpls

Router(config-subif)# mpls atm multi-vc
Router(config-subif)# exit
Router(config)# exit
```

Related Commands

Command	Description
mpls cos-map	Creates a class map that specifies how classes map to label virtual circuits when they are combined with a prefix map.
mpls prefix-map	Configures a networking device to use a specified QoS map when a label destination prefix matches the specified access list.

mpls atm vpi

Note Effective with Cisco IOS Release 12.4(20)T, the **mpls atm vpi** command is not available in Cisco IOS software.

To configure the range of values to use in the virtual path identifier (VPI) field for label virtual circuits (LVCs), use the **mpls atm vpi** command in interface configuration mode. To clear the range of values, use the **no** form of this command.

mpls atm vpi *vpi*[*-high*][**vci-range** *low-high*]

no mpls atm vpi *vpi*[*-high*][**vci-range** *low-high*]

Syntax Description

vpi	Virtual path identifier, low end of range (0 to 4095).
- vpi	(Optional) Virtual path identifier, high end of range (0 to 4095).
vci-range *low - high*	(Optional) Range of virtual channel identifier (VCI) values the subinterface can use for the VPI(s).

Command Default

The default VPI range is 1-1.

The default VCI range is 33-65535.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.2(4)T	This command was updated to reflect the MPLS IETF terminology. The **vci-range** keyword was added. The VPI range of values was extended to 4095.
12.4(20)T	This command was removed.

Usage Guidelines

You might need to change the default VPI range on the switch if:

- It is an administrative policy to use a VPI value other than 1, the default VPI.

- There are many LVCs on an interface.

To configure ATM MPLS on a router interface (for example, an ATM Interface Processor), you must enable an MPLS subinterface.

Note The **mpls atm control-vc** and the **mpls atm vpi** subinterface level configuration commands are available on any interface that can support ATM labeling.

Use this command to select an alternate range of VPI values for ATM label assignment on this interface. The two ends of the link negotiate a range defined by the intersection of the range configured at each end.

- To configure the VPI range for an edge label switch router (edge LSR) subinterface connected to another router or to an LSC, limit the range to four VPIs.
- For an ATM-LSR, the VPI range specified must lie within the range that was configured on the ATM switch for the corresponding ATM switch interface.
- If the LDP neighbor is a router, the VPI range can be no larger than two. For example, you can specify from 5 to 6 (a range of two), not 5 to 7 (a range of three). If the LDP neighbor is a switch, the maximum VPI range is 0 to 255.

If you use the **vci-range** keyword, you must specify a VPI value.

Examples

The following example shows how to create a subinterface and selects a VPI range from VPI 1 to VPI 3:

```
Router(config)# interface atm4/0.1 mpls
Router(config-if)# mpls ip
Router(config-if)# mpls atm vpi 1-3
```

The following example shows how to create a subinterface with a VPI of 240 and a VCI range between 33 and 4090:

```
Router(config)# interface atm4/0.1 mpls
Router(config-if)# mpls ip
Router(config-if)# mpls atm vpi 240 vci-range 33-4090
```

Related Commands

Command	Description
mpls atm control-vc	Configures VPI and VCI values for the initial link to an MPLS peer.

mpls atm vp-tunnel

Note Effective with Cisco IOS Release 12.4(20)T, the **mpls atm vp-tunnel** command is not available in Cisco IOS software.

To specify an interface or a subinterface as a virtual path (VP) tunnel, use the **mpls atm vp-tunnel** command in interface configuration mode. To remove the VP tunnel from an interface or subinterface, use the **no** form of this command.

mpls atm vp-tunnel *vpi*[**vci-range** *low-high*]

no mpls atm vp-tunnel *vpi*[**vci-range** *low-high*]

Syntax Description

vpi	Virtual path identifier (VPI) value for the local end of the tunnel (0 to 4095).
vci-range *low-high*	(Optional) Range of virtual channel identifier (VCI) values the VP tunnel can use.

Command Default

If you do not specify a VCI range for the VP tunnel, the tunnel uses the default VCI range of 33-65535.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.2(4)T	This command was updated to reflect the Multiprotocol Label Switching (MPLS) Internet Engineering Task Force (IETF) terminology. The **vci-range** keyword was added. The VPI range of values was extended to 4095.
12.4(20)T	This command was removed.

Usage Guidelines

The **mpls atm vp-tunnel** and the **mpls atm vpi** commands are mutually exclusive.

This command is available on both extended MPLS ATM (XTagATM) interfaces and on LC-ATM subinterfaces of router ATM interfaces. The command is not available on the LS1010, where all subinterfaces are automatically VP tunnels.

It is not necessary to use the **mpls atm vp-tunnel** command on an XTagATM interface in most applications. The switch learns (through VSI interface discovery) whether the XTagATM interface is a tunnel, the VPI value of the tunnel, and tunnel status.

Examples

The following example shows how to create an MPLS subinterface VP tunnel with a VPI value of 4:

```
Router(config-if)# mpls atm vp-tunnel 4
```

The following example shows how to create a VP tunnel with a value of 240 and a VCI range of 33 to 4090:

```
Router(config-if)# mpls atm vp-tunnel 240 vci-range 33-4090
```

mpls bgp forwarding

To enable an interface to receive Multiprotocol Label Switching (MPLS) packets when the signaling of MPLS labels is through the use of the Border Gateway Protocol (BGP), use the **mpls bgp forwarding** command in interface configuration mode. To disable this configuration, use the **no** form of this command.

mpls bgp forwarding

no mpls bgp forwarding

Syntax Description

This command has no arguments or keywords.

Command Default

MPLS forwarding by BGP is not enabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.

Usage Guidelines

Use the **mpls bgp forwarding** command when you want to enable MPLS forwarding on directly connected loopback interfaces. This command is automatically generated by BGP for directly connected nonloopback neighbors.

Examples

The following example shows how to configure BGP to enable MPLS forwarding on a directly connected loopback interface, Ethernet 0/0:

```
interface ethernet 0/0
 mpls bgp forwarding
```

Related Commands

Command	Description
ip vrf forwarding	Associates a VRF with an interface or subinterface.

mpls control-word

To enable the Multiprotocol Label Switching (MPLS) control word in an Any Transport over MPLS (AToM) static pseudowire connection, use the**mpls control-word** command in xconnect configuration mode. To disable the control word, use the **no** form of this command.

mpls control-word

no mpls control-word

Syntax Description

This command has no arguments or keywords.

Command Default

The control word is included in connections.

Command Modes

Xconnect configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

This command is used when configuring AToM static pseudowires, and is mandatory when configuring Frame Relay data-link connection identifier (DLCI) and ATM adaptation layer 5 (AAL5) attachment circuits.

Because the control word is included by default, it may be necessary to explicitly disable this command in AToM static pseudowire configurations.

When the **mpls control-word** command is used in static pseudowire configurations, the command must be configured the same way on both ends of the connection to work correctly, or else the provider edge routers will not be able to exchange control messages to negotiate inclusion or exclusion of the control word.

Examples

The following example shows the configuration for both sides of an AToM static pseudowire connection:

```
Router# configure terminal
Router(config)# interface Ethernet 1/0
Router(config-if)# xconnect 10.131.191.251 100 encapsulation mpls manual pw-class mpls
Router(config-if-xconn)# mpls label 100 150
Router(config-if-xconn)# no mpls control-word
Router(config-if-xconn)# exit
Router(config-if)# exit
Router# configure terminal
Router(config)# interface Ethernet 1/0
Router(config-if)# xconnect 10.132.192.252 100 encapsulation mpls manual pw-class mpls
Router(config-if-xconn)# mpls label 150 100
Router(config-if-xconn)# no mpls control-word
Router(config-if-xconn)# exit
Router(config-if)# exit
```

Related Commands

Command	Description
mpls label	Configures an AToM static pseudowire connection by defining local and remote pseudowire labels.
mpls label range	Configures the range of local labels available for use on packet interfaces.
show mpls l2transport vc	Displays information about AToM VCs and AToM static pseudowires that have been enabled to route Layer 2 packets on a router.
xconnect	Binds an attachment circuit to a pseudowire, and configures an AToM static pseudowire.

mpls cos-map

Note Effective with Cisco IOS Release 12.4(20)T, the **mpls cos-map** command is not available in Cisco IOS software.

To create a class map that specifies how classes map to label virtual circuits (VCs) when they are combined with a prefix map, use the **mpls cos-map** command in global configuration mode.

mpls cos-map *cos-map*

Syntax Description

cos-map	Number from 1 to 155 that identifies the class map.

Command Default

No class maps are specified.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(10)ST	This command was modified to reflect Multiprotocol Label Switching (MPLS) Internet Engineering Task Force (IETF) syntax and terminology.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.4(20)T	This command was removed.

Examples

The following example shows how to create a class map:

```
Router(config)# mpls cos-map 55
Router(config-mpls-cos-map)# class 1 premium
Router(config-mpls-cos-map)# exit
Router(config)#
```

Related Commands

Command	Description
mpls cos-map	Displays the QoS map used to assign a quantity of label virtual circuits and the associated class of service for those label virtual circuits.

mpls experimental

To configure Multiprotocol Label Switching (MPLS) experimental (EXP) levels for a virtual circuit (VC) class that can be assigned to a VC bundle and thus applied to all VC members of that bundle, use the **mplsexperimental**command in VC-class configuration mode. To remove the MPLS EXP levels from the VC class, use the **no** form of this command.

To configure the MPLS EXP levels for a VC member of a bundle, use the **mplsexperimental**command in bundle-vc configuration mode. To remove the MPLS EXP levels from the VC, use the **no** form of this command.

mpls experimental [**other**| *range*]

no mpls experimental

Syntax Description

other	(Optional) Specifies any MPLS EXP levels in the range from 0 to 7 that are not explicitly configured. This is the default.
range	(Optional) A single MPLS EXP level specified as a number from 0 to 7, or a range of levels, specified as a hyphenated range.

Command Default

Defaults to **other**, that is, any MPLS EXP levels in the range from 0 to 7 that are not explicitly configured.

Command Modes

VC-class configuration for a VC class (config-vc-class) Bundle-vc configuration for ATM VC bundle members (config-if-atm-member)

Command History

Release	Modification
12.2(8)T	This command was introduced.
12.0(26)S	This command was implemented on the Cisco 10000 series router.
12.0(29)S	This command was integrated into Cisco IOS Release 12.0(29)S.
12.2(16)BC	This command was implemented on the ESR-PRE2.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.

Usage Guidelines

Assignment of MPLS EXP levels to VC bundle members allows you to create differentiated service because you can distribute the MPLS EXP levels over the different VC bundle members. You can map a single level

or a range of levels to each discrete VC in the bundle, thereby enabling VCs in the bundle to carry packets marked with different levels. Alternatively, you can configure a VC with the **mplsexperimentalother** command to indicate that it can carry traffic marked with levels not specifically configured for it. Only one VC in the bundle can be configured with the **mplsexperimentalother** command to carry all levels not specified. This VC is considered the default one.

To use this command in VC-class configuration mode, enter the **vc-classatm** global configuration command before you enter this command. This command has no effect if the VC class that contains the command is attached to a standalone VC, that is, if the VC is not a bundle member.

To use this command to configure an individual bundle member in bundle-VC configuration mode, first enter the **bundle** command to enact bundle configuration mode for the bundle to which you want to add or modify the VC member to be configured. Then use the **pvc-bundle** command to specify the VC to be created or modified and enter bundle-VC configuration mode.

VCs in a VC bundle are subject to the following configuration inheritance guidelines (listed in order of next highest MPLS EXP level):

- VC configuration in bundle-VC mode
- Bundle configuration in bundle mode (with the effect of assigned VC class configuration)
- Subinterface configuration in subinterface mode

Note If you are using an ATM interface, you must configure all MPLS EXP levels (ranging from 0 to 7) for the bundle. For this configuration, Cisco recommends configuring one member of the bundle with the **mplsexperimentalother** command. The **other** keyword defaults to any MPLS EXP level in a range from 0 to 7 that is not explicitly configured.

Examples

The following example configures a class named control-class that includes an **mplsexperimental**command that, when applied to a bundle, configures all VC members of that bundle to carry MPLS EXP level 7 traffic. Note that VC members of that bundle can be individually configured with the **mplsexperimental**command at the bundle-vc level, which would supervene.

```
vc-class atm control-class
 mpls experimental 7
```

The following example configures a permanent virtual circuit (PVC) 401, named control-class, to carry traffic with MPLS EXP levels in the range of 4 to 2, overriding the level mapping set for the VC through VC-class configuration:

```
pvc-bundle control-class 401
 mpls experimental 4-2
```

Related Commands

Command	Description
bump	Configures the bumping rules for a VC class that can be assigned to a VC bundle.
bundle	Creates a bundle or modifies an existing bundle, and enters bundle configuration mode.

Command	Description
class-vc	Assigns a VC class to an ATM PVC, SVC, or VC bundle member.
protect	Configures a VC class with protected group or protected VC status for application to a VC bundle member.
pvc-bundle	Adds a VC to a bundle as a member and enters bundle-VC configuration mode to configure that VC bundle member.
ubr	Configures UBR QoS and specifies the output peak cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
vbr-nrt	Configures the VBR-nrt QoS and specifies the output peak cell rate, output sustainable cell rate, and output maximum burst cell size for an ATM PVC, SVC, VC class, or VC bundle member.
vc-class atm	Creates a VC class for an ATM PVC, SVC, or ATM interface, and enters VC-class configuration mode.

mpls export interval

To configure the collection and export of Multiprotocol Label Switching (MPLS) Prefix/Application/Label (PAL) information to a NetFlow collector, use the **mpls export interval** command in global configuration mode. To disable the collecting and exporting of the MPLS PAL information, use the **no** form of this command.

mpls export interval *minutes*

no mpls export interval

Syntax Description

minutes	Time interval, in minutes, between full MPLS PAL table exports. The range is 0 to 10080.

Command Default

No capture or export of PAL table entries is configured.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(28)SB	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.0(1)M	This command was integrated into a release earlier than Cisco IOS Release 15.0(1)M.

Usage Guidelines

Use the **mpls export interval** command to configure the collection and export of MPLS PAL information to a NetFlow collector. The collector can be the Cisco NetFlow Collection Engine or a third-party collector application.

The *minutes*argument specifies the number of minutes between one export of the entire MPLS PAL table and the next export of the entire table. We recommend that you select a time interval from 360 minutes (6 hours) to 1440 minutes (24 hours) depending on the size of your network. If you want to trigger an immediate export of the PAL table, disable the functionality (**no mpls export interval** command) and reconfigure the command with the *minutes* argument greater than zero.

If you enter the command with a periodic interval of zero, entries of the MPLS PAL table are not exported repeatedly, but PAL label tracking still occurs and PAL information is exported to the collector when a label is allocated. To display the entire MPLS PAL table, use the **show mpls flow mappings** command.

The *minutes* argument that you specify is the least amount of time that passes before another export of the MPLS PAL table. The system might choose to delay the MPLS PAL table export, if the PAL export queue already contains a large number of entries. This might occur if the export queue contains tens of thousands of entries, for example, if the export occurred at a time when thousands of routes just came up, or if NetFlow did not have the time to clear the export queue from either a previous export of the full table or a previous time when thousands of routes came up in a brief period.

Examples

The following example shows how to configure a time interval of 720 minutes (12 hours) between exports of the entire MPLS PAL table to a NetFlow collector:

```
Router> enable
Router# configure terminal
Router(config)# mpls export interval 720
Router(config)# exit
```

Related Commands

Command	Description
mpls export vpnv4 prefixes	Configures the tracking and export of VPNv4 label information from the MPLS PAL table to a NetFlow collector.
show mpls flow mappings	Displays all entries in the MPLS PAL table.

mpls export vpnv4 prefixes

To configure the tracking and export of VPN IPv4 (VPNv4) label information from the Multiprotocol Label Switching (MPLS) Prefix/Application/Label (PAL) table to a NetFlow collector, use the **mpls export vpnv4 prefixes** command in global configuration mode. To disable the tracking and exporting of VPNv4 label information, use the **no** form of this command.

mpls export vpnv4 prefixes

no mpls export vpnv4 prefixes

Syntax Description

This command has no arguments or keywords.

Command Default

VPNv4 labels are exported from the MPLS PAL table with a destination prefix of 0.0.0.0.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(28)SB	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.0(1)M	This command was integrated into a release earlier than Cisco IOS Release 15.0(1)M.

Usage Guidelines

Use the **mpls export vpnv4 prefixes** command to enable the tracking and export of VPNv4 label information from the MPLS PAL table.

In MPLS PAL table records, the default prefix stored for labels allocated by VPNs, Border Gateway Protocol (BGP) IPv4, or BGP VPNv4 is intentionally 0.0.0.0 because VPN prefixes may be reused; other VPNs may use the same prefix.

If you configure the **mpls export vpnv4 prefixes** command, the MPLS PAL table stores the VPN prefix and its associated route distinguisher (RD). The use of an RD removes any ambiguity among VPN prefixes. Even if IP addresses are reused, the addition of an RD creates a unique prefix.

Examples

The following example shows how to configure the tracking and exporting of VPNv4 label information from the MPLS PAL table to a NetFlow collector:

```
Router> enable
Router# configure terminal
Router(config)# mpls export interval 720
Router(config)# mpls export vpnv4 prefixes
Router(config)# exit
```

The full MPLS PAL table with MPLS VPNv4 label information is configured to export to the NetFlow collector every 720 minutes (12 hours).

Related Commands

Command	Description
mpls export interval	Configures the collection and export of MPLS PAL information to a NetFlow collector.
show mpls flow mappings	Displays all entries in the MPLS PAL table.

mpls forwarding bgp

To enable Multiprotocol Label Switching (MPLS) nonstop forwarding on an interface that uses Border Gateway Protocol (BGP) as the label distribution protocol, use the **mpls forwarding bgp** command in interface configuration mode. To disable MPLS nonstop forwarding on the interface, use the **no** form of this command.

mpls forwarding bgp

no mpls forwarding bgp

Syntax Description

This command has no arguments or keywords.

Command Default

MPLS nonstop forwarding is not enabled on the interface.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(25)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series router.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Configure this command on the interfaces of the BGP peers that send and receive labels. If this command is not configured on an interface and a stateful switchover occurs, packets received from an interface are dropped until the BGP session is established in the new route processor.

Issue this command to enable nonstop forwarding on interfaces that use BGP to distribute labels for the following types of VPNs:

- MPLS VPN--Carrier Supporting Carrier--IPv4 BGP Label Distribution
- MPLS VPN--Inter-AS--IPv4 BGP Label Distribution

Examples

In the following examples, an interface is configured to save BGP labels in the event of a stateful switchover:

Examples

```
Router(config)# interface Pos1/0
Router(config-if)# mpls forwarding bgp
```

Examples

```
Router(config)# interface Pos1/0/0
Router(config-if)# mpls forwarding bgp
```

Related Commands

Command	Description
bgp graceful-restart	Enables BGP Graceful Restart on the router.

mpls ip (global configuration)

To enable Multiprotocol Label Switching (MPLS) forwarding of IPv4 packets along normally routed paths for the platform, use the **mpls ip** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ip

no mpls ip

Syntax Description

This command has no arguments or keywords.

Command Default

Label switching of IPv4 packets along normally routed paths is enabled for the platform.

Command Modes

Global configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
12.0(14)ST	This command was integrated into Cisco IOS Release 12.0(14)ST.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000-PRE2 router.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.1(2)SNG	This command was integrated into Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

MPLS forwarding of IPv4 packets along normally routed paths (sometimes called dynamic label switching) is enabled by this command. For a given interface to perform dynamic label switching, this switching function must be enabled for the interface and for the platform.

The **no** form of this command stops dynamic label switching for all platform interfaces regardless of the interface configuration; it also stops distribution of labels for dynamic label switching. However, the no form of this command does not affect the sending of labeled packets through label switch path (LSP) tunnels.

For an LC-ATM interface, the **no** form of this command prevents the establishment of label virtual circuits (LVCs) originating at, terminating at, or passing through the platform.

Examples

The following example shows that dynamic label switching is disabled for the platform, and all label distribution is terminated for the platform:

```
Router(config)# no mpls ip
```

Related Commands

Command	Description
mpls ip (interface configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for the associated interface.

mpls ip (interface configuration)

To enable Multiprotocol Label Switching (MPLS) forwarding of IPv4 packets along normally routed paths for a particular interface, use the **mpls ip** command in interface configuration mode. To disable this configuration, use the **no** form of this command.

mpls ip

no mpls ip

Syntax Description

This command has no arguments or keywords.

Command Default

MPLS forwarding of IPv4 packets along normally routed paths for the interface is disabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.0(10)ST	This command was introduced.
12.0(14)ST	This command was integrated into Cisco IOS Release 12.0(14)ST.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000-PRE2 router.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.
15.1(2)SNG	This command was integrated into Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

MPLS forwarding of IPv4 packets along normally routed paths is sometimes called dynamic label switching. If dynamic label switching has been enabled for the platform when this command is issued on an interface, label distribution for the interface begins with the periodic transmission of neighbor discovery Hello messages on the interface. When the outgoing label for a destination routed through the interface is known, packets for the destination are labeled with that outgoing label and forwarded through the interface.

The **no** form of this command causes packets routed out through the interface to be sent unlabeled; this form of the command also terminates label distribution for the interface. However, the no form of the command does not affect the sending of labeled packets through any link-state packet (LSP) tunnels that might use the interface.

For an LC-ATM interface, the **no** form of this command prevents the establishment of label virtual circuits (LVCs) beginning at, terminating at, or passing through the interface.

Examples

The following example shows how to enable label switching on the specified Ethernet interface:

```
Router(config)# configure terminal
Router(config-if)# interface e0/2
Router(config-if)# mpls ip
```

The following example shows that label switching is enabled on the specified vlan interface (SVI) on a Cisco ASR 901 series router:

```
Router(config)# configure terminal
Router(config-if)# interface vlan 1
Router(config-if)# mpls ip
```

Related Commands

Command	Description
mpls ldp maxhops	Limits the number of hops permitted in an LSP established by the downstream on demand method of label distribution.
show mpls interfaces	Displays information about one or more interfaces that have been configured for label switching.

mpls ip default-route

To enable the distribution of labels associated with the IP default route, use the **mpls ip default-route** command in global configuration mode.

mpls ip default-route

Syntax Description

This command has no arguments or keywords.

Command Default

No distribution of labels for the IP default route.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.1(3)T	This command was modified to reflect new Multiprotocol Label Switching (MPLS) Internet Engineering Task Force (IETF) terminology.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Dynamic label switching (that is, distribution of labels based on routing protocols) must be enabled before you can use the **mpls ip default-route** command.

Examples

The following example shows how to enable the distribution of labels associated with the IP default route:

```
Router# configure terminal
Router(config)# mpls ip
Router(config)# mpls ip default-route
```

Related Commands

Command	Description
mpls ip (global configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for the platform.
mpls ip (interface configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for a particular interface.

mpls ip encapsulate explicit-null

To encapsulate all packets forwarded from the interface or subinterface with an explicit NULL label header, use the **mpls ip encapsulate explicit-null** command in interface configuration or subinterface configuration mode. To disable this function, use the **no** form of this command.

mpls ip encapsulate explicit-null

no mpls ip encapsulate explicit-null

Syntax Description

This command has no arguments or keywords.

Command Default

Packets are sent out without an explicit NULL label header.

Command Modes

Interface configuration Subinterface configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.

Usage Guidelines

This is a per-interface command. The command establishes an explicit NULL LSP at the customer edge (CE) router. If MPLS is configured on a router and you enter this command, an error message occurs. This command is also supported on the Cisco 2600 series and Cisco 3600 series platforms.

Examples

The following example shows how to encapsulate all packets forwarded onto the interface or subinterface with an explicit NULL label header:

```
Router(config-if)# mpls ip encapsulate explicit-null
```

mpls ip propagate-ttl

To control the generation of the time-to-live (TTL) field in the Multiprotocol Label Switching (MPLS) header when labels are first added to an IP packet, use the **mpls ip propagate-ttl** command in global configuration mode. To use a fixed TTL value (255) for the first label of the IP packet, use the **no** form of this command.

mpls ip propagate-ttl

no mpls ip propagate-ttl [**forwarded**| **local**]

Syntax Description

forwarded	(Optional) Prevents the **traceroute** command from showing the hops for forwarded packets.
local	(Optional) Prevents the **traceroute** command from showing the hops only for local packets.

Command Default

This command is enabled. The TTL field is copied from the IP header. A traceroute command shows all of the hops in the network.

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.
12.1(5)T	The keywords **forwarded** and **local** were added to this command.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

By default, the **mpls ip propagate-ttl** command is enabled and the IP TTL value is copied to the MPLS TTL field during label imposition. To disable TTL propagation for all packets, use the **no mpls ip propagate-ttl** command. To disable TTL propagation for only forwarded packets, use the **no mpls ip propagate forwarded** command. Disabling TTL propagation of forwarded packets allows the structure of the MPLS network to be hidden from customers, but not the provider.

This feature supports the IETF draft document ICMP Extensions for Multiprotocol Label Switching, draft-ietf-mpls-label-icmp-01.txt. The document can be accessed at the following URL:

http://www2.ietf.org/internet-drafts/draft-ietf-mpls-label-icmp-01.txt

Examples

The following example shows how to disable the TTL field in the MPLS header for only forwarded packets:

```
Router(config)# no mpls ip propagate-ttl forwarded
```

Related Commands

Command	Description
traceroute	Displays the routes that packets take through a network to their destinations.

mpls ip ttl-expiration pop

To specify how a packet with an expired time-to-live (TTL) value is forwarded, use the **mpls ip ttl-expiration pop** command in global configuration mode. To disable this function, use the **no** form of this command.

mpls ip ttl-expiration pop *labels*

no mpls ip ttl-expiration pop *labels*

Syntax Description

labels	The maximum number of labels in the packet necessary for the packet to be forwarded by means of the global IP routing table.

Command Default

The packets are forwarded by the original label stack. However, in previous versions of Cisco IOS software, the packets were forwarded by the global routing table by default.

12.0S	Packets are forwarded through the use of the global routing table.
12.0ST	Packets are forwarded through the use of the original label stack.
12.1T	Packets are forwarded through the use of the original label stack.

Command Modes

Global configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

You can specify that the packet be forwarded by the global IP routing table or by the packet's original label stack. The forwarding method is determined by the number of labels in the packet. You specify the number of labels as part of the command. If the packet contains the same or fewer labels than you specified, it is

forwarded through the use of the global IP routing table. If the packet contains more labels than you specified, the packet is forwarded through the use of the original label stack.

This command is useful if expired TTL packets do not get back to their source, because there is a break in the Interior Gateway Protocol (IGP) path. Currently, MPLS forwards the expired TTL packets by reimposing the original label stack and forwarding the packet to the end of a label switched path (LSP). (For provider edge routers forwarding traffic over a Virtual Private Network (VPN), this is the only way to get the packet back to the source.) If there is a break in the IGP path to the end of the LSP, the packet never reaches its source.

If packets have a single label, that label is usually a global address or terminal VPN label. Those packets can be forwarded through the use of the global IP routing table. Packets that have more than one label can be forwarded through the use of the original label stack. Enter the **mpls ip ttl-expiration pop 1** command to enable forwarding based on more than one label. (This is the most common application of the command.)

Examples

The following example shows how to enable forwarding based on more than one label:

```
Router(config)# mpls ip ttl-expiration pop 1
```

Related Commands

Command	Description
traceroute	Displays the routes that packets take through a network to their destinations.

mpls ipv6 source-interface

Note Effective with Cisco IOS Release 12.2(25)S, the **mpls ipv6 source-interface** command is not available in Cisco IOS 12.2S releases. Effective with Cisco IOS Release 12.4(15)T, the **mpls ipv6 source-interface** command is not available in Cisco IOS 12.4T releases.

To specify an IPv6 address of an interface to be used as the source address for locally generated IPv6 packets to be sent over a Multiprotocol Label Switching (MPLS) network, use the **mpls ipv6 source-interface** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ipv6 source-interface *type number*

no mpls ipv6 source-interface

Syntax Description

type number	The interface type and number whose IPv6 address is to be used as the source for locally generated IPv6 packets to be sent over an MPLS backbone. **Note** A space between the *type* and *number* arguments is not required.

Command Default

This command is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.0(22)S	This command was introduced.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.2(20)S	This command was integrated into Cisco IOS Release 12.2(20)S.
12.2(25)S	This command was removed from Cisco IOS Release 12.2(25)S.
12.4(15)T	This command was removed from Cisco IOS Release 12.4(15)T.

Usage Guidelines

Use the **mpls ipv6 source-interface** command with the **neighbor send-label** address family configuration command to allow IPv6 traffic to run over an IPv4 MPLS network without any software or hardware configuration changes in the backbone. Edge routers, configured to run both IPv4 and IPv6, forward IPv6 traffic using MPLS and multiprotocol internal BGP (MP-iBGP).

The **mpls ipv6 source-interface** command was removed from Cisco IOS software as per RFC 3484, which defines how the source address of a locally generated packet must be chosen. This command will be removed from the other Cisco IOS release trains in which it currently appears.

Examples

The following example shows loopback interface 0 being configured as a source address for locally generated IPv6 packets :

```
interface Loopback0
 ip address 192.168.99.5 255.255.255.255
 ipv6 address 2001:0DB8::1/32
!
mpls ipv6 source-interface loopback0
```

Related Commands

Command	Description
neighbor send-label	Advertises the capability of the router to send MPLS labels with BGP routes.

mpls l2transport route

To enable routing of Any Transport over MPLS (AToM) packets over a specified virtual circuit (VC), use the **mpls l2transport route** command in the appropriate command mode. To delete the VC, use the **no** form of this command on both provider edge (PE) routers.

mpls l2transport route *destination vc-id*

no mpls l2transport route *destination vc-id*

Syntax Description

destination	Specifies the Label Distribution Protocol (LDP) IP address of the remote PE router.
vc-id	Assigns a VC number to the virtual circuit between two PE routers.

Command Default

Routing of MPLS packets over a specified VC is disabled.

Command Modes

Depending on the AToM transport type you are configuring, you use the **mpls l2transport route** command in one of the following command modes:

Transport Type	Command Mode
ATM AAL5 and cell relay	ATM VC configuration mode
Ethernet VLAN	Subinterface or interface configuration mode
Frame Relay	Connect submode
HDLC and PPP	Interface configuration mode

Command History

Release	Modification
12.1(8a)E	This command was introduced.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.

Release	Modification
12.2(14)SX	This command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	Support for this command on the Supervisor Engine 2 was extended to Cisco IOS Release 12.2(17d)SXB.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

A Multiprotocol Label Switching (MPLS) VC runs across an MPLS cloud to connect interfaces on two PE routers.

Use this command on each PE router to route packets across the MPLS cloud to the interface of the other PE router. Specify the LDP IP address of the other PE router for the destination parameter. Do not specify the IP address of the router from which you are issuing the command.

You can choose any number for the VC ID. However, the VC ID must be unique per pair of routers. Therefore, in large networks, it may be necessary to track the VC ID assignments to ensure that a VC ID does not get assigned twice.

Cisco 7600 Series Routers

Cisco 7600 series routers equipped with a Supervisor Engine 2 must be equipped with either an optical services module (OSM) or a FlexWAN port adapter that is facing the MPLS network with a Layer 2 Ethernet port (non-OSM) facing the customer.

The **mpls l2transport route** command enables the virtual connection used to route the VLAN packets. The types of virtual connections used are as follows:

- VC Type 4--Allows all the traffic in a VLAN to use a single VC across the MPLS network.
- VC Type 5--Allows all traffic on a port to share a single VC across the MPLS network.

During the VC setup, VC type 5 is advertised. If the peer advertises VC type 4, the VC type is changed to type 4 and the VC is restarted. The change only happens from type 5 to type 4 and never from type 4 to type 5.

An MPLS VLAN virtual circuit in Layer 2 runs across an MPLS cloud to connect the VLAN interfaces on two PE routers.

Use the mpls l2transport route command on the VLAN interface of each PE router to route the VLAN packets in Layer 2 across the MPLS cloud to the VLAN interface of the other PE router. Specify the IP address of the other PE router for the destination parameter. Do not specify the IP address of the router from which you are issuing the command.

You can choose any value for the virtual-connection ID. However, the virtual-circuit ID must be unique to each virtual connection. In large networks, you may need to track the virtual-connection ID assignments to ensure that a virtual-connection ID does not get assigned twice.

The routed virtual connections are supported on the main interfaces, not subinterfaces.

Examples The following examples show how to enable routing of MPLS packets over a specified VC. Two routers named PE1 and PE2 establish a VC to transport packets. PE1 has IP address 172.16.0.1, and PE2 has IP address 192.168.0.1. The VC ID is 50.

Examples At PE1, enter the following commands:

```
PE1_Router(config)# interface atm5/0.100
PE1_Router(config-if)# pvc ½00
PE1_Router(config-atm-vc)# encapsulation aal5
PE1_Router(config-atm-vc)# mpls l2transport route
 192.168.0.1 50
```

At PE2, enter the following commands:

```
PE2_Router(config)# interface atm5/0.100
PE2_Router(config-if)# pvc ½00
PE2_Router(config-atm-vc)# encapsulation aal5
PE2_Router(config-atm-vc)# mpls l2transport route 172.16.0.1 50
```

Examples At PE1, enter the following commands:

```
PE1_Router(config)# interface atm5/0.100
PE1_Router(config-if)# pvc ½00 l2transport
PE1_Router(config-atm-vc)# encapsulation aal0
PE1_Router(config-atm-vc)# mpls l2transport route
 192.168.0.1 50
```

At PE2, enter the following commands:

```
PE2_Router(config)# interface atm5/0.100
PE2_Router(config-if)# pvc ½00 l2transport
PE2_Router(config-atm-vc)# encapsulation aal0
PE2_Router(config-atm-vc)# mpls l2transport route 172.16.0.1 50
```

Examples At PE1, enter the following commands:

```
PE1_Router(config)# interface GigabitEthernet1/0.2
PE1_Router(config-subif)# encapsulation dot1Q 200
PE1_Router(config-subif)# mpls l2transport route 192.168.0.1 50
```

At PE2, enter the following commands:

```
PE2_Router(config)# interface GigabitEthernet2/0.1
PE2_Router(config-subif)# encapsulation dot1Q 200
PE2_Router(config-subif)# mpls l2transport route 172.16.0.1 50
```

Examples At PE1, enter the following commands:

```
PE1_Router(config)# connect frompls1 Serial5/0 1000 l2transport
PE1_Router(config-fr-pw-switching)# mpls l2transport route 192.168.0.1 50
```

At PE2, enter the following commands:

```
PE2_Router(config)# connect frompls2 Serial2/0 102 l2transport
PE2_Router(config-fr-pw-switching)# mpls l2transport route 172.16.0.1 50
```

Examples

At PE1, enter the following commands:

```
PE1_Router(config)# interface Serial3/0
PE1_Router(config-if)# encapsulation hdlc
PE1_Router(config-if)# mpls l2transport route 192.168.0.1 50
```

At PE2, enter the following commands:

```
PE2_Router(config)# interface Serial1/0
PE2_Router(config-if)# encapsulation hdlc
PE2_Router(config-if)# mpls l2transport route 172.16.0.1 50
```

Examples

At PE1, enter the following commands:

```
PE1_Router(config)# interface Serial3/0
PE1_Router(config-if)# encapsulation ppp
PE1_Router(config-if)# mpls l2transport route 192.168.0.1 50
```

At PE2, enter the following commands:

```
PE2_Router(config)# interface Serial1/0
PE2_Router(config-if)# encapsulation ppp
PE2_Router(config-if)# mpls l2transport route 172.16.0.1 50
```

Related Commands

Command	Description
show mpls l2transport vc	Displays information about AToM VCs that have been enabled to route Layer 2 packets on a router.

mpls label

To configure an Any Transport over MPLS (AToM) static pseudowire connection by defining local and remote circuit labels, use the **mpls label** command in xconnect configuration mode. To remove the local and remote pseudowire labels, use the **no** form of this command.

mpls label *local-pseudowire-label remote-pseudowire-label*

no mpls label

Syntax Description

local-pseudowire-label	An unused static label that is within the range defined by the **mpls label range** command.
remote-pseudowire-label	The value of the peer provider edge router's local pseudowire label.

Command Default

No default labels.

Command Modes

Xconnect configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

This command is mandatory when configuring AToM static pseudowires, and must be configured at both ends of the connection.

The **mpls label** command checks the validity of the local pseudowire label and will generate an error message if the label is invalid.

Examples

The following example shows configurations for both ends of an AToM static pseudowire connection:

```
Router# configure terminal
Router(config)# interface Ethernet 1/0
Router(config-if)# no ip address
Router(config-if)# xconnect 10.131.191.251 100 encapsulation mpls manual pw-class mpls
Router(config-if-xconn)# mpls label 100 150
Router(config-if-xconn)# exit
Router(config-if)# exit
Router# configure terminal
Router(config)# interface Ethernet 1/0
Router(config-if)# no ip address
Router(config-if)# xconnect 10.132.192.252 100 encapsulation mpls manual pw-class mpls
Router(config-if-xconn)# mpls label 150 100
```

```
Router(config-if-xconn)# exit
Router(config-if)# exit
```

Related Commands

Command	Description
mpls control-word	Enables sending the MPLS control word in an AToM static pseudowire connection.
mpls label range	Configures the range of local labels available for use on packet interfaces.
show mpls l2transport vc	Displays information about AToM VCs and AToM static pseudowires that have been enabled to route Layer 2 packets on a router.
xconnect	Binds an attachment circuit to a pseudowire, and configures an AToM static pseudowire.

mpls label mode

To configure per virtual routing and forwarding (VRF) labels, use the **mpls label mode** command in global configuration mode. To disable the configuration, use the **no** form of this command.

mpls label mode {**vrf** *vrf-name*| **all-vrfs**} **protocol bgp-vpnv4** {**per-prefix**| **per-vrf**| **per-ce**| **vrf-conn-aggr**}

no mpls label mode {**vrf** *vrf-name*| **all-vrfs**} **protocol bgp-vpnv4** {**per-prefix**| **per-vrf**| **per-ce**| **vrf-conn-aggr**}

Syntax Description

vrf	Configures a single VPN routing and forwarding (VRF) domain.
vrf-name	Name for the single VRF to configure.
all-vrfs	Configures a label mode for all VRFs on the router.
protocol	Specifies a protocol to use for the label mode.
bgp-vpnv4	Specifies the IPv4 VRF address-family protocol for the label mode configuration.
per-prefix	Specifies per-prefix label mode.
per-vrf	Specifies per-VRF label mode.
per-ce	Specifies per-CE label mode.
vrf-conn-aggr	Specifies per-VRF label mode for connected and Border Gateway Protocol (BGP) aggregates in the VRF.

Command Default

Per-vrf label mode is the default for connected routes and BGP aggregate routes on the Cisco 6500 routers. Per-prefix label mode is the default for all other local routes.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Release 2.2	This command was introduced.
12.2(33)SRD	This command was integrated into Cisco IOS Release 12.2(33)SRD.
15.0(1)M	This command was modified in a release earlier than Cisco IOS Release 15.0(1)M. The **vrf-conn-aggr** keyword was added.

Release	Modification
Cisco IOS XE Release 3.10S	This command was modified. The **per-ce** keyword was added.

Examples

The following example shows how to configure all VRFs to per-vrf label mode:

```
Device> enable
Device# configure terminal
Device(config)# mpls label mode all-vrfs protocol bgp-vpnv4 per-vrf
```

Examples

The following example shows how to configure per-ce label mode:

```
Device> enable
Device# configure terminal
Device(config)# mpls label mode all-vrfs protocol bgp-vpnv4 per-ce
```

Related Commands

Command	Description
debug ip bgp vpn4 unicast	Displays debugging messages for VPNv4 unicast routes.
show ip vrf detail	Displays the assigned label mode for the VRF.
show mpls forwarding-table	Displays the contents of the Multiprotocol Label Switching (MPLS) Label Forwarding Information Base (LFIB).

mpls label mode (6VPE)

To configure the MPLS VPN 6VPE per VRF Label feature, use the **mpls label mode** command in global configuration mode. To disable the MPLS VPN 6VPE per VRF Label feature, use the **no** form of this command.

mpls label mode {**vrf** *vrf-name*| **all-vrfs**} **protocol** {**bgp-vpnv6**| **all-afs**} {**per-prefix**| **per-vrf**}

no mpls label mode {**vrf** *vrf-name*| **all-vrfs**} **protocol** {**bgp-vpnv6**| **all-afs**} {**per-prefix**| **per-vrf**}

Syntax Description

vrf *vrf-name*	Configures a single VPN routing and forwarding (VRF) domain. • *vrf-name*- --The name for the single VRF you want to configure.
all-vrfs	Configures a label mode for all VRFs on the router.
protocol	Specifies a protocol to use for the label mode. • **bgp-vpnv6** --Specifies the IPv6 VRF address-family protocol for the label mode configuration. • **all-afs** --Configures a label mode for all address families (AFs) on the router. • If a VRF is configured with the **all-afs** label mode, you cannot change the label mode for individual AFs. To configure each of the AFs for different label modes, you must first remove the **all-afs** mode keyword. Similarly, if individual AFs are configured with different label modes, the **all-afs** label mode for the VRF is not accepted. • The **all-afs** label mode keyword has higher precedence over the individual AF label mode keywords (**vrf** or **all-vrfs**).
per-prefix	Specifies per-prefix label mode.
per-vrf	Specifies per-vrf label mode.

Command Default

The command default for connected routes and Border Gateway Protocol (BGP) aggregate routes on the Cisco 7600 router is **Per-vrf-aggr** label mode. The command default for all other local routes is **Per-prefix** label mode.

Command Modes

Global configuration (config)#

Command History

Release	Modification
12.2(33)SRD	This command was introduced.

Examples

The following example configures all VRFs to per-vrf mode:

```
Router(config)# mpls label mode all-vrfs protocol bgp-vpnv6 per-vrf
```

Related Commands

Command	Description
debug ip bgp vpnv6 unicast	Displays debugging messages for VPNv6 unicast routes.
show vrf detail	Displays the assigned label mode for the VRF.

mpls label protocol (global configuration)

To specify the Label Distribution Protocol (LDP) for a platform, use the **mpls label protocol** command in global configuration mode. To restore the default LDP, use the **no** form of this command.

mpls label protocol {**ldp**| **tdp**}

no mpls label protocol

Syntax Description

ldp	Specifies that LDP is the default label distribution protocol.
tdp	Specifies that Tag Distribution Protocol (TDP) is the default label distribution protocol.

Command Default

LDP is the default label distribution protocol.

Command Modes

Global configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
12.0(14)ST	This command was integrated into Cisco IOS Release 12.0(14)ST.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Release	Modification
12.4(3)	The command default changed from TDP to LDP.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
15.3(2)S	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

If neither the global mpls label protocol ldp command nor the interface mpls label protocol ldp command is used, all label distribution sessions use LDP.

Note Use caution when upgrading the image on a router that uses TDP. Ensure that the TDP sessions are established when the new image is loaded. You can accomplish this by issuing the global configuration command **mpls label protocol tdp**. Issue this command and save it to the startup configuration before loading the new image. Alternatively, you can enter the command and save the running configuration immediately after loading the new image.

Examples

The following command establishes LDP as the label distribution protocol for the platform:

```
Router(config)# mpls label protocol ldp
```

Related Commands

Command	Description
mpls ldp maxhops	Limits the number of hops permitted in an LSP established by the Downstream on Demand method of label distribution.
show mpls interfaces	Displays information about one or more or all interfaces that are configured for label switching.

mpls label protocol (interface configuration)

To specify the label distribution protocol for an interface, use the **mpls label protocol** command in interface configuration mode. To remove the label distribution protocol from the interface, use the **no** form of this command.

mpls label protocol {**ldp**| **tdp**| **both**}

no mpls label protocol

Syntax Description

ldp	Specifies that the label distribution protocol (LDP) is to be used on the interface.
tdp	Specifies that the tag distribution protocol (TDP) is to be used on the interface.
both	Specifies that both label and tag distribution protocols are to be supported on the interface.

Command Default

If no protocol is explicitly configured for an interface, the label distribution protocol that was configured for the platform is used. To set the platform label distribution protocol, use the global **mpls label protocol** command.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.0(10)ST	This command was introduced.
12.0(14)ST	This command was integrated into Cisco IOS Release 12.0(14)ST.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Release	Modification
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SCA	This command was integrated into Cisco IOS Release 12.2(33)SCA.

Usage Guidelines

To successfully establish a session for label distribution for a link connecting two label switch routers (LSRs), the link interfaces on the LSRs must be configured to use the same label distribution protocol. If there are multiple links connecting two LSRs, all of the link interfaces connecting the two LSRs must be configured to use the same protocol.

The both option is intended for use with interfaces to multiaccess networks, such as Ethernet and FDDI, where some peers might use LDP and others use TDP. When you specify the both option, the LSR sends both LDP and TDP discovery hello messages and responds to both types of messages.

Examples

The following example shows how to establish LDP as the label distribution protocol for the interface:

```
Router(config-if)# mpls label protocol ldp
```

Related Commands

Command	Description
show mpls interfaces	Displays information about one or more interfaces that are configured for label switching.

mpls label range

To configure the range of local labels available for use with Multiprotocol Label Switching (MPLS) applications on packet interfaces, use the**mpls label range** command in global configuration mode. To revert to the platform defaults, use the **no** form of this command.

mpls label range *minimum-value maximum-value* [**static** *minimum-static-value maximum-static-value*]

no mpls label range

Syntax Description

minimum-value	The value of the smallest label allowed in the label space. The default is 16.
maximum-value	The value of the largest label allowed in the label space. The default is platform-dependent.
static	(Optional) Reserves a block of local labels for static label assignments. If you omit the **static** keyword and the *minimum-static-value maximum-static-value* arguments, no labels are reserved for static assignment.
minimum-static-value	(Optional) The minimum value for static label assignments. There is no default value.
maximum-static-value	(Optional) The maximum value for static label assignments. There is no default value.

Command Default

The platform's default values are used.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.1(3)T	This command was modified to use the new MPLS Internet Engineering Task Force (IETF) terminology and CLI syntax.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S. The static keyword was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.4(16)	The output was modified to display the upper and lower minimum static label values in the help lines instead of the default range.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
XE Release 2.2	This command was integrated into Cisco IOS XE Release 2.2. The default values for the following arguments were modified: *maximum-value*, *minimum-static-value*, and *maximum-static-value*. The "Usage Guidelines" changed.

Usage Guidelines

The labels 0 through 15 are reserved by the IETF (see RFC 3032, MPLS Label Stack Encoding, for details) and cannot be included in the range specified in the **mpls label range** command. If you enter a 0 in the command, you will get a message that indicates that the command is an unrecognized command.

The label range defined by the**mpls label range** command is used by all MPLS applications that allocate local labels (for dynamic label switching, MPLS traffic engineering, MPLS Virtual Private Networks (VPNs), and so on).

If you specify a new label range that does not overlap the range currently in use, the new range does not take effect until you reload the router or the router undergoes a Stateful Switchover (SSO) when you are using Cisco IOS Release 12.0S and older software. Later software with the new MPLS Forwarding Infrastructure (MFI), 12.2SR, 12.2SB, 12.2(33)XHI, 12.2(25)SE, and 12.5 allows immediate use of the new range. Existing label bindings, which may violate the newly-configured ranges, remain active until the binding is removed through other methods.

You can use label distribution protocols, such as Label Distribution Protocol (LDP) and Resource Reservation Protocol (RSVP), to reserve a generic range of labels from 16 through 1048575 for dynamic assignment.

You specify the optional **static** keyword, to reserve labels for static assignment. The MPLS Static Labels feature requires that you configure a range of labels for static assignment. You can configure static bindings only from the current static range. If the static range is not configured or is exhausted, then you cannot configure static bindings.

The range of label values is 16 to 1048575. The maximum value defaults to 1048575, but might be limited to a lower value on certain platforms. Some platforms may support only 256,000 or 512,000 labels. Refer to your platform documentation for the default maximum label value.

If you configure the dynamic label space from 16 to 1048575, the static label space can be in a range that is outside the chosen dynamic label space. The upper and lower minimum static label values are displayed in the help line. For example, if you configure the dynamic label with a minimum value of 100 and a maximum value of 1000, the help lines display as follows:

```
Router(config)# mpls label range 100 1000 static ?
<1001-1048575>  Upper Minimum static label value
<16-99>         Lower Minimum static label value
Reserved Label Range  --> 0    to 15
Available Label Range --> 16   to 1048575
Dynamic Label Range   --> 100  to 1000
Lower End Range       --> 16   to 99
Upper End Range       --> 1001 to 1048575
```

In this example, you can configure a static range from one of the following ranges: 16 to 99 or 1001 to 1048575.

If the lower minimum static label space is not available, the lower minimum is not displayed in the help line. For example:

```
Router(config)# mpls label range 16 400 static ?
  <401-1048575>  Upper Minimum static label value
```

In this example, you can configure a static range with a minimum static value of 401 and a maximum static value of up to 1048575.

If an upper minimum static label space is not available, then the upper minimum is not displayed in the help line:

```
Router(config)# mpls label range 1000 1048575 static ?
  <16-999>  Lower Minimum static label value
```

In this example, the range for static label assignment is 16 to 999.

If you configure the dynamic label space with the default minimum (16) and maximum (1048575) values, no space remains for static label assignment, help lines are not displayed, and you cannot configure static label bindings. For example:

```
Router(config)# mpls label range 16 1048575 ?
  <cr>
```

Examples

The following example shows how to configure the size of the local label space. In this example, the minimum static value is set to 200, and the maximum static value is set to 120000.

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# mpls label range 200 120000
Router(config)#
```

If you had specified a new range that overlaps the current range (for example, the new range of the minimum static value set to 16 and the maximum static value set to 120000), then the new range takes effect immediately.

The following example show how to configure a dynamic local label space with a minimum static value set to 1000 and the maximum static value set to 1048575 and a static label space with a minimum static value set to 16 and a maximum static value set to 999:

```
Router(config)# mpls label range 1000 1048575 static 16 999
Router(config)#
```

In the following output, the **show mpls label range** command, executed after a reload, shows that the configured range is now in effect:

```
Router# show mpls label range
Downstream label pool: Min/Max label: 1000/1048575
Range for static labels: Min/Max/Number: 16/999
```

The following example shows how to restore the label range to its default value:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# no mpls label range
Router(config)# end
```

Related Commands

Command	Description
show mpls forwarding table	Displays the contents of the MPLS LFIB.

Command	Description
show mpls label range	Displays the range of the MPLS local label space.

mpls ldp address-message

To specify advertisement of platform addresses to an LC-ATM label distribution protocol (LDP) peer, use the **mpls ldp address-message** command in interface configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp address-message

no mpls ldp address-message

Syntax Description

This command has no arguments or keywords.

Command Default

LDP Address and Address Withdraw messages are not sent to LC-ATM LDP peers.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
12.0(14)ST	This command was integrated into Cisco IOS Release 12.0(14)ST.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The LDP specification includes Address and Address Withdraw messages used by a label switch router (LSR) to advertise its addresses to its peers.

An LSR uses the addresses it learns from peers when operating in Downstream Unsolicited label advertisement mode to convert between route next hop addresses (found in the LSR routing table) and peer LDP identifiers.

The ability to map between the IP address and the peer LDP identifier is required so that:

- When the Multiprotocol Label Switching (MPLS) forwarding engine (the Label Forwarding Information Base [LFIB]) asks for labels for a given destination prefix and next hop address, the LSR can find the label learned (if any) from the next hop. The LSR maintains learned labels in its label information base (LIB) tagged by the LDP ID of the advertising LSR.
- When the LSR learns a label for destination prefix P from an LDP peer, it can determine if that peer (known to the LSR by its LDP identifier) is currently the next hop for P.

In principle, an LSR operating in Downstream On Demand (DoD) mode for an LC-ATM interface does not need this information for two reasons:

- The LSR should know from the routing table the next hop interface.
- Only one DoD peer exists per LC-ATM interface.

Consequently, Cisco platforms do not normally send Address and Address Withdraw messages to LC-ATM peers.

Some LDP implementations might require the information learned in Address and Address Withdraw messages for LC-ATM. The **mpls ldp address-message** command is provided to enable interoperability with implementation vendors that require Address messages for LC-ATM.

Note Cisco platforms always advertise their addresses in Address and Address Withdraw messages for LDP sessions operating in Downstream Unsolicited label advertisement mode.

Examples

The following is an example of the **mpls ldp address-message** command:

```
Router(config-if)# mpls ldp address-message
```

Related Commands

Command	Description
show mpls interfaces	Displays information about one or more or all interfaces that are configured for label switching.

mpls ldp advertise-labels

To control the distribution of locally assigned (incoming) labels by means of label distribution protocol (LDP), use the **mpls ldp advertise-labels** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp advertise-labels [**vrf** *vpn-name*] [**interface** *interface*| **for** *prefix-access-list* [**to** *peer-access-list*]]

no mpls ldp advertise-labels [**vrf** *vpn-name*] [**interface** *interface*| **for** *prefix-access-list* [**to** *peer-access-list*]]

Syntax Description

vrf *vpn-name*	(Optional) Specifies the Virtual Private Network (VPN) routing and forwarding (VFR) instance for label advertisement.
interface *interface*	(Optional) Specifies an interface for label advertisement of an interface address.
for *prefix-access-list*	(Optional) Specifies which destinations should have their labels advertised.
to *peer-access-list*	(Optional) Specifies which LDP neighbors should receive label advertisements. An LSR is identified by its router ID, which consists of the first 4 bytes of its 6-byte LDP identifier.

Command Default

The labels of all destinations are advertised to all LDP neighbors. If the **vrf** keyword is not specified, this command applies to the default routing domain. If the **interface** keyword is not specified, no label is advertised for the interface address.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect Multiprotocol Label Switching (MPLS) Internet Engineering Task Force (IETF) command syntax and terminology.
12.0(14)ST	This command was modified to reflect MPLS VPN support for LDP and to make the command consistent with the way Cisco IOS software interprets the *prefix-access-list* argument.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.

Release	Modification
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.(22)S. The **interface***interface* keyword and argument were added.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000-PRE2 router.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This command is used to control which labels are advertised to which LDP neighbors. To prevent the distribution of any locally assigned labels, use the **no mpls ldp advertise-labels** command with no optional parameters. To reenable the distribution of all locally assigned labels to all LDP neighbors, use the **mpls ldp advertise-labels** command with no optional parameters.

You can execute multiple **mpls ldp advertise-labels** commands. In the aggregate, such commands determine how the LSR advertises local labels. The following rules describe the effects of multiple commands:

1. Every **mpls ldp advertise-labels** command has a (prefix acl, peer acl) pair associated with it. The *access list* pair associated with the this command (in the absence of both the **for** and **to** keywords) is (none, none); the *access list* pair associated with the **mpls ldp advertise-labels** for prefix acl command (in the absence of the **to** keyword) is (prefix-acl, none).
2. A given prefix can have, at most, one (prefix acl, peer acl) pair that applies to it, as in the following explanation:
    1. A given (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.
    2. If more than one (prefix acl, peer acl) pair from multiple **mpls ldp advertise-labels** commands matches a prefix, the (prefix acl, peer acl) pair in the first such command (as determined by the **show running-config** command) applies to the prefix.

3 When an LSR is ready to advertise a label for a prefix, the LSR:

1. Determines whether a (prefix acl, peer acl) pair applies to the prefix.
2. If none applies, and if the **mpls ldp advertise-labels** command has been configured, the label for the prefix is not advertised to any peer; otherwise, the label is advertised to all peers.
3. 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.
4. If the prefix acl permits the prefix and the peer acl is none (that is, the command that applies to the prefix is an **mpls ldp advertise-labels** for prefix acl command without the **to** keyword), then the label is advertised to all peers.
5. If the prefix acl permits the prefix and there is a peer acl, then the label is advertised to all peers permitted by the peer acl.

Note The **mpls ldp advertise-labels** command has no effect on an LC-ATM interface. Such an interface behaves as though this command had not been executed.

Normally, LDP advertises labels only for IP prefixes that are in the routing table. You can use the **mpls ldp advertise-labels** interface command to force LDP to advertise a label for a prefix constructed from an interface address and a 32-bit mask. Such a prefix is not usually in the routing table.

Examples

In the following example, the router is configured to advertise no locally assigned labels to any LDP neighbors:

```
Router(config)# no mpls ldp advertise-labels
```

In the following example, the router is configured to advertise to all LDP neighbors only the labels for networks 10.101.0.0 and 10.221.0.0:

```
Router(config)# ip access-list standard pfx-filter
Router(config-std-nacl)# permit 10.101.0.0 0.0.255.255
Router(config-std-nacl)# permit 10.221.0.0 0.0.255.255
Router(config-std-nacl)# exit
Router(config)# mpls ldp advertise-labels for pfx-filter
Router(config)# no mpls ldp advertise-labels
```

In the following example, the router is configured to advertise the label for network 10.165.200.0 only to LSR 10.200.110.55, the label for network 10.35.35.55 only to LSR 10.150.25.25, and the labels for all other prefixes to all LSRs:

```
Router(config)# ip access-list standard pfx-filter1
Router(config-std-nacl)# permit 10.165.200.0
Router(config-std-nacl)# exit
Router(config)# ip access-list standard lsr-filter1
Router(config-std-nacl)# permit 10.200.110.55
Router(config-std-nacl)# exit
Router(config)# ip access-list standard pfx-filter2
Router(config-std-nacl)# permit 10.35.35.55
Router(config-std-nacl)# exit
Router(config)# ip access-list standard lsr-filter2
Router(config-std-nacl)# permit 10.150.25.25
Router(config-std-nacl)# exit
Router(config)# mpls ldp advertise-labels for pfx-filter1 to lsr-filter1
Router(config)# mpls ldp advertise-labels for pfx-filter2 to lsr-filter2
```

The output of the **show mpls ip binding detail** command includes the (prefix acl, peer acl) pairs that apply to each prefix. For this example, the applicable pairs are as follows:

```
Router# show mpls ip binding detail
```

```
Advertisement spec:
 Prefix acl = pfx-filter1; Peer acl = lsr-filter1
 Prefix acl = pfx-filter2; Peer acl = lsr-filter2
  10.35.35.55/8, rev 109
 in label:     16
  Advertised to:
  10.150.25.25:0
 out label:    imp-null  lsr: 10.200.110.55:0     inuse
 out label:    imp-null  lsr: 10.150.25.25:0
 Advert acl(s): Prefix acl pfx-filter2, Peer acl lsr-filter2
  10.165.200.0/8, rev 108
 in label:     imp-null
  Advertised to:
  10.200.110.55:0
 out label:    16        lsr: 10.200.110.55:0
 out label:    19        lsr: 10.150.25.25:0
 Advert acl(s): Prefix acl pfx-filter1, Peer acl lsr-filter1
  10.0.0.33/32, rev 98
 out label:    imp-null  lsr: 10.150.25.25:0
  10.0.0.44/32, rev 99
 in label:     imp-null
  Advertised to:
  10.200.110.55:0           10.150.25.25:0
  10.150.25.25/32, rev 101
 in label:     20
  Advertised to:
  10.200.110.55:0           10.150.25.25:0
 out label:    19        lsr: 10.200.110.55:0
 out label:    imp-null  lsr: 10.150.25.25:0     inuse
  10.0.0.44/32, rev 103
 in label:     imp-null
  Advertised to:
  10.200.110.55:0           10.150.25.25:0
 out label:    20        lsr: 10.200.110.55:0
 out label:    18        lsr: 10.150.25.25:0
  10.200.110.55/32, rev 104
 in label:     17
  Advertised to:
  10.200.110.55:0           10.150.25.25:0
 out label:    imp-null  lsr: 10.200.110.55:0     inuse
 out label:    17        lsr: 10.150.25.25:0
Router#
```

In the following example, the **vrf** keyword is specified to configure label advertisement in the VPN routing and forwarding instance named vpn1:

```
Router(config)# mpls ldp advertise-labels vrf vpn1 for pfx-filter1 to lsr-filter1
Router(config)# mpls ldp advertise-labels vrf vpn1 for pfx-filter2 to lsr-filter2
```

The following example uses the **interface** keyword to configure label advertisement for a /32 prefix constructed from the IP address of ethernet interface 1/1:

```
Router(config)# mpls ldp advertise-labels interface ethernet1/1
```

Related Commands

Command	Description
mpls ldp advertise-labels old-style	Uses the method of earlier software releases to interpret the for prefix-access-list parameter for the **mpls ldp advertise-labels** command.
show mpls ip binding detail	Displays detailed information about label bindings, including the access lists, if any, controlling which local labels are advertised to which LDP neighbors.

Command	Description
show running-config	Displays the contents of the currently running configuration file or the configuration for a specific class map, interface, map class, policy map, or VC class,

mpls ldp advertise-labels old-style

To cause the **for** *prefix-access-list* parameter of the **mpls ldp advertise-labels** command to be interpreted according to the method used in earlier Cisco IOS software versions, use the **mpls ldp advertise-labels old-style** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp advertise-labels [**vrf** *vpn-name*] **old-style**

no mpls ldp advertise-labels [**vrf** *vpn-name*] **old-style**

Syntax Description

vrf *vpn-name*	(Optional) Specifies the VPN routing and forwarding (VRF) instance for label advertisement.

Command Default

If this command is not specified, the **for** *prefix-access-list* parameter in any **mpls ldp advertise-labels** commands is interpreted according to the rules specified under the "Usage Guidelines" section for the **mpls ldp advertise-labels** command. If the **vrf** *vpn-name* parameter is not specified, this command applies to the default routing domain.

Command Modes

Global configuration

Command History

Release	Modification
12.0(14)ST	This command was introduced to add Multiprotocol Label Switching (MPLS) VPN support for lable distribution protocol (LDP) and to cause the **for** *prefix-access-list* parameter in the command to be interpreted in the same way as in earlier Cisco IOS releases.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Release	Modification
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The method for interpreting the for prefix-access-list parameter in the **mpls ldp advertise-labels** command is defined by Rule 2.a in the "Usage Guidelines" section in the **mpls ldp advertise-labels** command. This Rule 2.a follows normal access list conventions.

However, earlier Cisco IOS software versions used a different method for interpreting the **for** *prefix-access-list* parameter in **mpls ldp advertise-labels** command. For those earlier software versions, Rule 2.a read as follows:

2. A given prefix can have, at most, one (prefix acl, peer acl) pair that applies to it.

a. A given (prefix acl, peer acl) pair applies to a prefix only if the prefix acl matches the prefix. A match occurs if the prefix acl explicitly permits or denies the prefix by means of a permit or deny command. A prefix acl that contains a permit any or deny any command matches any prefix.

This earlier Rule 2.a departed from normal access list conventions in that:

- An explicit deny (including a deny any) that matches the prefix causes the (*prefixacl* , *peeracl*) pair to apply to the prefix.
- Explicit deny any and implicit deny any (which all access lists have) have different effects, in that the explicit deny any causes the access list pair to apply to all prefixes, but the implicit deny any has no effect.

Use the **mpls ldp advertise-labels old-style** command to force the use of the old-style method of interpreting the **for** *prefix-access-list* parameter used by earlier software versions if the following apply:

- A configuration developed for use with earlier software versions depends on this previous method for interpreting the **for** *prefix-access-list* parameter in **mpls ldp advertise-labels** commands.
- It is inconvenient to update the configuration to work with Rule 2.a as it appears under the "Usage Guidelines" section of the **mpls ldp advertise-labels** command.

Examples

The following command causes the old-style method of interpreting the for prefix-access-list parameter to be used in executing **mpls ldp advertise-labels** commands:

```
Router# mpls ldp advertise-labels old-style
```

In the following example, the **vrf** keyword is specified to configure label advertisement in the VFR instance named vpn1:

```
Router(config)# mpls ldp advertise-labels vrf vpn1 old-style
```

Related Commands

Command	Description
mpls ldp advertise-labels	Controls the distribution of locally assigned labels by means of LDP.

mpls ldp atm control-mode

Note Effective with Cisco IOS Release 12.4(20)T, the **mpls ldp atm control-mode** command is not available in Cisco IOS software.

To control the mode used for handling label binding requests on LC-ATM interfaces, use the **mpls ldp atm control-mode** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp atm control-mode {**ordered| independent**}

no mpls ldp atm control-mode {**ordered| independent**}

Syntax Description

ordered	Delays a label binding in response to a Label Request message from a label distribution protocol (LDP) neighbor until a label binding has been received from the next hop LDP neighbor for the destination in question.
independent	Returns a label binding immediately in response to a Label Request message from an LDP neighbor. Any packets for the destination in question are discarded by the label switch router (LSR) until a label binding from the next hop LSR has been received.

Command Default

The default is ordered control mode.

Command Modes

Global configuration (config)

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
12.0(14)ST	This command was integrated into Cisco IOS Release 12.0(14)ST.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T.
12.1(8a)E	This command was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.

Release	Modification
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000-PRE2 router.
12.4(20)T	This command was removed.

Usage Guidelines

Use of ordered control mode by an ATM device acting as a transit LSR in an ATM cloud ensures that the device will receive labeled packets to forward only after it has learned the outgoing labels required by MPLS to forward the packets. Ordered control mode relieves the device of the burden of reassembling cells into packets that must be forwarded by means of the normal (non-MPLS) packet forwarding or discard mechanisms.

Use of independent control mode on ATM transit LSRs might slightly reduce the time an ATM edge router must wait to use an ATM label switched path (LSP) it has initiated. Independent control mode eliminates the need for the edge router to wait for the Label Request/Label Mapping signaling to traverse the ATM cloud from edge router ingress to egress and back before it can send packets into the LSP. However, there is a risk that an ATM transit device might receive labeled packets before it has learned the outgoing labels required for MPLS forwarding, thus forcing the transit device to reassemble the cells into a packet that it is likely to discard.

Examples

In the following example, the mode for handling LDP Label Request messages is set to independent for the platform:

```
Router(config)# mpls ldp atm control-mode independent
```