MPLS Commands

- autodiscovery, on page 3
- backup peer, on page 5
- encapsulation mpls, on page 6
- ip multicast mrinfo-filter, on page 7
- ip multicast-routing, on page 8
- l2 vfi autodiscovery, on page 9
- l2 vfi manual, on page 10
- l2vpn vfi context , on page 12
- l2vpn xconnect context, on page 13
- label mode , on page 14
- load-balance, on page 15
- mdt log-reuse, on page 17
- mdt default, on page 18
- mdt data, on page 20
- member (l2vpn vfi), on page 22
- member pseudowire, on page 23
- mpls label range, on page 25
- mpls label protocol (interface configuration), on page 28
- mpls label protocol (global configuration), on page 29
- mpls ldp logging neighbor-changes, on page 30
- mpls ip (interface configuration), on page 31
- mpls ip (global configuration), on page 32
- mpls ip default-route, on page 33
- neighbor (MPLS), on page 34
- show ip pim mdt send, on page 35
- show ip pim mdt receive, on page 36
- show ip pim mdt history, on page 38
- show ip pim mdt bgp, on page 39
- show mpls label range, on page 40
- show mpls ldp bindings, on page 41
- show mpls ldp discovery, on page 43
- show mpls ldp neighbor, on page 45
- show mpls forwarding-table, on page 46

- show mpls static binding, on page 54
- show mpls static crossconnect, on page 56
- mpls static binding ipv4, on page 57
- show platform hardware fed (TCAM utilization), on page 59
- show platform software fed switch l2vpn, on page 62
- show platform software fed switch mpls, on page 64
- show platform software l2vpn switch, on page 66
- source template type pseudowire, on page 68
- tunnel destination, on page 69
- tunnel mpls-ip-only, on page 70
- tunnel source, on page 71
- xconnect, on page 73

autodiscovery

To designate a Layer 2 virtual forwarding interface (VFI) as having Border Gateway Protocol (BGP) or Label Distribution Protocol (LDP) autodiscovered pseudowire members, use the **autodiscovery** command in Layer 2 VFI configuration mode. To disable autodiscovery, use the **no** form of this command.

autodiscovery bgp signaling {**bgp** | **ldp**}[**template** *template-name*]
no autodiscovery bgp signaling {**bgp** | **ldp**}[**template** *template-name*]

Syntax Description

bgp	Specifies that BGP should be used for signaling and autodiscovery.
ldp	Specifies that LDP should be used for signaling.
template *template-name*	Specifies the template to be used for autodiscovered pseudowires.

Command Default

Layer 2 VFI autodiscovery is disabled.

Command Modes

Layer 2 VFI configuration (config-vfi)

Command History

Release	Modification
Cisco IOS XE Amsterdam 17.1.1	This command was introduced.

Usage Guidelines

Layer 2 VFI autodiscovery enables each VPLS provider edge (PE) device to discover other PE devices that are part of the same VPLS domain. VPLS autodiscovery also automatically detects when PE devices are added to or removed from the VPLS domain.

The **bgp** keyword specifies that BGP should be used for signaling and autodiscovery, accordance with RFC 4761.

The **ldp** keyword specifies that LDP should be used for signaling. BGP will be used for autodiscovery.

Use of the **autodiscovery** command places the device into Layer 2 VPN VFI autodiscovery configuration mode (config-vfi-autodiscovery).

Examples

The following example shows how to enable Layer 2 VFI as having BGP autodiscovered pseudowire members and specify that LDP signaling should be used for autodiscovery:

```
Device> enable
Devide# configure terminal
Device(config)# l2vpn vfi context vfi1
Device(config-vfi)# vpn id 100
Device(config-vfi)# autodiscovery bgp signaling ldp
Device(config-vfi-autodiscovery)#
```

Related Commands

Command	Description
l2 vfi autodiscovery	Enables the VPLS PE device to automatically discover other PE devices that are part of the same VPLS domain.

Command	Description
vpn id	Sets or updates a VPN ID on a VPLS instance.

backup peer

To specify a redundant peer for a pseudowire virtual circuit (VC), use the **backup peer** command in interface configuration mode or Xconnect configuration mode. To remove the redundant peer, use the **no** form of this command.

backup peer *peer-router-ip-addr vcid* [**pw-class** *pw-class-name*] [**priority** *value*]

no backup peer *peer-router-ip-addr vcid*

Syntax Description

peer-router-ip-addr	IP address of the remote peer.
vcid	32-bit identifier of the VC between the devices at each end of the layer control channel.
pw-class	(Optional) Specifies the pseudowire type. If this is not specified, the pseudowire type is inherited from the parent Xconnect.
pw-class-name	(Optional) Name of the pseudowire that you created while establishing the pseudowire class.
priority *value*	(Optional) Specifies the priority of the backup pseudowire in instances where multiple backup pseudowires exist. The range is from 1 to 10. The default is 1.

Command Default

No redundant peer is established.

Command Modes

Interface configuration (config-if)
Xconnect configuration (config-if-xconn)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Usage Guidelines

The combination of the *peer-router-ip-addr* and *vcid* arguments must be unique on the device.

Examples

The following example shows how to configure a Multiprotocol Label Switching (MPLS) Xconnect with one redundant peer:

```
Device(config)# interface GigabitEthernet1/0/44
Device(config-if)# xconnect 10.0.0.1 100 encapsulation mpls
Device(config-if-xconn)# backup peer 10.0.0.2 200
```

Related Commands

Command	Description
xconnect	Binds an attachment circuit to a pseudowire for Xconnect service, and enters Xconnect configuration mode.

encapsulation mpls

To specify Multiprotocol Label Switching (MPLS) as the data encapsulation method, use the **encapsulation mpls** command in interface configuration mode. To remove the encapsulation type, use the **no** form of this command.

encapsulation mpls

no encapsulation mpls

Syntax Description

This command has no arguments or keywords.

Command Default

The command is enabled by default.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Examples

The following example shows how to configure MPLS as the data encapsulation method for a pseudowire interface:

```
Device> enable
Device# configure terminal
Device(config)# interface pseudowire 100
Device(config-if)# encapsulation mpls
```

Related Commands

Command	Description
interface pseudowire	Specifies the pseudowire interface.
xconnect	Binds an attachment circuit to a pseudowire for Xconnect service and enters Xconnect configuration mode.

ip multicast mrinfo-filter

To filter multicast router information (mrinfo) request packets, use the **ip multicast mrinfo-filter**command in global configuration mode. To remove the filter on mrinfo requests, use the **no** form of this command.

ip multicast [**vrf** *vrf-name*] **mrinfo-filter** *access-list*
no ip multicast [**vrf** *vrf-name*] **mrinfo-filter**

Syntax Description

vrf	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.
vrf-name	(Optional) Name assigned to the VRF.
access-list	IP standard numbered or named access list that determines which networks or hosts can query the local multicast device with the **mrinfo** command.

Command Default

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The **ip multicast mrinfo-filter**command filters the mrinfo request packets from all of the sources denied by the specified access list. That is, if the access list denies a source, that source's mrinfo requests are filtered. mrinfo requests from any sources permitted by the ACL are allowed to proceed.

Examples

The following example shows how to filter mrinfo request packets from all hosts on network 192.168.1.1 while allowing requests from any other hosts:

```
ip multicast mrinfo-filter 51
access-list 51 deny 192.168.1.1
access list 51 permit any
```

Related Commands

Command	Description
mrinfo	Queries a multicast device about which neighboring multicast devices are peering with it.

ip multicast-routing

To enable IP multicast routing, use the **ip multicast-routing** command in global configuration mode. To disable IP multicast routing, use the **no** form of this command.

ip multicast-routing [**vrf** *vrf-name*]
no ip multicast-routing [**vrf** *vrf-name*]

Syntax Description

vrf *vrf-name*	(Optional) Enables IP multicast routing for the Multicast VPN routing and forwarding (MVRF) instance specified for the *vrf-name* argument.

Command Default

IP multicast routing is disabled.

Command Modes

Global configuration (config).

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

When IP multicast routing is disabled, the Cisco IOS software does not forward any multicast packets.

Note For IP multicast, after enabling IP multicast routing, PIM must be configured on all interfaces. Disabling IP multicast routing does not remove PIM; PIM still must be explicitly removed from the interface configurations.

Examples

The following example shows how to enable IP multicast routing:

```
Device(config)# ip multicast-routing
```

The following example shows how to enable IP multicast routing on a specific VRF:

```
Device(config)# ip multicast-routing vrf vrf1
```

The following example shows how to disable IP multicast routing:

```
Device(config)# no ip multicast-routing
```

Related Commands

Command	Description
ip pim	Enables PIM on an interface.

l2 vfi autodiscovery

To enable the Virtual Private LAN Service (VPLS) provider edge (PE) device to automatically discover other PE devices that are part of the same VPLS domain, use the **l2 vfi autodiscovery** command in global configuration mode. To disable VPLS autodiscovery, use the **no** form of this command.

l2 vfi *vfi-name* **autodiscovery**
no l2 vfi *vfi-name* **autodiscovery**

Syntax Description

vfi-name	Specifies the name of the virtual forwarding instance. The virtual forwarding instance (VFI) identifies a group of pseudowires that are associated with a virtual switching instance (VSI).

Command Default

Layer 2 VFI autodiscovery is not enabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Usage Guidelines

VPLS autodiscovery enables each VPLS PE device to discover other PE devices that are part of the same VPLS domain. VPLS autodiscovery also automatically detects when PE devices are added to or removed from the VPLS domain.

Examples

The following example enables VPLS Autodiscovery on a PE device:

```
Device> enable
Device# configure terminal
Device(config)# l2 vfi vfi2 autodiscovery
```

Related Commands

Command	Description
l2 vfi manual	Manually creates a Layer 2 VFI.

l2 vfi manual

To create a Layer 2 virtual forwarding instance (VFI) and enter Layer 2 VFI manual configuration mode, use the **l2 vfi manual** command in global configuration mode. To remove the Layer 2 VFI, use the **no** form of this command.

l2 vfi *name* **manual**
no l2 vfi *name* **manual**

Syntax Description

name	Name of a new or existing Layer 2 VFI.

Command Default

The Layer 2 VFI is not configured.

Command Modes

Global configuration (config)

Command History

Release	Modifica
Cisco IOS XE Everest 16.6.1	This cor introduc

Usage Guidelines

A VFI is a collection of data structures used by the data plane, software-based or hardware-based, to forward packets to one or more virtual circuits (VC). It is populated and updated by both the control plane and the data plane and also serves as the data structure interface between the control plane and the data plane.

Within the Layer 2 VFI manual configuration mode, you can configure the following parameters:

- VPN ID of a Virtual Private LAN Service (VPLS) domain
- Addresses of other PE devices in this domain
- Type of tunnel signaling and encapsulation mechanism for each peer

Within the Layer 2 VFI manual configuration mode, the following commands are available:

- **vpn id** *vpn-id*
- [**no**] **neighbor** *remote-router-id* {**encapsulation mpls** | **pw-class** *pw-name*| **no-split-horizon**}

Examples

This example shows how to create a Layer 2 VFI, enter Layer 2 VFI manual configuration mode, and configure a VPN ID:

```
Device> enable
Device# configure terminal
Device(config)# l2 vfi vfitest1 manual
Device(config-vfi)# vpn id 303
```

Related Commands

Command	Description
vpn id	Configures a VPN ID in RFC 2685 format. You can change the value of the VPN ID only after its configuration, and you cannot remove it.
neighbor	Specifies the type of tunnel signaling and encapsulation mechanism for each peer.

l2vpn vfi context

To establish a Layer 2 VPN virtual forwarding interface (VFI) between two or more separate networks, use the **l2vpn vfi context** command in global configuration mode. To disable the connection, use the **no** form of this command.

l2vpn vfi context *name*
no l2vpn vfi context *name*

Syntax Description

name	Name of the VFI context.

Command Default

Layer 2 VPN VFIs are not established.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Usage Guidelines

The **l2vpn vfi context** command is used as part of the protocol-CLI mode for configuring Virtual Private LAN Service (VPLS). This command establishes a VFI for specifying core-facing pseudowires in a VPLS. The VFI represents an emulated LAN or a VPLS forwarder from the VPLS architectural model when using an emulated LAN interface.

Examples

The following example shows how to establish an Layer 2 VPN VFI context:

```
Device> enable
Device# configure terminal
Device(config)# l2vpn vfi context vfi1
```

Related Commands

Command	Description
l2 vfi	Establishes an Layer 2 VFI.

l2vpn xconnect context

To create a Layer 2 VPN (L2VPN) cross-connect context and enter Xconnect configuration mode, use the **l2vpn xconnect context** command in global configuration mode. To remove the connection, use the **no** form of this command.

l2vpn xconnect context *context-name*

no l2vpn xconnect context *context-name*

Syntax Description

context-name	Name of the cross-connect context.

Command Default

L2VPN cross connections are not created.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Usage Guidelines

Use the **l2vpn xconnect context** command to define a cross-connect context that specifies the two members in a Virtual Private Wire Service (VPWS), that is, attachment circuit to pseudowire, pseudowire-to-pseudowire (multisegment pseudowire), or attachment circuit-to-attachment circuit (local connection). The type of members specified, that is, attachment circuit interface or pseudowire, automatically define the type of L2VPN service.

Examples

The following example shows how to establish an L2VPN cross-connect context:

```
Device> enable
Device# configure terminal
Device(config)# l2vpn xconnect context con1
Device(config-xconnect)# interworking ip
```

Related Commands

Command	Description
interworking	Enables L2VPN interworking and specifies the type of traffic that can be sent over the pseudowire.

label mode

To configure the IPv6 Explicit Null Label, use the **label mode** command in the address family configuration mode. To disable the IPv6 Explicit Null Label, use the **no** form of the command.

label mode { **explicit-null** | **all-explicit-null** }

no label mode

Syntax Description

explicit-null	Configures IPv6 Explicit Null Label for directly connected IPv6 prefixes sent to BGP labelled unicast neighbors.
all-explicit-null	Configures IPv6 Explicit Null Label for all IPv6 prefixes sent to BGP labelled unciast neighbors.

Command Default

IPv6 Explicit Null Label is not configured by default.

Command Modes

Address family configuration mode (config-router-af)

Command History

Release	Modification
Cisco IOS XE Bengaluru 17.6.1	This command was introduced.

The following example shows how to configure the IPv6 explicit-null label.

```
Device(config)# router bgp 1
Device(config-router)# address-family ipv6
Device(config-router-af)#label mode explicit-null
Device(config-router-af)# neighbor 33.33.33.33 activate
Device(config-router-af)# neighbor 33.33.33.33 send-label
```

The following example shows how to configure the IPv6 all-explicit-null label

```
Device(config)# router bgp 1
Device(config-router)# address-family ipv6
Device(config-router-af)#label mode all-explicit-null
Device(config-router-af)# neighbor 33.33.33.33 activate
Device(config-router-af)# neighbor 33.33.33.33 send-label
```

load-balance

To set the load-distribution method for pseudowire, use the **load-balance** command in interface configuration mode. To reset the load-balancing mechanism to the default setting, use the **no** form of this command.

load-balance {**flow** [**ethernet [dst-mac | src-dst-mac | src-mac]** | **ip [dst-ip | src-dst-ip | src-ip]**] | **flow-label** {**both** | **receive** | **transmit**}**[static [advertise]]**}

no load-balance {flow | flow-label}

Syntax Description

flow	Enables flow-based load balancing for pseudowire.
ethernet	Specifies Ethernet pseudowire flow classification.
dst-mac	Specifies load distribution based on the destination host MAC address.
src-dst-mac	Specifies load distribution based on the source and destination host MAC address.
src-mac	Specifies load distribution based on the source MAC address.
ip	Specifies IP pseudowire flow classification.
dst-ip	Specifies load distribution based on the destination host IP address.
src-dst-ip	Specifies load distribution based on the source and destination host IP address.
src-ip	Specifies load distribution based on the source host IP address.
flow-label	Enables flow-aware transport of pseudowire.
both	Enables flow-aware transport of pseudowire in both directions.
receive	Enables flow-aware transport of pseudowire in the receiving direction.
transmit	Enables flow-aware transport of pseudowire in the transmitting direction.
static	Enables flow labels even if not signaled by the remote peer.
advertise	Sends flow label sub type, length, value (sub-TLV).

Command Default

The command is disabled by default.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Examples

This example shows how to set flow-based load balancing for pseudowire in the context of a specified IP address:

```
Device> enable
Device# configure terminal
Device(config)# interface pseudowire 17
Device(config-if)# load-balance flow ip 192.168.2.25
```

Related Commands

Command	Description
interface pseudowire	Specifies the pseudowire interface.

mdt log-reuse

To enable the recording of data multicast distribution tree (MDT) reuse, use the **mdt log-reuse**command in VRF configuration or in VRF address family configuration mode. To disable this function, use the **no** form of this command.

mdt log-reuse
no mdt log-reuse

Syntax Description

This command has no arguments or keywords.

Command Default

The command is disabled.

Command Modes

VRF address family configuration (config-vrf-af)

VRF configuration (config-vrf)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The **mdt log-reuse** command generates a syslog message whenever a data MDT is reused.

You can access the **mdt log-reuse**command by using the **ip vrf** global configuration command. You can also access the **mdt log-reuse** command by using the **vrf definition** global configuration command followed by the **address-family ipv4** VRF configuration command.

Examples

The following example shows how to enable MDT log reuse:

```
mdt log-reuse
```

Related Commands

Command	Description
mdt data	Configures the multicast group address range for data MDT groups.
mdt default	Configures a default MDT group for a VPN VRF.

mdt default

To configure a default multicast distribution tree (MDT) group for a Virtual Private Network (VPN) routing and forwarding (VRF) instance, use the **mdt default** command in VRF configuration or VRF address family configuration mode. To disable this function, use the **no** form of this command.

mdt default*group-address*
no mdt default*group-address*

Syntax Description

group-address	IP address of the default MDT group. This address serves as an identifier for the community in that provider edge (PE) devices configured with the same group address become members of the group, allowing them to receive packets sent by each other.

Command Default

The command is disabled.

Command Modes

VRF address family configuration (config-vrf-af)

VRF configuration (config-vrf)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The default MDT group must be the same group configured on all PE devices that belong to the same VPN.

If Source Specific Multicast (SSM) is used as the protocol for the default MDT, the source IP address will be the address used to source the Border Gateway Protocol (BGP) sessions.

A tunnel interface is created as a result of this command. By default, the destination address of the tunnel header is the *group-address* argument.

You can access the **mdt default** command by using the **ip vrf** global configuration command. You can also access the **mdt default** command by using the **vrf definition** global configuration command followed by the **address-family ipv4** VRF configuration command.

Examples

In the following example, Protocol Independent Multicast (PIM) SSM is configured in the backbone. Therefore, the default and data MDT groups are configured within the SSM range of IP addresses. Inside the VPN, PIM sparse mode (PIM-SM) is configured and only Auto-RP announcements are accepted.

```
ip vrf vrf1
 rd 1000:1
 mdt default 236.1.1.1
 mdt data 228.0.0.0 0.0.0.127 threshold 50
 mdt data threshold 50
 route-target export 1000:1
 route-target import 1000:1
!
!
```

Related Commands

Command	Description
mdt data	Configures the multicast group address range for data MDT groups.

mdt data

To specify a range of addresses to be used in the data multicast distribution tree (MDT) pool, use the **mdt data** command in VRF configuration or VRF address family configuration mode. To disable this function, use the **no** form of this command.

mdt data threshold *kb/s*
no mdt data threshold *kb/s*

Syntax Description

threshold *kb/s*	(Optional) Defines the bandwidth threshold value in kilobits per second (kb/s). The range is from 1 to 4294967.

Command Default

A data MDT pool is not configured.

Command Modes

VRF address family configuration (config-vrf-af)

VRF configuration (config-vrf)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

A data MDT can include a maximum of 256 multicast groups per MVPN. Multicast groups used to create the data MDT are dynamically chosen from a pool of configured IP addresses.

Use the **mdt data** command to specify a range of addresses to be used in the data MDT pool. The threshold is specified in kb/s. Using the optional **list** keyword and *access-list* argument, you can define the (S, G) MVPN entries to be used in a data MDT pool, which would further limit the creation of a data MDT pool to the particular (S, G) MVPN entries defined in the access list specified for the *access-list*argument.

You can access the **mdt data**command by using the **ip vrf** global configuration command. You can also access the **mdt data**command by using the **vrf definition**global configuration command followed by the **address-family ipv4**VRF configuration command.

Examples

The following example shows how to configure the range of group addresses for the MDT data pool. A threshold of 500 kb/s has been set, which means that if a multicast stream exceeds 1 kb/s, then a data MDT is created.

```
ip vrf vrf1
 rd 1000:1
 route-target export 10:27
 route-target import 10:27
 mdt default 236.1.1.1
 mdt data 228.0.0.0 0.0.0.127 threshold 500 list 101
!
.
.
.
!
ip pim ssm default
```

```
ip pim vrf vrf1 accept-rp auto-rp
!
```

Related Commands

Command	Description
mdt default	Configures a default MDT group for a VPN VRF.

member (l2vpn vfi)

To specify the devices that form a point-to-point Layer 2 VPN virtual forwarding interface (VFI) connection, use the **member** command in Layer 2 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 Layer 2 VPN VFI connection are not specified.

Command Modes

Layer 2 VFI configuration (config-vfi)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Usage Guidelines

This instance of the **member** command is used as part of the protocol-CLI mode for configuring Virtual Private LAN Service (VPLS).

Examples

The following example shows how to configure an Layer 2 VPN VFI connection as part of the protocol-CLI mode for configuring Virtual Private LAN Service (VPLS). :

```
Device> enable
Device# configure terminal
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 pseudowire

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

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

no member pseudowire *interface-number*

Syntax Description

interface-number	Interface number.
ip-address	IP address of the peer.
vcid	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. The lowest priority is 16.

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 Everest 16.6.1	This command was introduced.

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 the pseudowire interface and the peer information are specified, an interface is dynamically created by using the *interface-number* argument specified in the **pseudowire** command.

Configure the group name to specify which of the two possible groups a member belongs to.

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

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

Examples

The following example shows how to specify pseudowire as the attachment circuit type:

```
Device> enable
Device# configure terminal
Device(config)# l2vpn xconnect context con1
Device(config-xconnect)# member pseudowire 17
```

Related Commands

Command	Description
l2vpn xconnect context	Creates a Layer 2 VPN (L2VPN) cross-connect context.
xconnect	Binds an attachment circuit to a pseudowire for Xconnect service, and enters Xconnect configuration mode.

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
Cisco IOS XE Everest 16.5.1a	This command was introduced.

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).

You can use label distribution protocols, such as Label Distribution Protocol (LDP), 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 4096. The maximum value defaults to 4096. You can split for static label space between say 16 to 100 and for dynamic label space between 101 to 4096.

The upper and lower minimum static label values are displayed in the help line.

Examples

The following example displays the help lines when you configure the dynamic label with a minimum value of 16 and a maximum value of 100:

```
Device(config)# mpls label range 16 100 static ?
<100>  Upper Minimum static label value
<16>         Lower Minimum static label value
Reserved Label Range  --> 0    to 15
Available Label Range --> 16   to 4096
Static Label Range    --> 16   to 100
Dynamic Label Range   --> 101  to 4096
```

The following example shows how to configure a static range from 16 to 100. If the lower minimum static label space is not available, the lower minimum is not displayed in the help line.

```
Device(config)# mpls label range 16 100 static ?
  <16-100>  static label value range
```

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 4000.

```
Device# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Device(config)# mpls label range 200 4000
Device(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 1000), 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 100 and the maximum static value set to 1000 and a static label space with a minimum static value set to 16 and a maximum static value set to 99:

```
Device(config)# mpls label range 100 1000 static 16 99
Device(config)#
```

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

```
Device# show mpls label range
Downstream label pool: Min/Max label: 100/1000
Range for static labels: Min/Max/Number: 16/99
```

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

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

Related Commands

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

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
no mpls label protocol ldp

Syntax Description

ldp	Specifies that the label distribution protocol (LDP) is to be used 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
Cisco IOS XE Everest 16.5.1a	This command was introduced.

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.

Examples

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

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

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
no mpls label protocol ldp

Syntax Description

ldp	Specifies that LDP is the default label distribution protocol.

Command Default

LDP is the default label distribution protocol.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

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.

Examples

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

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

mpls ldp logging neighbor-changes

To generate system error logging (syslog) messages when Label Distribution Protocol (LDP) sessions go down, use the **mpls ldp logging neighbor-changes** command in global configuration mode. To disable generating syslog messages, use the **no** form of this command.

mpls ldp logging neighbor-changes
no mpls ldp logging neighbor-changes

Syntax Description

This command has no arguments or keywords.

Command Default

Logging is enabled by default.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Usage Guidelines

Use the **mpls ldp logging neighbor-changes** command to generate syslog messages when an LDP session goes down. The command also provides VRF information about the LDP neighbor and the reason for the LDP session going down. Some of the reasons for an LDP session going down are the following:

- An LDP was disabled globally by configuration.
- An LDP was disabled on an interface.

Examples

The following example generates syslog messages when LDP sessions go down:

```
Device> enable
Device# configure terminal
Device(config)# mpls ldp logging neighbor-changes
```

The following output shows the log entries when an LDP session with neighbor 192.168.1.100:0 goes down and comes up. The session went down because the discovery hold timer expired. The VRF table identifier for the neighbor is 1.

```
2d00h: %LDP-5-NBRCHG: LDP Neighbor 192.168.1.100:0 (1) is DOWN (Disc hold timer expired)
2d00h: %LDP-5-NBRCHG: LDP Neighbor 192.168.1.100:0 (1) is UP
```

mpls ip (interface configuration)

To enable Multiprotocol Label Switching (MPLS) forwarding of IPv4 and IPv6 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 and IPv6 packets along normally routed paths for the interface is disabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

MPLS forwarding of IPv4 and IPv6 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.

Examples

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

```
Device(config)# configure terminal
Device(config-if)# interface TenGigabitEthernet1/0/3
Device(config-if)# mpls ip
```

The following example shows that label switching is enabled on the specified vlan interface (SVI) on a Cisco Catalyst switch:

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

mpls ip (global configuration)

To enable Multiprotocol Label Switching (MPLS) forwarding of IPv4 and IPv6 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 and IPv6 packets along normally routed paths is enabled for the platform.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

MPLS forwarding of IPv4 and IPv6 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.

Examples

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

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

Related Commands

Command	Description
mpls ip (interface configuration)	Enables MPLS forwarding of IPv4 and IPv6 packets along normally routed paths for the associated interface.

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
Cisco IOS XE Everest 16.5.1a	This command was introduced.

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:

```
Device# configure terminal
Device(config)# mpls ip
Device(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.

neighbor (MPLS)

To specify the peer IP address and virtual circuit (VC) ID value of a Layer 2 VPN (L2VPN) pseudowire, use the **neighbor** command in interface configuration mode. To remove the peer IP address and VC ID value of an L2VPN pseudowire, use the **no** form of this command.

neighbor *peer-address vcid-value*

no neighbor

Syntax Description

peer-address	IP address of the provider edge (PE) peer.
vcid-value	VC ID value. The range is from 1 to 4294967295.

Command Default

Peer address and VC ID value of a pseudowire are not specified.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Usage Guidelines

You must configure the **neighbor** command for the pseudowire to be functional.

Examples

The following example shows how to specify a peer IP address of 10.1.2.3 and a VC ID value of 100:

```
Device> enable
Device# configure terminal
Device(config)# interface pseudowire 100
Device(config-if)# neighbor 10.1.2.3 100
```

show ip pim mdt send

To display the data multicast distribution tree (MDT) groups in use, use the **show ip pim mdt send** command in privileged EXEC mode.

show ip pim vrf *vrf-name* **mdt send**

Syntax Description

vrf *vrf-name*	Displays the data MDT groups in use by the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the *vrf-name* argument.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

Use this command to show the data MDT groups in use by a specified MVRF.

Examples

The following is sample output from the **show ip pim mdt send** command:

```
Device# show ip pim vrf vpn8 mdt send
MDT-data send list for VRF:vpn8
  (source, group)                      MDT-data group      ref_count
  (10.100.8.10, 225.1.8.1)             232.2.8.0           1
  (10.100.8.10, 225.1.8.2)             232.2.8.1           1
  (10.100.8.10, 225.1.8.3)             232.2.8.2           1
  (10.100.8.10, 225.1.8.4)             232.2.8.3           1
  (10.100.8.10, 225.1.8.5)             232.2.8.4           1
  (10.100.8.10, 225.1.8.6)             232.2.8.5           1
  (10.100.8.10, 225.1.8.7)             232.2.8.6           1
  (10.100.8.10, 225.1.8.8)             232.2.8.7           1
  (10.100.8.10, 225.1.8.9)             232.2.8.8           1
  (10.100.8.10, 225.1.8.10)            232.2.8.9           1
```

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

Table 1: show ip pim mdt send Field Descriptions

Field	Description
source, group	Source and group addresses that this router has switched over to data MDTs.
MDT-data group	Multicast address over which these data MDTs are being sent.
ref_count	Number of (S, G) pairs that are reusing this data MDT.

show ip pim mdt receive

To display the data multicast distribution tree (MDT) group mappings received from other provider edge (PE) routers, use the **show ip pim mdt receive**command in privileged EXEC mode.

show ip pim vrf *vrf-name* **mdt receive** [**detail**]

Syntax Description

vrf *vrf-name*	Displays the data MDT group mappings for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the *vrf-name* argument.
detail	(Optional) Provides a detailed description of the data MDT advertisements received.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

When a router wants to switch over from the default MDT to a data MDT, it advertises the VRF source, the group pair, and the global multicast address over which the traffic will be sent. If the remote router wants to receive this data, then it will join this global address multicast group.

Examples

The following is sample output from the **show ip pim mdt receive**command using the **detail** keyword for further information:

```
Device# show ip pim vrf vpn8 mdt receive detail
Joined MDT-data groups for VRF:vpn8
group:172.16.8.0 source:10.0.0.100 ref_count:13
(10.101.8.10, 225.1.8.1), 1d13h/00:03:28/00:02:26, OIF count:1, flags:TY
(10.102.8.10, 225.1.8.1), 1d13h/00:03:28/00:02:27, OIF count:1, flags:TY
```

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

Table 2: show ip pim mdt receive Field Descriptions

Field	Description
group:172.16.8.0	Group that caused the data MDT to be built.
source:10.0.0.100	VRF source that caused the data MDT to be built.
ref_count:13	Number of (S, G) pairs that are reusing this data MDT.
OIF count:1	Number of interfaces out of which this multicast data is being forwarded.

Field	Description
flags:	Information about the entry. • A--candidate Multicast Source Discovery Protocol (MSDP) advertisement • B--bidirectional group • D--dense • C--connected • F--register flag • I--received source-specific host report • J--join shortest path source tree (SPT) • L--local • M--MSDP created entry • P--pruned • R--RP bit set • S--sparse • s--Source Specific Multicast (SSM) group • T--SPT bit set • X--proxy join timer running • U--URL Rendezvous Directory (URD) • Y--joined MDT data group • y--sending to MDT data group • Z--multicast tunnel

show ip pim mdt history

To display information about the history of data multicast distribution tree (MDT) groups that have been reused, use the **show ip pim mdt history**command in privileged EXEC mode.

show ip pim vrf *vrf-name* **mdt history interval** *minutes*

Syntax Description

vrf *vrf-name*	Displays the history of data MDT groups that have been reused for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the *vrf-name* argument.
interval *minutes*	Specifies the interval (in minutes) for which to display information about the history of data MDT groups that have been reused. The range is from 1 to 71512 minutes (7 weeks).

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The output of the **show ip pim mdt history** command displays the history of reused MDT data groups for the interval specified with the **interval** keyword and *minutes* argument. The interval is from the past to the present, that is, from the time specified for the *minutes* argument to the time at which the command is issued.

Examples

The following is sample output from the **show ip pim mdt history**command:

```
Device# show ip pim vrf vrf1 mdt history interval 20
   MDT-data send history for VRF - vrf1 for the past 20 minutes
MDT-data group        Number of reuse
     10.9.9.8           3
     10.9.9.9           2
```

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

Table 3: show ip pim mdt history Field Descriptions

Field	Description
MDT-data group	The MDT data group for which information is being shown.
Number of reuse	The number of data MDTs that have been reused in this group.

show ip pim mdt bgp

To show details about the Border Gateway Protocol (BGP) advertisement of the route distinguisher (RD) for the multicast distribution tree (MDT) default group, use the show ip pim mdt bgp command in user EXEC or privileged EXEC mode.

show ip pim [**vrf** *vrf-name*] **mdt bgp**

Syntax Description

vrf *vrf-name*	(Optional) Displays information about the BGP advertisement of the RD for the MDT default group associated with Multicast Virtual Private Network (MVPN) routing and forwarding (MVRF) instance specified for the *vrf-name* argument.

Command Modes

User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

Use this command to show detailed BGP advertisement of the RD for the MDT default group.

Examples

The following is sample output from the **show ip pim mdt bgp**command:

```
Device# show ip pim mdt bgp
MDT-default group 232.2.1.4
 rid:10.1.1.1 next_hop:10.1.1.1
```

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

Table 4: show ip pim mdt bgp Field Descriptions

Field	Description
MDT-default group	The MDT default groups that have been advertised to this router.
rid:10.1.1.1	The BGP router ID of the advertising router.
next_hop:10.1.1.1	The BGP next hop address that was contained in the advertisement.

show mpls label range

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

show mpls label range

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

You can use the **mpls label range** command to configure a range for local labels that is different from the default range. The **show mpls label range** command displays both the label range currently in use and the label range that will be in use following the next switch reload.

Examples

In the following example, the use of the **show mpls label range** command is shown before and after the **mpls label range** command is used to configure a label range that does not overlap the starting label range:

```
Device# show mpls label range
Downstream label pool: Min/Max label: 16/100
Device# configure terminal
Device(config)# mpls label range 101 4000
Device(config)# exit
Device# show mpls label range
Downstream label pool: Min/Max label: 101/4000
```

Related Commands

Command	Description
mpls label range	Configures a range of values for use as local labels.

show mpls ldp bindings

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

show mpls ldp bindings [**all** | **vrf** *vrf-name*] [**brief**] [**summary**]

Syntax Description

all	Displays all Label Distribution Protocol (LDP) configured VRFs.
vrf *vrf-name*	Displays information for the specified VRF.
brief	Displays concise information about specified LDP-enabled interface.
summary	Displays information for LDP discovery.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Amsterdam 17.3.1	This command was introduced.

Examples

The following is a sample output of the **show mpls ldp bindings brief** command:

```
Device# show mpls ldp bindings brief
Fri Mar  9 17:39:27.358 UTCs
Prefix              Local      Advertised  Remote Bindings
                    Label        (peers)       (peers)
------------------  ---------  ----------  ---------------
0.0.0.0/0           ImpNull             2                0
1.1.1.1/32          ImpNull             2                2
1.2.3.0/24          -                   0                2
3.3.3.3/32          24054               2                2
4.4.4.4/32          24050               2                2
5.5.5.5/32          24051               2                2
5.7.0.0/16          ImpNull             2                0
5.8.0.0/16          -                   0                2
5.11.0.0/16         24002               2                0
6.6.6.6/32          24055               2                2
10.5.1.0/24         ImpNull             2                0
10.105.0.0/16       24003               2                0
11.11.11.0/24       ImpNull             2                0
12.12.12.2/32       ImpNull             2                0
14.0.0.0/16         -                   0                2
20.20.20.0/24       ImpNull             2                2
30.30.30.0/24       ImpNull             2                2
56.2.1.0/24         ImpNull             2                0
86.0.0.1/32         ImpNull             2                0
100.0.0.0/16        ImpNull             2                0
100.0.0.1/32        ImpNull             2                0
110.1.1.1/32        -                   0                2
120.1.1.1/32        -                   0                2
202.153.0.0/16      24005               2                0
202.153.144.25/32   24004               2                2
```

The following is a sample output of the **show mpls ldp bindings summary** command:

```
Device# show mpls ldp bindings summary
Fri Mar  9 17:39:22.572 UTC
LIB Summary:
  Total Prefix   : 25
  Revision No    : Current:92, Advertised:92
  Local Bindings : 20
      NULL    : 12 (implicit:12, explicit:0)
      Non-NULL: 8 (lowest:24002, highest:24055)
  Remote Bindings: 26
```

Related Commands

Command	Description
show mpls ldp discovery	Displays the status of LDP discovery process
show mpls ldp neighbor	Displays the status of LDP sessions.

show mpls ldp discovery

To display the status of Label Distribution Protocol (LDP) discovery process, use the **show mpls ldp discovery** command.

show mpls ldp discovery [**all** | **vrf** *vrf-name*] [**brief**] [**summary**]

Syntax Description

all	Displays all LDP-configured VRFs.
vrf *vrf-name*	Displays information for the specified VRF.
brief	Displays concise information about specified LDP-enabled interface.
summary	Displays information for LDP discovery.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Amsterdam 17.3.1	This command was introduced.

Examples

The following is a sample output of the **show mpls ldp discovery brief** command:

```
Device# show mpls ldp discovery brief

Fri Mar  9 17:39:00.536 UTC

Local LDP Identifier: 1.1.1.1:0

Discovery Source     VRF Name             Peer LDP Id          Holdtime Session
-------------------- -------------------- -------------------- -------- -------
Te0/1/1/10           default              4.4.4.4:0               15       Y
Te0/1/1/12           default              3.3.3.3:0               15       Y
Tgt:87.0.0.1         default              -                       -        N
```

The following is a sample output of the **show mpls ldp discovery summary** command:

```
Device# show mpls ldp discovery summary
Fri Mar  9 17:38:55.977 UTC

LDP Identifier: 1.1.1.1:0
Interfaces:
  Configured: 2
  Enabled   : 2
Discovery:
  Hello xmit: 3 (2 link, 1 targeted)
  Hello recv: 2 (2 link)
  Hello Errors Received:
    Bad Source Address: 0
    Bad Hello PDU:      0
    Bad Xport Address:  0
    Same Router ID:     0
    Wrong Router ID:    0
```

Related Commands

Command	Description
show mpls ldp bindings	Displays the contents of Label Information Base (LIB).
show mpls ldp neighbor	Displays the status of LDP sessions.

show mpls ldp neighbor

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

show mpls ldp neighbor [**all** | **vrf** *vrf-name*] [**brief**] [**summary**]

Syntax Description

all	Displays all LDP-configured VRFs.
vrf *vrf-name*	Displays information for the specified VRF.
brief	Displays concise information about specified LDP-enabled interface.
summary	Displays information for LDP discovery.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Amsterdam 17.3.1	This command was introduced.

Examples

The following is a sample output of the **show mpls ldp neighbor brief** command:

```
Device# show mpls ldp neighbor brief

Fri Mar  9 17:38:11.890 UTC

Peer               GR  NSR  Up Time     Discovery   Addresses     Labels
-----------------  --  ---  ----------  ----------  ----------  ------------
4.4.4.4:0          N   N    2d02h       1           6           13
3.3.3.3:0          N   N    2d02h       1           7           13
```

The following is a sample output of the **show mpls ldp neighbor summary** command:

```
Device# show mpls ldp neighbor summary
Fri Mar  9 17:38:55.977 UTC
VRF vrf1

Local LDP Identifier: 16.0.0.3:0

Sessions: 2 operational
          1 directly connected
          0 graceful restart
```

Related Commands

Command	Description
show mpls ldp bindings	Displays the contents of Label Information Base (LIB).
show mpls ldp discovery	Displays the status of LDP discovery process.

show mpls forwarding-table

To display the contents of the Multiprotocol Label Switching (MPLS) Label Forwarding Information Base (LFIB), use the **show mpls forwarding-table** command in user EXEC or privileged EXEC mode.

Note When a local label is present, the forwarding entry for IP imposition will not be showed; if you want to see the IP imposition information, use **show ip cef**.

show mpls forwarding-table [*network* {*masklength*} | **interface** *interface* | **labels** *label* [**dash** *label*] | **lcatm atm** *atm-interface-number* | **next-hop** *address* | **lsp-tunnel** [*tunnel-id*]] [**vrf** *vrf-name*] [**detail slot** *slot-number*]

network	(Optional) Destination network number.
mask	IP address of the destination mask whose entry is to be shown.
length	Number of bits in the mask of the destination.
interface *interface*	(Optional) Displays entries with the outgoing interface specified.
labels *label-label*	(Optional) Displays entries with the local labels specified.
lcatm atm *atm-interface-number*	Displays ATM entries with the specified Label Controlled Asynchronous Transfer Mode (LCATM).
next-hop *address*	(Optional) Displays only entries with the specified neighbor as the next hop.
lsp-tunnel	(Optional) Displays only entries with the specified label switched path (LSP) tunnel, or with all LSP tunnel entries.
tunnel-id	(Optional) Specifies the LSP tunnel for which to display entries.
vrf *vrf-name*	(Optional) Displays entries with the specified VPN routing and forwarding (VRF) instance.
detail	(Optional) Displays information in long form (includes length of encapsulation, length of MAC string, maximum transmission unit [MTU], and all labels).
slot *slot-number*	(Optional) Specifies the slot number, which is always 0.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Examples

The following is sample output from the **show mpls forwarding-table** command:

```
Device# show mpls forwarding-table
Local Outgoing      Prefix            Bytes label Outgoing       Next Hop
Label Label or VC   or Tunnel Id      switched  interface
26    No Label      10.253.0.0/16     0         Et4/0/0       10.27.32.4
28    1/33          10.15.0.0/16      0         AT0/0.1       point2point
29    Pop Label     10.91.0.0/16      0         Hs5/0         point2point
      1/36          10.91.0.0/16      0         AT0/0.1       point2point
30    32            10.250.0.97/32    0         Et4/0/2       10.92.0.7
      32            10.250.0.97/32    0         Hs5/0         point2point
34    26            10.77.0.0/24      0         Et4/0/2       10.92.0.7
      26            10.77.0.0/24      0         Hs5/0         point2point
35    No Label[T]   10.100.100.101/32 0         Tu301         point2point
36    Pop Label     10.1.0.0/16      0         Hs5/0         point2point
      1/37          10.1.0.0/16      0         AT0/0.1       point2point
[T]     Forwarding through a TSP tunnel.
        View additional labeling info with the 'detail' option
```

The following is sample output from the **show mpls forwarding-table** command when the IPv6 Provider Edge Router over MPLS feature is configured to allow IPv6 traffic to be transported across an IPv4 MPLS backbone. The labels are aggregated because there are several prefixes for one local label, and the prefix column contains “IPv6” instead of a target prefix.

```
Device# show mpls forwarding-table
Local Outgoing      Prefix            Bytes label Outgoing       Next Hop
Label Label or VC   or Tunnel Id      switched  interface
16    Aggregate     IPv6              0
17    Aggregate     IPv6              0
18    Aggregate     IPv6              0
19    Pop Label     192.168.99.64/30  0         Se0/0         point2point
20    Pop Label     192.168.99.70/32  0         Se0/0         point2point
21    Pop Label     192.168.99.200/32 0         Se0/0         point2point
22    Aggregate     IPv6              5424
23    Aggregate     IPv6              3576
24    Aggregate     IPv6              2600
```

The following is sample output from the **show mpls forwarding-table detail** command. If the MPLS EXP level is used as a selection criterion for packet forwarding, a bundle adjacency exp (vcd) field is included in the display. This field includes the EXP value and the corresponding virtual circuit descriptor (VCD) in parentheses. The line in the output that reads “No output feature configured” indicates that the MPLS egress NetFlow accounting feature is not enabled on the outgoing interface for this prefix.

```
Device# show mpls forwarding-table detail
Local Outgoing      Prefix            Bytes label Outgoing       Next Hop
label   label or VC     or Tunnel Id      switched  interface
16    Pop label       10.0.0.6/32        0         AT1/0.1       point2point
  Bundle adjacency exp(vcd)
  0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
  MAC/Encaps=12/12, MTU=4474, label Stack{}
      00010000AAAA030000008847
  No output feature configured
```

```
17    18            10.0.0.9/32        0         AT1/0.1       point2point
  Bundle adjacency exp(vcd)
  0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
  MAC/Encaps=12/16, MTU=4470, label Stack{18}
      00010000AAAA030000008847 00012000
  No output feature configured
18    19            10.0.0.10/32        0        AT1/0.1       point2point
  Bundle adjacency exp(vcd)
  0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
  MAC/Encaps=12/16, MTU=4470, label Stack{19}
      00010000AAAA030000008847 00013000
  No output feature configured
19    17            10.0.0.0/8         0        AT1/0.1       point2point
  Bundle adjacency exp(vcd)
  0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
  MAC/Encaps=12/16, MTU=4470, label Stack{17}
      00010000AAAA030000008847 00011000
  No output feature configured
20    20            10.0.0.0/8         0        AT1/0.1       point2point
  Bundle adjacency exp(vcd)
  0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
  MAC/Encaps=12/16, MTU=4470, label Stack{20}
      00010000AAAA030000008847 00014000
  No output feature configured
21    Pop label       10.0.0.0/24        0        AT1/0.1       point2point
  Bundle adjacency exp(vcd)
  0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
  MAC/Encaps=12/12, MTU=4474, label Stack{}
      00010000AAAA030000008847
  No output feature configured
22    Pop label       10.0.0.4/32         0        Et2/3         10.0.0.4
  MAC/Encaps=14/14, MTU=1504, label Stack{}
      000427AD10430005DDFE043B8847
  No output feature configured
```

The following is sample output from the **show mpls forwarding-table detail** command. In this example, the MPLS egress NetFlow accounting feature is enabled on the first three prefixes, as indicated by the line in the output that reads “Feature Quick flag set.”

```
Device# show mpls forwarding-table detail
Local  Outgoing    Prefix            Bytes label  Outgoing   Next Hop
label    label or VC   or Tunnel Id      switched   interface
16     Aggregate   10.0.0.0/8[V]     0
        MAC/Encaps=0/0, MTU=0, label Stack{}
        VPN route: vpn1
        Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
17     No label    10.0.0.0/8[V]      0          Et0/0/2    10.0.0.1
        MAC/Encaps=0/0, MTU=1500, label Stack{}
        VPN route: vpn1
        Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
18     No label    10.42.42.42/32[V] 4185       Et0/0/2    10.0.0.1
        MAC/Encaps=0/0, MTU=1500, label Stack{}
        VPN route: vpn1
        Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
19     2/33        10.41.41.41/32    0          AT1/0/0.1  point2point
        MAC/Encaps=4/8, MTU=4470, label Stack{2/33(vcd=2)}
        00028847 00002000
        No output feature configured
```

The table below describes the significant fields shown in the displays.

Table 5: show mpls forwarding-table Field Descriptions

Field	Description
Local label	Label assigned by this device.
Outgoing Label or VC **Note** This field is not supported on the Cisco 10000 series routers.	Label assigned by the next hop or the virtual path identifier (VPI)/virtual channel identifier (VCI) used to get to next hop. The entries in this column are the following: • [T]--Forwarding is through an LSP tunnel. • No Label--There is no label for the destination from the next hop or label switching is not enabled on the outgoing interface. • Pop Label--The next hop advertised an implicit NULL label for the destination and the device removed the top label. • Aggregate--There are several prefixes for one local label. This entry is used when IPv6 is configured on edge devices to transport IPv6 traffic over an IPv4 MPLS network.
Prefix or Tunnel Id	Address or tunnel to which packets with this label are sent. **Note** If IPv6 is configured on edge devices to transport IPv6 traffic over an IPv4 MPLS network, “IPv6” is displayed here. • [V]--The corresponding prefix is in a VRF.
Bytes label switched	Number of bytes switched with this incoming label. This includes the outgoing label and Layer 2 header.
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the neighbor that assigned the outgoing label.
Bundle adjacency exp(vcd)	Bundle adjacency information. Includes the MPLS EXP value and the corresponding VCD.
MAC/Encaps	Length in bytes of the Layer 2 header and length in bytes of the packet encapsulation, including the Layer 2 header and label header.
MTU	MTU of the labeled packet.
label Stack	All the outgoing labels. If the outgoing interface is transmission convergence (TC)-ATM, the VCD is also shown. **Note** TC-ATM is not supported on Cisco 10000 series routers.

Field	Description
00010000AAAA030000008847 00013000	The actual encapsulation in hexadecimal form. A space is shown between Layer 2 and the label header.

Explicit-Null Label Example

The following is sample output, including the explicit-null label = 0 (commented in bold), for the **show mpls forwarding-table** command on a CSC-PE device:

```
Device# show mpls forwarding-table
Local  Outgoing      Prefix            Bytes label  Outgoing   Next Hop
label  label or VC   or Tunnel Id      switched     interface
17     Pop label     10.10.0.0/32      0            Et2/0      10.10.0.1
18     Pop label     10.10.10.0/24     0            Et2/0      10.10.0.1
19     Aggregate     10.10.20.0/24[V]  0
20     Pop label     10.10.200.1/32[V] 0            Et2/1      10.10.10.1
21     Aggregate     10.10.1.1/32[V]   0
22     0             192.168.101.101/32[V]   \
                                       0            Et2/1      192.168.101.101
23     0             192.168.101.100/32[V]   \
                                       0            Et2/1      192.168.101.100
25     0             192.168.102.125/32[V] 0        Et2/1      192.168.102.125 !outlabel
value 0
```

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

Table 6: show mpls forwarding-table Field Descriptions

Field	Description
Local label	Label assigned by this device.
Outgoing label or VC	Label assigned by the next hop or VPI/VCI used to get to the next hop. The entries in this column are the following: • [T]--Forwarding is through an LSP tunnel. • No label--There is no label for the destination from the next hop or that label switching is not enabled on the outgoing interface. • Pop label--The next hop advertised an implicit NULL label for the destination and that this device popped the top label. • Aggregate--There are several prefixes for one local label. This entry is used when IPv6 is configured on edge devices to transport IPv6 traffic over an IPv4 MPLS network. • 0--The explicit null label value = 0.

Field	Description
Prefix or Tunnel Id	Address or tunnel to which packets with this label are sent. **Note** If IPv6 is configured on edge devices to transport IPv6 traffic over an IPv4 MPLS network, IPv6 is displayed here. • [V]--Means that the corresponding prefix is in a VRF.
Bytes label switched	Number of bytes switched with this incoming label. This includes the outgoing label and Layer 2 header.
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the neighbor that assigned the outgoing label.

Cisco IOS Software Modularity: MPLS Layer 3 VPNs Example

The following is sample output from the **show mpls forwarding-table** command:

```
Device# show mpls forwarding-table
Local      Outgoing   Prefix           Bytes Label   Outgoing   Next Hop
Label      Label      or Tunnel Id     Switched      interface
16         Pop Label  IPv4 VRF[V]      62951000      aggregate/v1
17    [H]  No Label   10.1.1.0/24      0             AT1/0/0.1 point2point
           No Label   10.1.1.0/24      0             PO3/1/0 point2point
      [T]  No Label   10.1.1.0/24      0             Tu1 point2point
18    [HT] Pop Label  10.0.0.3/32      0             Tu1 point2point
19    [H]  No Label   10.0.0.0/8       0             AT1/0/0.1 point2point
           No Label   10.0.0.0/8       0             PO3/1/0 point2point
20    [H]  No Label   10.0.0.0/8       0             AT1/0/0.1 point2point
           No Label   10.0.0.0/8       0             PO3/1/0 point2point
21    [H]  No Label   10.0.0.1/32      812           AT1/0/0.1 point2point
           No Label   10.0.0.1/32      0             PO3/1/0 point2point
22    [H]  No Label   10.1.14.0/24     0             AT1/0/0.1 point2point
           No Label   10.1.14.0/24     0             PO3/1/0 point2point
23    [HT] 16         172.1.1.0/24[V]  0             Tu1 point2point
24    [HT] 24         10.0.0.1/32[V]   0             Tu1 point2point
25    [H]  No Label   10.0.0.0/8[V]    0             AT1/1/0.1 point2point
26    [HT] 16         10.0.0.3/32[V]   0             Tu1 point2point
27         No Label   10.0.0.1/32[V]   0             AT1/1/0.1 point2point
[T]     Forwarding through a TSP tunnel.
        View additional labelling info with the 'detail' option
[H]     Local label is being held down temporarily.
```

The table below describes the Local Label fields relating to the Cisco IOS Software Modularity: MPLS Layer 3 VPNs feature.

Table 7: show mpls forwarding-table Field Descriptions

Field	Description
Local Label	Label assigned by this device. • [H]--Local labels are in holddown, which means that the application that requested the labels no longer needs them and stops advertising them to its labeling peers. The label's forwarding-table entry is deleted after a short, application-specific time. If any application starts advertising a held-down label to its labeling peers, the label could come out of holddown. **Note** [H] is not shown if labels are held down globally. A label enters global holddown after a stateful switchover or a restart of certain processes in a Cisco IOS modularity environment. • [T]--The label is forwarded through an LSP tunnel. **Note** Although [T] is still a property of the outgoing interface, it is shown in the Local Label column. • [HT]--Both conditions apply.

L2VPN Inter-AS Option B: Example

The following is sample output from the **show mpls forwarding-table interface** command. In this example, the pseudowire identifier (that is, 4096) is displayed in the Prefix or Tunnel Id column. The **show mpls l2transport vc detail** command can be used to obtain more information about the specific pseudowire displayed.

```
Device# show mpls forwarding-table
Local      Outgoing   Prefix           Bytes Label    Outgoing   Next Hop
Label      Label      or Tunnel Id     Switched       interface
1011       No Label   l2ckt(4096)          0          none       point2point
```

The table below describes the fields shown in the display.

Table 8: show mpls forwarding-table interface Field Descriptions

Field	Description
Local Label	Label assigned by this device.
Outgoing Label	Label assigned by the next hop or virtual path identifier (VPI)/virtual channel identifier (VCI) used to get to the next hop.
Prefix or Tunnel Id	Address or tunnel to which packets with this label are going.
Bytes Label Switched	Number of bytes switched with this incoming label. This includes the outgoing label and Layer 2 header.

Field	Description
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the neighbor that assigned the outgoing label.

show mpls static binding

To display Multiprotocol Label Switching (MPLS) static label bindings, use the **show mpls static binding** command in privileged EXEC mode.

show mpls static binding[**ipv4**[**vrf** *vrf-name*]][*prefix* {*mask-lengthmask*}][**local** | **remote**][**nexthop** *address*]

Syntax Description

ipv4	(Optional) Displays IPv4 static label bindings.
vrf *vrf-name*	(Optional) The static label bindings for a specified VPN routing and forwarding instance.
prefix {*mask-length* | *mask*}	(Optional) Labels for a specific prefix.
local	(Optional) Displays the incoming (local) static label bindings.
remote	(Optional) Displays the outgoing (remote) static label bindings.
nexthop *address*	(Optional) Displays the label bindings for prefixes with outgoing labels for which the specified next hop is to be displayed.

Command Modes

Privileged EXEC (#)

Command History

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

If you do not specify any optional arguments, the show mpls static binding command displays information about all static label bindings. Or the information can be limited to any of the following:

- Bindings for a specific prefix or mask
- Local (incoming) labels
- Remote (outgoing) labels
- Outgoing labels for a specific next hop router

Examples

In the following output, the **show mpls static binding ipv4** command with no optional arguments displays all static label bindings:

```
Device# show mpls static binding ipv4
10.0.0.0/8: Incoming label: none;
  Outgoing labels:
     10.13.0.8           explicit-null
10.0.0.0/8: Incoming label: 55 (in LIB)
  Outgoing labels:
     10.0.0.66              2607
```

```
10.66.0.0/16: Incoming label: 17 (in LIB)
  Outgoing labels:  None
```

In the following output, the **show mpls static binding ipv4** command displays remote (outgoing) statically assigned labels only:

```
Device# show mpls static binding ipv4 remote
10.0.0.0/8:
  Outgoing labels:
     10.13.0.8           explicit-null
10.0.0.0/8:
  Outgoing labels:
     10.0.0.66              2607
```

In the following output, the **show mpls static binding ipv4** command displays local (incoming) statically assigned labels only:

```
Device# show mpls static binding ipv4 local
10.0.0.0/8: Incoming label: 55 (in LIB)
10.66.0.0/16: Incoming label: 17 (in LIB)
```

In the following output, the**show mpls static binding ipv4** command displays statically assigned labels for prefix 10.0.0.0 / 8 only:

```
Device# show mpls static binding ipv4 10.0.0.0/8
10.0.0.0/8: Incoming label: 55 (in LIB)
  Outgoing labels:
     10.0.0.66              2607
```

In the following output, the **show mpls static binding ipv4** command displays prefixes with statically assigned outgoing labels for next hop 10.0.0.66:

```
Device# show mpls static binding ipv4 10.0.0.0 8 nexthop 10.0.0.66
10.0.0.0/8: Incoming label: 55 (in LIB)
  Outgoing labels:
     10.0.0.66              2607
```

The following output, the **show mpls static binding ipv4 vrf** command displays static label bindings for a VPN routing and forwarding instance vpn100:

```
Device# show mpls static binding ipv4 vrf vpn100
192.168.2.2/32: (vrf: vpn100) Incoming label: 100020
Outgoing labels: None
192.168.0.29/32: Incoming label: 100003 (in LIB)
Outgoing labels: None
```

Related Commands

Command	Description
mpls static binding ipv4	Binds an IPv4 prefix or mask to a local or remote label.

show mpls static crossconnect

To display statically configured Label Forwarding Information Database (LFIB) entries, use the **show mpls static crossconnect** command in privileged EXEC mode.

show mpls static crossconnect [*low label* [*high label*]]

Syntax Description

low label high label	(Optional) The statically configured LFIB entries.

Command Modes

Privileged EXEC (#)

Command History

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

If you do not specify any label arguments, then all the configured static cross-connects are displayed.

Examples

The following sample output from the **show mpls static crossconnect** command shows the local and remote labels:

```
Device# show mpls static crossconnect
Local  Outgoing    Outgoing   Next Hop
label  label       interface
45     46          pos5/0     point2point
```

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

Table 9: show mpls static crossconnect Field Descriptions

Field	Description
Local label	Label assigned by this router.
Outgoing label	Label assigned by the next hop.
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the next hop router's interface that is connected to this router's outgoing interface.

Related Commands

Command	Description
mpls static crossconnect	Configures an LFIB entry for the specified incoming label and outgoing interface.

mpls static binding ipv4

To bind a prefix to a local or remote label, use the **mpls static binding ipv4** command in global configuration mode. To remove the binding between the prefix and label, use the **no** form of this command.

mpls static binding ipv4 *prefix mask* {*label* | **input** *label* | **output** *nexthop* {**explicit-null** | **implicit-null***label*}}
no mpls static binding ipv4 *prefix mask* {*label* | **input** *label* | **output** *nexthop* {**explicit-null** | **implicit-null***label*}}

prefix mask	Specifies the prefix and mask to bind to a label. (When you do not use the **input** or **output** keyword, the specified label is an incoming label.) **Note** Without the arguments, the **no** form of the command removes all static bindings.
label	Binds a prefix or a mask to a local (incoming) label. (When you do not use the **input** or **output** keyword, the specified label is an incoming label.)
input *label*	Binds the specified label to the prefix and mask as a local (incoming) label.
output *nexthop* **explicit-null**	Binds the Internet Engineering Task Force (IETF) Multiprotocol Label Switching (MPLS) IPv4 explicit null label (0) as a remote (outgoing) label.
output *nexthop* **implicit-null**	Binds the IETF MPLS implicit null label (3) as a remote (outgoing) label.
output *nexthop label*	Binds the specified label to the prefix/mask as a remote (outgoing) label.

Command Default

Prefixes are not bound to local or remote labels.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The mpls static binding ipv4 command pushes bindings into Label Distribution Protocol (LDP). LDP then needs to match the binding with a route in the Routing Information Base (RIB) or Forwarding Information Base (FIB) before installing forwarding information.

The mpls static binding ipv4 command installs the specified bindings into the LDP Label Information Base (LIB). LDP will install the binding labels for forwarding use if or when the binding prefix or mask matches a known route.

Static label bindings are not supported for local prefixes, which are connected networks, summarized routes, default routes, and supernets. These prefixes use implicit-null or explicit-null as the local label.

If you do not specify the **input** or the **output** keyword, input (local label) is assumed.

For the **no** form of the command:

- If you specify the command name without any keywords or arguments, all static bindings are removed.
- Specifying the prefix and mask but no label parameters removes all static bindings for that prefix or mask.

Examples

In the following example, the **mpls static binding ipv4** command configures a static prefix and label binding before the label range is reconfigured to define a range for static assignment. The output of the command indicates that the binding has been accepted, but cannot be used for MPLS forwarding until you configure a range of labels for static assignment that includes that label.

```
Device# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 55
 % Specified label 55 for 10.0.0.0/8 out of configured
 % range for static labels.  Cannot be used for forwarding until
 % range is extended.
Router(config)# end
```

The following **mpls static binding ipv4** commands configure input and output labels for several prefixes:

```
Device(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 55
Device(config)# mpls static binding ipv4 10.0.0.0 255.0.0.0 output 10.0.0.66 2607
Device(config)# mpls static binding ipv4 10.66.0.0 255.255.0.0 input 17
Device(config)# mpls static binding ipv4 10.66.0.0 255.255.0.0 output 10.13.0.8 explicit-null
Device(config)# end
```

The following **show mpls static binding ipv4** command displays the configured bindings:

```
Device# show mpls static binding ipv4

10.0.0.0/8: Incoming label: 55
  Outgoing labels:
    10.0.0.66   2607
10.66.0.0/24: Incoming label: 17
  Outgoing labels:
    10.13.0.8    explicit-null
```

Related Commands

Command	Description
show mpls forwarding-table	Displays labels currently being used for MPLS forwarding.
show mpls label range	Displays statically configured label bindings.

show platform hardware fed (TCAM utilization)

To display Ternary Content Addressable Memory (TCAM) utilization information, use the **show platform hardware fed switch** command in privileged EXEC mode.

show platform hardware fed switch { *switch_number* | **active** | **standby** } **fwd-asic resource tcam utilization** [*asic_number* | **detail**]

Syntax Description

switch { *switch_number* | **active** | **standby** }	Selects the switch which you want to display information. • *switch_number*—ID of the switch. • **active**—Displays information related to the active switch. • **standby**—Displays information relating to standby switch.
fwd-asic	Displays ASIC information for each ASIC.
resource	Displays all ASIC resources.
tcam	Displays TCAM resource information.
utilization [*asic_number* | **detail**]	Displays the current Content Addressable Memory (CAM) utilization. • *asic_number*—ASIC number. The range is from 0 to 7. • **detail**—Displays detailed CAM utilization information. This option is available if the **service internal** command is configured on the device.

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.
Cisco IOS XE Amsterdam 17.2.1	The command output was enhanced to display TCAM utilization categorised by IPv4, IPv6, MPLS and other protocols.

Usage Guidelines

The output displayed is for each ASIC on the device which includes the sum of two cores of the ASIC.

Example

The following is sample output from the **show platform hardware fed switch active fwd-asic resource tcam utilization** command:

Note Certain device configurations and protocols are identified as insecure and pose a security risk to Cisco devices. While existing deployments continue to function, you must intentionally enable these features for new installations. For more information on remediation, refer to Cisco C9000 Switching IOS XE – Resilient Infrastructure Playbook.

```
Device> enable
Device# show platform software fed switch active fwd-asic resource tcam utilization
Codes: EM - Exact_Match, I - Input, O - Output, IO - Input & Output, NA - Not Applicable

CAM Utilization for ASIC  [0]
 Table                Subtype   Dir      Max     Used    %Used   V4     V6     MPLS    Other


-----------------------------------------------------------------------------------------------

 Mac Address Table    EM         I      81920     23       0%     0      0      0        23
 Mac Address Table    TCAM       I        768     21       2%     0      0      0        21
 L3 Multicast         EM         I      16384      0       0%     0      0      0         0
 L3 Multicast         TCAM       I        768     35       4%     3     32      0         0
 L2 Multicast         TCAM       I       2304      7       0%     3      4      0         0
 IP Route Table       EM/LPM     I     114688     18       0%    18      0      0         0
 IP Route Table       TCAM       I       1536     13       0%    10      3      0         0
 QOS ACL Ipv4         TCAM       I       5632     15       0%    15      0      0         0
 QOS ACL Non Ipv4     TCAM       I       2560     30       1%     0     20      0        10
 QOS ACL Ipv4         TCAM       O       6144     13       0%    13      0      0         0
 QOS ACL Non Ipv4     TCAM       O       2048     27       1%     0     18      0         9
 Security ACL Ipv4    TCAM       I       7168     12       0%    12      0      0         0
 Security ACL Non
 Ipv4                 TCAM       I       5120     76       1%     0     36      0        40
 Security ACL Ipv4    TCAM       O       7168     13       0%    13      0      0         0
 Security ACL Non
 Ipv4                 TCAM       O       8192     27       0%     0     22      0         5
 Netflow ACL          TCAM       I       1024      6       0%     2      2      0         2
 PBR ACL              TCAM       I       3072     22       0%    16      6      0         0
 Netflow ACL          TCAM       O       1024      6       0%     2      2      0         2
 Flow SPAN ACL        TCAM       I        512      5       0%     1      2      0         2
 Flow SPAN ACL        TCAM       O        512      8       1%     2      4      0         2
 Control Plane        TCAM       I       1024    256      25%   110    104      0        42
 Tunnel Termination   TCAM       I       2816     26       0%    10     16      0         0
 Lisp Inst Mapping    TCAM       I       1024      1       0%     0      0      0         1
 CTS Cell Matrix/VPN
 Label                EM         O      32768      0       0%     0      0      0         0
 CTS Cell Matrix/VPN
 Label                TCAM       O        768      1       0%     0      0      0         1
 Client Table         EM         I       8192      0       0%     0      0      0         0
 Client Table         TCAM       I        512      0       0%     0      0      0         0
 Input Group LE       TCAM       I       1024      0       0%     0      0      0         0
 Output Group LE      TCAM       O       1024      0       0%     0      0      0         0
 Macsec SPD           TCAM       I        256      2       0%     0      0      0         2
CAM Utilization for ASIC  [1]
 Table                Subtype   Dir      Max     Used    %Used   V4     V6     MPLS    Other
```

```
-----------------------------------------------------------------------------------------------------

 Mac Address Table    EM         I      81920     23       0%     0      0      0       23
 Mac Address Table    TCAM       I        768     21       2%     0      0      0       21
 L3 Multicast         EM         I      16384      0       0%     0      0      0        0
 L3 Multicast         TCAM       I        768     35       4%     3     32      0        0
 L2 Multicast         TCAM       I       2304      7       0%     3      4      0        0
 IP Route Table       EM/LPM     I     114688     18       0%    18      0      0        0
 IP Route Table       TCAM       I       1536     13       0%    10      3      0        0
 QOS ACL Ipv4         TCAM       I       5632     15       0%    15      0      0        0
 QOS ACL Non Ipv4     TCAM       I       2560     30       1%     0     20      0       10
 QOS ACL Ipv4         TCAM       O       6144     12       0%    12      0      0        0
 QOS ACL Non Ipv4     TCAM       O       2048     24       1%     0     16      0        8
 Security ACL Ipv4    TCAM       I       7168     12       0%    12      0      0        0
 Security ACL Non
 Ipv4                 TCAM       I       5120     76       1%     0     36      0       40
 Security ACL Ipv4    TCAM       O       7168     13       0%    13      0      0        0
 Security ACL Non
 Ipv4                 TCAM       O       8192     27       0%     0     22      0        5
 Netflow ACL          TCAM       I       1024      6       0%     2      2      0        2
 PBR ACL              TCAM       I       3072     22       0%    16      6      0        0
 Netflow ACL          TCAM       O       1024      6       0%     2      2      0        2
 Flow SPAN ACL        TCAM       I        512      5       0%     1      2      0        2
 Flow SPAN ACL        TCAM       O        512      8       1%     2      4      0        2
 Control Plane        TCAM       I       1024    256      25%   110    104      0       42
 Tunnel Termination   TCAM       I       2816     26       0%    10     16      0        0
 Lisp Inst Mapping    TCAM       I       1024      1       0%     0      0      0        1
 CTS Cell Matrix/VPN
 Label                EM         O      32768      0       0%     0      0      0        0
 CTS Cell Matrix/VPN
 Label                TCAM       O        768      1       0%     0      0      0        1
 Client Table         EM         I       8192      0       0%     0      0      0        0
 Client Table         TCAM       I        512      0       0%     0      0      0        0
 Input Group LE       TCAM       I       1024      0       0%     0      0      0        0
 Output Group LE      TCAM       O       1024      0       0%     0      0      0        0
 Macsec SPD           TCAM       I        256      2       0%     0      0      0        2
```

Table 10: show platform hardware fed (TCAM utilization) Field Descriptions

Field	Description
`Table`	Displays the feature configured on the device.
`Subtype`	Displays resource type.
`Dir`	Displays direction of traffic.
`Max`	Displays maximum number of entries allocated.
`Used`	Displays number of entries used.
`%Used`	Displays percentage of entries used.
`V4`	Displays number of entries used by IPv4 protocol.
`V6`	Displays number of entries used by IPv6 protocol.
`MPLS`	Displays number of entries used by MPLS protocol.
`Other`	Displays number of entries used by other protocols.

show platform software fed switch l2vpn

To display device-specific software information, use the **show platform software fed switch** command.

show platform software fed switch {*switch number* | **active** | **standby**} **l2vpn** {**atom-disposition** | **atom-imposition** | **summary** | **vfi-segment** | **xconnect**}

Note This topic elaborates on only the Layer 2 VPN-specific (L2VPN-specific) options available with the **show platform software fed switch l2vpn** command.

Syntax Description

switch {*switch number* | **active** | **standby**}	Specifies the device for which you want to display information. • *switch number*: Switch ID. Displays information about the specified switch. • **active**: Displays information about the active switch. • **standby**: Displays information about the standby switch, if available.
l2vpn	Displays L2VPN information. Choose one of the following options: • **atom-disposition**: Displays L2VPN atom disposition information. • **atom-imposition**: Displays L2VPN atom imposition information. • **summary**: Displays L2VPN summary. • **vfi-segment**: Displays L2VPN Virtual Forwarder Interface (VFI) segment information. • **xconnect**: Displays L2VPN Xconnect information.

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Examples

The following is a sample output of the **show platform software fed switch l2vpn** command:

```
Device# show platform software fed switch 1 l2vpn atom-disposition all

Number of disp  entries:25
 ATOM_DISP:6682 ac_ifhdl:4325527 xconid:0 dot1q_etype:0
     disp_flags:0x111 pdflags:0 hw_handle:0x4b010118
     disp flags (FED) in detail   CW_IN_USE  VCCV  L2L
  AAL: id:1258357016 , port_id:4325527, adj_flags:0x4 pw_id:1074 ref_cnt:1
       adj_flags in detail:  PORT MODE VC  CW Enabled
       port_hdl:0x5c01020f, dot1q:0 , is_vfi_seg;1 vfi_seg_hdl:0 stats_valid:1
```

```
      drop_adj_flag:0 unsupported_feature:0
      sih:0x7f1c6ce84b58(18438) di_id:23713 rih:0x7f1c6ce845a8(5154)
ATOM_DISP:12654 ac_ifhdl:311 xconid:1104 dot1q_etype:0
    disp_flags:0x211 pdflags:0 hw_handle:0xad000139
    disp flags (FED) in detail   CW_IN_USE  VCCV  ETHERNET_ITW
 AAL: id:2902458681 , port_id:311, adj_flags:0xc pw_id:54 ref_cnt:1
      adj_flags in detail:  TYPE5 VC  CW Enabled
      port_hdl:0xe1000254, dot1q:0 , is_vfi_seg;0 vfi_seg_hdl:0 stats_valid:1
      drop_adj_flag:0 unsupported_feature:0
      sih:0x7f1c6a6b5078(17152) di_id:24265 rih:0x7f1c6a6b4ac8(3678)
ATOM_DISP:17319 ac_ifhdl:1248 xconid:3500 dot1q_etype:0
    disp_flags:0x211 pdflags:0 hw_handle:0x8c000185
    disp flags (FED) in detail   CW_IN_USE  VCCV  ETHERNET_ITW
 AAL: id:2348810629 , port_id:1248, adj_flags:0xc pw_id:991 ref_cnt:1
      adj_flags in detail:  TYPE5 VC  CW Enabled
      port_hdl:0x8d0101fd, dot1q:0 , is_vfi_seg;0 vfi_seg_hdl:0 stats_valid:1
      drop_adj_flag:0 unsupported_feature:0
      sih:0x7f1c6ad17288(16884) di_id:24265 rih:0x7f1c6ad16d48(518)
ATOM_DISP:17325 ac_ifhdl:1249 xconid:3201 dot1q_etype:0
    disp_flags:0x211 pdflags:0 hw_handle:0xdd000184
    disp flags (FED) in detail   CW_IN_USE  VCCV  ETHERNET_ITW
 AAL: id:3707765124 , port_id:1249, adj_flags:0xc pw_id:993 ref_cnt:1
      adj_flags in detail:  TYPE5 VC  CW Enabled
      port_hdl:0x10101fe, dot1q:0 , is_vfi_seg;0 vfi_seg_hdl:0 stats_valid:1
      drop_adj_flag:0 unsupported_feature:0
      sih:0x7f1c6ad1cb58(16885) di_id:24265 rih:0x7f1c6ad17858(520)
ATOM_DISP:17330 ac_ifhdl:1249 xconid:3201 dot1q_etype:0
    disp_flags:0x1211 pdflags:0 hw_handle:0x37000183
    disp flags (FED) in detail   CW_IN_USE  VCCV  ETHERNET_ITW  PW_STANDBY
 AAL: id:922747267 , port_id:1249, adj_flags:0xc pw_id:994 ref_cnt:1
      adj_flags in detail:  TYPE5 VC  CW Enabled
      port_hdl:0x10101fe, dot1q:0 , is_vfi_seg;0 vfi_seg_hdl:0 stats_valid:1
      drop_adj_flag:1 unsupported_feature:0
      sih:0x7f1c6b88f0e8(16886) di_id:3212 rih:0x7f1c6ad1d798(522)
ATOM_DISP:17335 ac_ifhdl:1250 xconid:3202 dot1q_etype:0
    disp_flags:0x411 pdflags:0 hw_handle:0xb1000182
    disp flags (FED) in detail   CW_IN_USE  VCCV  VLAN_ITW
 AAL: id:2969567618 , port_id:1250, adj_flags:0x5 pw_id:995 ref_cnt:1
      adj_flags in detail:  TYPE4 VC/PORT MODE  CW Enabled
      port_hdl:0x500101ff, dot1q:0 , is_vfi_seg;0 vfi_seg_hdl:0 stats_valid:1
      drop_adj_flag:0 unsupported_feature:0
      sih:0x7f1c6b893b38(16887) di_id:24265 rih:0x7f1c6b893588(526)
ATOM_DISP:17340 ac_ifhdl:1250 xconid:3202 dot1q_etype:0
    disp_flags:0x1411 pdflags:0 hw_handle:0x3e000181
    disp flags (FED) in detail   CW_IN_USE  VCCV  VLAN_ITW  PW_STANDBY
 AAL: id:1040187777 , port_id:1250, adj_flags:0x5 pw_id:996 ref_cnt:1
      adj_flags in detail:  TYPE4 VC/PORT MODE  CW Enabled
      port_hdl:0x500101ff, dot1q:0 , is_vfi_seg;0 vfi_seg_hdl:0 stats_valid:1
      drop_adj_flag:1 unsupported_feature:0
      sih:0x7f1c6bd6b7d8(16888) di_id:3212 rih:0x7f1c6bd6b298(528)
.
.
.
```

show platform software fed switch mpls

To display device-specific software information, use the **show platform software fed switch** command.

show platform software fed switch {*switch number* | **active** | **standby** } **mpls** {**eos** | **forwarding** | **label_oce** | **lookup** | **summary**}

Note This topic elaborates only the Multiprotocol Label Switching-specific options available with the **show platform software fed switch mpls** command.

Syntax Description

switch {*switch number* | **active** | **standby**}	Specifies the device for which you want to display information. • *switch number*: Switch ID. Displays information about the specified switch. • **active**: Displays information about the active switch. • **standby**: Displays information about the standby switch, if available.
mpls	Displays MPLS information. Choose one of the following options: • **eos**: Displays MPLS end of stack (EOS) information. • **forwarding**: Displays MPLS forwarding information. • **label_oce**: Displays MPLS label output chain element (OCE) information. • **lookup**: Displays MPLS lookup information. • **summary**: Displays the summary of the MPLS configuration.

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Examples

The following is a sample output of the **show platform software fed switch mpls** command:

```
Device# show platform software fed switch 1 mpls summary

Number of lentries: 2024
   # of create/modify/delete msgs: 3595/15390/1571
   LENTRY create paused: 0
   LENTRY Number of create paused: 0
   LENTRY Number of add after create paused: 3595
   LENTRY Number of out-of-resource: 0
```

```
 Number of lable oce entries: 4015
   # of create/modify/delete msgs: 21165/2993/17150
   # of unsupported_recursive_lbls: 0
   # of AAL mpls adj deleted and recreated: 0
   # of AAL local mpls adj deleted and recreated: 0
   # of changes from mpls-adj -> mpls-local-adj: 0
   # of changes from local-mpls-adj -> mpls-adj: 0
   # of out label changes in lbl_oce 0
   # of collapsed oce 0
   # of unsuppoted_nh 0

 Number of EOS oce entries: 1991
   # of create/modify/delete msgs: 6303/7/4312
   Number of ECR bwalk apply skipped: 0

 Number of ECR entries: ipv4/ipv6: 22/0
   # of create/modify/delete msgs: 5196/1/5174
   # of ECR nested backwalks ignore:0
   ECR OOR Retry queue size:0

AAL L3 ECR summary:

  # of ecr add/modify/delete ::6/4/3
  # of modify from level-1 to level-2:0
  # of modify from level-2 to level-1:0
  # of ecr delete errs::0
  # of ecr create skip refcnt::0
  # of ecr modify inuse: 1 nochange:3 inplace:0
 MPLS Summary: Info at AAL layers:
  General info:
    Number of Physical ASICs:2
    Number of ASIC Instances:4
    num_modify_stack_in_use: 0
    num_modify_ri_in_use: 0
    Feature IDs:{l2_fid:57 mpls_fid:152 vpws_fid:153 vpls_fid:154}
  MAX values from selected SDM template:
    MAX label entries: 45056
    MAX LSPA entries: 32768
    MAX L3VPN VRF(rc:0): 1024
    MAX L3VPN Routes PerVrF Mode(rc:0): 209920
    MAX L3VPN Routes PerPrefix Mode(rc:0): 32768
    MAX ADJ stats counters: 49152
  Resource sharing info:
    SI: 1133/131072
    RI: 4943/98304
    Well Known Index: 8024/2048
    Tcam: 4962/245760
    lv1_ecr: 0/64
    lv2_ecr: 3/256
    lspa: 0/32769
    label_stack_id: 26/65537
.
.
.
```

show platform software l2vpn switch

To display the software information of Layer 2 VPN (L2VPN), use the **show platform software l2vpn switch** command.

show platform software fed switch {*switch number* | **active** | **standby**} {**F0** | **F1** | **R0** | **R1** | **RP** | {**active** | **standby**}} {**atom** | **disposition** | **imposition** | **internal**}

Syntax Description

switch {*switch number* | **active** | **standby**}	The device for which you want to display information. • *switch number*: Switch ID. Displays information for the specified switch. • **active**: Displays information for the active switch. • **standby**: Displays information for the standby switch, if available.
F0	Displays information about the Embedded Service Processor (ESP) slot 0.
F1	Displays information about the ESP slot 1.
R0	Displays information about the Route Processor (RP) slot 0.
R1	Displays information about the RP slot 1.
RP	Displays information about the RP. Choose one of the following options: • **active**: Displays information about the active RP. • **standby**: Displays information about the standby RP.
atom	Displays information about the Any Transport over MPLS (AToM) cross-connect table.
disposition	Displays information about the disposition output chain element (OCE).
imposition	Displays information about the imposition OCE.
internal	Displays information about AToM's internal state and statistics.

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Examples

The following is a sample output of the **show platform software l2vpn switch** command:

```
Device# show platform software l2vpn switch 1 R0 atom

Number of xconnect entries: 24
```

```
AToM Cross-Connect xid 0x137, ifnumber 0x137
  AC VLAN(IW:ETHERNET) -> Imp 0x316d(ATOM_IMP), OM handle: 0x3480fb3268
  VLAN Info: outVlan id: 1104, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0

AToM Cross-Connect xid 0x4e0, ifnumber 0x4e0
  AC VLAN(IW:ETHERNET) -> Imp 0x43a6(ATOM_IMP), OM handle: 0x348118f120
  VLAN Info: outVlan id: 3500, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0

AToM Cross-Connect xid 0x4e1, ifnumber 0x4e1
  AC VLAN(IW:ETHERNET) -> Imp 0x43ac(ATOM_IMP), OM handle: 0x348118f348
  VLAN Info: outVlan id: 3201, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0

AToM Cross-Connect xid 0x4e1, ifnumber 0x4e1
  AC VLAN(IW:ETHERNET) -> Imp 0x43b1(ATOM_IMP), OM handle: 0x348118f570
  VLAN Info: outVlan id: 3201, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0

AToM Cross-Connect xid 0x4e2, ifnumber 0x4e2
  AC VLAN(IW:VLAN) -> Imp 0x43b6(ATOM_IMP), OM handle: 0x348118f798
  VLAN Info: outVlan id: 3202, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0

AToM Cross-Connect xid 0x4e2, ifnumber 0x4e2
  AC VLAN(IW:VLAN) -> Imp 0x43bb(ATOM_IMP), OM handle: 0x348118f9c0
  VLAN Info: outVlan id: 3202, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0

AToM Cross-Connect xid 0x4e3, ifnumber 0x4e3
  AC VLAN(IW:VLAN) -> Imp 0x43c0(ATOM_IMP), OM handle: 0x348118fbe8
  VLAN Info: outVlan id: 3203, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0

AToM Cross-Connect xid 0x4e3, ifnumber 0x4e3
  AC VLAN(IW:VLAN) -> Imp 0x43c5(ATOM_IMP), OM handle: 0x348118fe10
  VLAN Info: outVlan id: 3203, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0

AToM Cross-Connect xid 0x4e4, ifnumber 0x4e4
  AC VLAN(IW:ETHERNET) -> Imp 0x43ca(ATOM_IMP), OM handle: 0x3481189e20
  VLAN Info: outVlan id: 3204, inVlan id: 0, outEther: 0x8100, peerVlan id: 0, dot1qAny: 0
.
.
.
```

source template type pseudowire

To configure the name of a source template of type pseudowire, use the **source template type pseudowire** command in interface configuration mode. To remove a source template of type pseudowire, use the **no** form of this command.

source template type pseudowire *template-name*
no source template type pseudowire

Syntax Description

template-name	The name of source template of type pseudowire.

Command Default

A source template of type pseudowire is not configured.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Amsterdam 17.1.1	This command was introduced.

Usage Guidelines

The **source template type pseudowire** command applies a source template of type pseudowire that consists of configuration settings used by all pseudowires bound to the template.

Examples

The following example shows how to configure the source template of type pseudowire named ether-pw:

```
Device> enable
Device# configure terminal
Device(config)# interface pseudowire 100
Device(config-if)# source template type pseudowire ether-pw
```

Related Commands

Command	Description
xconnect	Binds an attachment circuit to a pseudowire and configures an AToM static pseudowire.

tunnel destination

To specify the destination for a tunnel interface, use the **tunnel destination** command in interface configuration mode. To remove the destination, use the **no** form of this command.

tunnel destination {*host-name ip-address ipv6-address* | **dynamic**}
no tunnel destination

Syntax Description

host-name	Name of the host destination.
ip-address	IP address of the host destination expressed in dotted decimal notation.
ipv6-address	IPv6 address of the host destination expressed in IPv6 address format.
dynamic	Applies the tunnel destination address dynamically to the tunnel interface.

Command Default

No tunnel interface destination is specified.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You cannot configure two tunnels to use the same encapsulation mode with exactly the same source and destination addresses. The workaround is to create a loopback interface and configure the packet source off of the loopback interface.

Examples

The following example shows how to configure the logical Layer 3 GRE tunnel interface tunnel 2 in a global or non-VRF environment:

```
Device> enable
Device# configure terminal
Device(config)# interface tunnel 2
Device(config-if)# ip address 100.1.1.1 255.255.255.0
Device(config-if)# tunnel source 10.10.10.1
Device(config-if)# tunnel destination 10.10.10.2
Device(config-if)# tunnel mode gre ip
Device(config-if)# end
```

The following example shows how to configure the logical Layer 3 GRE tunnel interface tunnel 2 in a VRF environment. Use the **vrf definition** *vrf-name* and the **vrf forwarding** *vrf-name* commands to configure and apply VRF.

```
Device> enable
Device# configure terminal
Device(config)# interface tunnel 2
Device(config-if)# ip address 100.1.1.1 255.255.255.0
Device(config-if)# tunnel source 10.10.10.1
Device(config-if)# tunnel destination 10.10.10.2
Device(config-if)# tunnel mode gre ip
Device(config-if)# end
```

tunnel mpls-ip-only

To copy the Do Not Fragment bit of the inner IP header from the payload into the IP header of the tunnel packet, use the **tunnel mpls-ip-only** command in the interface configuration mode. To undo the copy operation, use the **no** form of this command.

tunnel mpls-ip-only
no tunnel mpls-ip-only

Syntax Description

This command has no arguments or keywords.

Command Default

Disabled

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Bengaluru 17.5.1	This command was introduced.

Usage Guidelines

If the Do Not Fragment bit is not set, the payload is fragmented when the IP packet exceeds the MTU set for the interface. When you enable the **tunnel mpls-ip-only** command, the **tunnel path-mtu-discovery** automatically gets enabled due to the dependency.

Examples

The following example shows how to enable this command:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/1/3
Device(config-if)# tunnel mpls-ip-only
Device(config-if)# end
```

tunnel source

To set the source address for a tunnel interface, use the **tunnel source** command in interface configuration mode. To remove the source address, use the **no** form of this command.

tunnel source {*ip-address* | *ipv6-address* | *interface-type interface-number* | **dynamic**}
no tunnel source

Syntax Description

ip-address	Source IP address of the packets in the tunnel.
ipv6-address	Source IPv6 address of the packets in the tunnel.
interface-type	Interface type.
interface-number	Port, connector, or interface card number. The numbers are assigned at the factory at the time of installation or when added to a system. This number can be displayed with the **show interfaces** command.
dynamic	Applies the tunnel source address dynamically to the tunnel interface.

Command Default

No tunnel interface source address is set.

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Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The source address is either an explicitly defined IP address or the IP address assigned to specified interface. You cannot have two tunnels using the same encapsulation mode with exactly the same source and destination addresses. The workaround is to create a loopback interface and source packets from the loopback interface.

Examples

The following example shows how to configure the logical Layer 3 GRE tunnel interface tunnel 2 in a global or non-VRF environment:

```
Device> enable
Device# configure terminal
Device(config)# interface tunnel 2
Device(config-if)# ip address 100.1.1.1 255.255.255.0
Device(config-if)# tunnel source 10.10.10.1
Device(config-if)# tunnel destination 10.10.10.2
Device(config-if)# tunnel mode gre ip
Device(config-if)# end
```

The following example shows how to configure the logical Layer 3 GRE tunnel interface tunnel 2 in a VRF environment. Use the **vrf definition** *vrf-name* and the **vrf forwarding** *vrf-name* commands to configure and apply VRF.

```
Device> enable
Device# configure terminal
Device(config)# interface tunnel 2
Device(config-if)# ip address 100.1.1.1 255.255.255.0
```

```
Device(config-if)# tunnel source 10.10.10.1
Device(config-if)# tunnel destination 10.10.10.2
Device(config-if)# tunnel mode gre ip
Device(config-if)# end
```

xconnect

To bind an attachment circuit to a pseudowire, and to configure an Any Transport over MPLS (AToM) static pseudowire, use the **xconnect** command in interface configuration mode. To restore the default values, use the **no** form of this command.

xconnect *peer-ip-address vc-id* **encapsulation mpls** [*pw-type*]

no xconnect *peer-ip-address vc-id* **encapsulation mpls** [*pw-type*]

Syntax Description

peer-ip-address	IP address of the remote provider edge (PE) peer. The remote router ID can be any IP address, as long as it is reachable.
vc-id	The 32-bit identifier of the virtual circuit (VC) between PE devices.
encapsulation mpls	Specifies Multiprotocol Label Switching (MPLS) as the tunneling method.
pw-type	(Optional) Pseudowire type. You can specify one of the following types: • **4**: Specifies Ethernet VLAN. • **5**: Specifies Ethernet port.

Command Default

The attachment circuit is not bound to the pseudowire.

Command Modes

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Command History

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

Usage Guidelines

The use of the **xconnect** command and the interface configuration mode **bridge-group** command is not supported on the same physical interface.

The combination of the *peer-ip-address* and *vcid* arguments must be unique on the device. Each Xconnect configuration must have a unique combination of *peer-ip-address* and *vcid* configuration.

The same *vcid* value that identifies the attachment circuit must be configured using the **xconnect** command on the local and remote PE device. The VC ID creates the binding between a pseudowire and an attachment circuit.

Examples

The following example shows how to enter Xconnect configuration mode and bind the attachment circuit to a pseudowire VC:

```
Device# configure terminal
Device(config)# interface TenGigabitEthernet1/0/36
Device(config-if)# no ip address
Device(config-if)# xconnect 10.1.10.1 962 encapsulation mpls
```

Related Commands

Command	Description
encapsulation mpls	Specifies MPLS as the data encapsulation method.