MPLS Commands

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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
```

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>peer-router-ip-addr</td>
<td>IP address of the remote peer.</td>
</tr>
<tr>
<td>vcid</td>
<td>32-bit identifier of the VC between the devices at each end of the layer control channel.</td>
</tr>
<tr>
<td>pw-class</td>
<td>(Optional) Specifies the pseudowire type. If this is not specified, the pseudowire type is inherited from the parent Xconnect.</td>
</tr>
<tr>
<td>pw-class-name</td>
<td>(Optional) Name of the pseudowire that you created while establishing the pseudowire class.</td>
</tr>
<tr>
<td>priority value</td>
<td>(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.</td>
</tr>
</tbody>
</table>

| Command Default    | No redundant peer is established. |
| Command Modes      | Interface configuration (config-if)  
|                    | Xconnect configuration (config-if-xconn) |

<table>
<thead>
<tr>
<th>Command History</th>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

| Usage Guidelines   | The combination of the `peer-router-ip-addr` and `vcid` arguments must be unique on the device. |

<table>
<thead>
<tr>
<th>Examples</th>
<th>The following example shows how to configure a MPLS Xconnect with one redundant peer:</th>
</tr>
</thead>
</table>
|          | 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 |

<table>
<thead>
<tr>
<th>Related Commands</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>xconnect</td>
<td>Binds an attachment circuit to a pseudowire for Xconnect service, and enters Xconnect configuration mode.</td>
</tr>
</tbody>
</table>
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

Enabled.

### Command Modes

Interface configuration (config-if)

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>interface pseudowire</td>
<td>Specifies the pseudowire interface.</td>
</tr>
<tr>
<td>xconnect</td>
<td>Binds an attachment circuit to a pseudowire for Xconnect service and enters Xconnect configuration mode.</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Use the `l2vpn xconnect context` command to define a cross-connect context that specifies the two members in Virtual Private Wire Service (VPWS), that is, attachment circuit to pseudowire, pseudo-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**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>interworking</td>
<td>Specifies the type of pseudowire and the type of traffic that can flow across the traffic.</td>
</tr>
</tbody>
</table>
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.

```
```

**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**

Disabled.

**Command Modes**

Interface configuration (config-if)

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Related Commands</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>interface pseudowire</td>
<td>Specifies the pseudowire interface.</td>
</tr>
</tbody>
</table>
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]]
```

## Syntax Description

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>interface-number</code></td>
<td>Interface number.</td>
</tr>
<tr>
<td><code>ip-address</code></td>
<td>IP address of the peer.</td>
</tr>
<tr>
<td><code>vcid</code></td>
<td>The virtual circuit (VC) ID. The range is from 1 to 4294967295.</td>
</tr>
<tr>
<td><code>encapsulation mpls</code></td>
<td>Specifies Multiprotocol Label Switching (MPLS) as the data encapsulation method.</td>
</tr>
<tr>
<td><code>template template-name</code></td>
<td>(Optional) Specifies the template to be used for encapsulation and protocol configuration. The maximum size is 32 characters.</td>
</tr>
<tr>
<td><code>group group-name</code></td>
<td>(Optional) Specifies the cross-connect member redundancy group name.</td>
</tr>
<tr>
<td><code>priority number</code></td>
<td>(Optional) Specifies the cross-connect member priority. The range is from 0 to 16. The highest priority is 0. Lowest priority is 16.</td>
</tr>
</tbody>
</table>

## Command Default

Devices that form an L2VPN cross connect are not specified.

## Command Modes

Xconnect configuration (config-xconnect)

## Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

## 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.
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

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>l2vpn xconnect context</td>
<td>Creates a Layer 2 VPN (L2VPN) cross-connect context.</td>
</tr>
<tr>
<td>xconnect</td>
<td>Binds an attachment circuit to a pseudowire for Xconnect service, and enters Xconnect configuration mode.</td>
</tr>
</tbody>
</table>
**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
```

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>minimum-value</code></td>
<td>The value of the smallest label allowed in the label space. The default is 16.</td>
</tr>
<tr>
<td><code>maximum-value</code></td>
<td>The value of the largest label allowed in the label space. The default is platform-dependent.</td>
</tr>
<tr>
<td><code>static</code></td>
<td>(Optional) Reserves a block of local labels for static label assignments. If you omit the <code>static</code> keyword and the <code>minimum-static-value maximum-static-value</code> arguments, no labels are reserved for static assignment.</td>
</tr>
<tr>
<td><code>minimum-static-value</code></td>
<td>(Optional) The minimum value for static label assignments. There is no default value.</td>
</tr>
<tr>
<td><code>maximum-static-value</code></td>
<td>(Optional) The maximum value for static label assignments. There is no default value.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command Default</th>
<th>The platform’s default values are used.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command Modes</td>
<td>Global configuration</td>
</tr>
<tr>
<td>Command History</td>
<td><strong>Release</strong></td>
</tr>
<tr>
<td></td>
<td>Cisco IOS XE Everest 16.5.1a</td>
</tr>
</tbody>
</table>

**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:

```bash
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.

```bash
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.

```bash
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:

```bash
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:

```bash
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:

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

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>show mpls label range</td>
<td>Displays the range of the MPLS local label space.</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>ldp</code></td>
<td>Specifies that LDP is the default label distribution protocol.</td>
</tr>
</tbody>
</table>

**Command Default**

LDP is the default label distribution protocol.

**Command Modes**

Global configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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 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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mpls ip (interface configuration)</td>
<td>Enables MPLS forwarding of IPv4 and IPv6 packets along normally routed paths for the associated interface.</td>
</tr>
</tbody>
</table>
mapi 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.

```
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

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mpls ip (global configuration)</td>
<td>Enables MPLS forwarding of IPv4 packets along normally routed paths for the platform.</td>
</tr>
<tr>
<td>mpls ip (interface configuration)</td>
<td>Enables MPLS forwarding of IPv4 packets along normally routed paths for a particular interface.</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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
```
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

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>host-name</td>
<td>Name of the host destination.</td>
</tr>
<tr>
<td>ip-address</td>
<td>IP address of the host destination expressed in dotted decimal notation.</td>
</tr>
<tr>
<td>ipv6-address</td>
<td>IPv6 address of the host destination expressed in IPv6 address format.</td>
</tr>
<tr>
<td>dynamic</td>
<td>Applies the tunnel destination address dynamically to the tunnel interface.</td>
</tr>
</tbody>
</table>

### Command Default

No tunnel interface destination is specified.

### Command Modes

Interface configuration (config-if)

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Gibraltar 16.11.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### 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 mode gre multipoint

To set the global encapsulation mode on all roaming interfaces of a mobile device to multipoint generic routing encapsulation (GRE), use the `tunnel mode gre multipoint` command in mobile device configuration mode. To restore the global default encapsulation mode, use the `no` form of this command.

```
tunnel mode gre multipoint
no tunnel mode gre multipoint
```

**Syntax Description**

This command has no arguments or keywords.

**Command Default**

The default encapsulation mode for Mobile IP is IP-in-IP encapsulation.

**Command Modes**

Interface configuration (config-if)

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Fuji 16.8.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Use this command to configure multipoint GRE as the tunnel mode.

The `no tunnel mode gre multipoint` command instructs the mobile device to revert to the default and register with IP-in-IP encapsulation.

**Examples**

The following example configures multipoint GRE as the tunnel mode:

```
Device(config-if)# tunnel mode gre multipoint
```
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**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip-address</td>
<td>Source IP address of the packets in the tunnel.</td>
</tr>
<tr>
<td>ipv6-address</td>
<td>Source IPv6 address of the packets in the tunnel.</td>
</tr>
<tr>
<td>interface-type</td>
<td>Interface type.</td>
</tr>
<tr>
<td>interface-number</td>
<td>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 <code>show interfaces</code> command.</td>
</tr>
<tr>
<td>dynamic</td>
<td>Applies the tunnel source address dynamically to the tunnel interface.</td>
</tr>
</tbody>
</table>

**Command Default**

No tunnel interface source address is set.

**Command Modes**

Interface configuration (config-if)

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Gibraltar 16.11.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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 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 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
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**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vrf vrf-name</code></td>
<td>Displays the data MDT groups in use by the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <code>vrf-name</code> argument.</td>
</tr>
</tbody>
</table>

**Command Modes**

Privileged EXEC

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>source, group</td>
<td>Source and group addresses that this router has switched over to data MDTs.</td>
</tr>
<tr>
<td>MDT-data group</td>
<td>Multicast address over which these data MDTs are being sent.</td>
</tr>
<tr>
<td>ref_count</td>
<td>Number of (S, G) pairs that are reusing this data MDT.</td>
</tr>
</tbody>
</table>
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]
```

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vrf vrf-name</code></td>
<td>Displays the data MDT group mappings for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <code>vrf-name</code> argument.</td>
</tr>
<tr>
<td><code>detail</code></td>
<td>(Optional) Provides a detailed description of the data MDT advertisements received.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command Modes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Privileged EXEC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command History</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Release</strong></td>
</tr>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Usage Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following is sample output from the <code>show ip pim mdt receive</code> command using the <code>detail</code> keyword for further information:</td>
</tr>
</tbody>
</table>

```
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>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>group:172.16.8.0</td>
<td>Group that caused the data MDT to be built.</td>
</tr>
<tr>
<td>source:10.0.0.100</td>
<td>VRF source that caused the data MDT to be built.</td>
</tr>
<tr>
<td>ref_count:13</td>
<td>Number of (S, G) pairs that are reusing this data MDT.</td>
</tr>
<tr>
<td>OIF count:1</td>
<td>Number of interfaces out of which this multicast data is being forwarded.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>flags:</td>
<td>Information about the entry.</td>
</tr>
<tr>
<td>• A</td>
<td>candidate Multicast Source Discovery Protocol (MSDP) advertisement</td>
</tr>
<tr>
<td>• B</td>
<td>bidirectional group</td>
</tr>
<tr>
<td>• D</td>
<td>dense</td>
</tr>
<tr>
<td>• C</td>
<td>connected</td>
</tr>
<tr>
<td>• F</td>
<td>register flag</td>
</tr>
<tr>
<td>• I</td>
<td>received source-specific host report</td>
</tr>
<tr>
<td>• J</td>
<td>join shortest path source tree (SPT)</td>
</tr>
<tr>
<td>• L</td>
<td>local</td>
</tr>
<tr>
<td>• M</td>
<td>MSDP created entry</td>
</tr>
<tr>
<td>• P</td>
<td>pruned</td>
</tr>
<tr>
<td>• R</td>
<td>RP bit set</td>
</tr>
<tr>
<td>• S</td>
<td>sparse</td>
</tr>
<tr>
<td>• s</td>
<td>Source Specific Multicast (SSM) group</td>
</tr>
<tr>
<td>• T</td>
<td>SPT bit set</td>
</tr>
<tr>
<td>• X</td>
<td>proxy join timer running</td>
</tr>
<tr>
<td>• U</td>
<td>URL Rendezvous Directory (URD)</td>
</tr>
<tr>
<td>• Y</td>
<td>joined MDT data group</td>
</tr>
<tr>
<td>• y</td>
<td>sending to MDT data group</td>
</tr>
<tr>
<td>• Z</td>
<td>multicast tunnel</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vrf vrf-name</td>
<td>Displays the history of data MDT groups that have been reused for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance.</td>
</tr>
<tr>
<td>interval minutes</td>
<td>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).</td>
</tr>
</tbody>
</table>

### Command Modes

- Privileged EXEC

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDT-data group</td>
<td>The MDT data group for which information is being shown.</td>
</tr>
<tr>
<td>Number of reuse</td>
<td>The number of data MDTs that have been reused in this group.</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vrf vrf-name</code></td>
<td>(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 <code>vrf-name</code> argument.</td>
</tr>
</tbody>
</table>

**Command Modes**

User EXEC
Privileged EXEC

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDT-default group</td>
<td>The MDT default groups that have been advertised to this router.</td>
</tr>
<tr>
<td>rid:10.1.1.1</td>
<td>The BGP router ID of the advertising router.</td>
</tr>
<tr>
<td>next_hop:10.1.1.1</td>
<td>The BGP next hop address that was contained in the advertisement.</td>
</tr>
</tbody>
</table>
**ip pim sparse-mode**

To configure a multiaccess WAN interface to be in sparse mode, use the `ip pim sparse-mode` command in interface configuration mode. To disable this function, use the `no` form of this command.

```
ip pim sparse-mode
no ip pim sparse-mode
```

**Syntax Description**
This command has no arguments or keywords.

**Command Default**
The command is disabled.

**Command Modes**
- Interface configuration (config-if)
- Virtual network interface (config-if-vnet)

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Fuji</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**
When this command is configured on all interfaces, any existing groups running in sparse mode will continue to operate in sparse mode but will use an RP address set to 0.0.0.0. Multicast entries with an RP address set to 0.0.0.0 will exhibit the following behavior:

- Existing (S, G) states will be maintained.
- No PIM Join or Prune messages for (*, G) or (S, G, RPbit) are sent.
- Received (*, G) or (S, G, RPbit) Joins or Prune messages are ignored.
- No registers are sent and traffic at the first hop is dropped.
- Received registers are answered with register stop.
- Asserts are unchanged.
- The (*, G) outgoing interface list (olist) is maintained only for the Internet Group Management Protocol (IGMP) state.
- Multicast Source Discovery Protocol (MSDP) source active (SA) messages for RP 0.0.0.0 groups are still accepted and forwarded.

**Examples**
The following example configures an interface to be in sparse mode:

```
Device(config-if)# ip pim sparse-mode
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip pim</td>
<td>Enables PIM on an interface.</td>
</tr>
</tbody>
</table>
To configure a multiaccess WAN interface to be in nonbroadcast multiaccess (NBMA) mode, use the `ip pim nbma-mode` command in interface configuration mode. To disable this function, use the `no` form of this command.

```plaintext
ip pim nbma-mode
no ip pim nbma-mode
```

**Syntax Description**
This command has no arguments or keywords.

**Command Default**
The command is disabled.

**Command Modes**
- Interface configuration (config-if)
- Virtual network interface (config-if-vnet)

**Command History**
<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Fuji 16.8.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**
Use this command on Frame Relay, Switched Multimegabit Data Service (SMDS), or ATM only, especially when these media do not have native multicast available. Do not use this command on multicast-capable LANs such as Ethernet or FDDI.

When this command is configured, each Protocol Independent Multicast (PIM) join message is tracked in the outgoing interface list of a multicast routing table entry. Therefore, only PIM WAN neighbors that have joined for the group will get packets sent as data-link unicasts. This command should only be used when the `ip pim sparse-mode` command is configured on the interface. This command is not recommended for LANs that have natural multicast capabilities.

**Examples**
The following example configures an interface to be in NBMA mode:

```plaintext
Device(config-if)# ip pim nbma-mode
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip pim</td>
<td>Enables PIM on an interface.</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mdt data</td>
<td>Configures the multicast group address range for data MDT groups.</td>
</tr>
<tr>
<td>mdt default</td>
<td>Configures a default MDT group for a VPN VRF.</td>
</tr>
</tbody>
</table>
**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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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.

```plaintext
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

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mdt data</td>
<td>Configures the multicast group address range for data MDT groups.</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>threshold</strong></td>
<td>(Optional) Defines the bandwidth threshold value in kilobits per second (kb/s). The range is from 1 to 4294967.</td>
</tr>
</tbody>
</table>

### Command Default

A data MDT pool is not configured.

### Command Modes

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

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Related Commands</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mdt default</td>
<td></td>
<td>Configures a default MDT group for a VPN VRF.</td>
</tr>
</tbody>
</table>
ip ospf network

To configure the Open Shortest Path First (OSPF) network type to a type other than the default for a given medium, use the `ip ospf network` command in interface configuration mode. To return to the default value, use the `no` form of this command.

```
ip ospf network {broadcast | non-broadcast | {point-to-multipoint [non-broadcast] | point-to-point}}
no ip ospf network
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>broadcast</td>
<td>Sets the network type to broadcast.</td>
</tr>
<tr>
<td>non-broadcast</td>
<td>Sets the network type to nonbroadcast multiaccess (NBMA).</td>
</tr>
<tr>
<td>point-to-multipoint</td>
<td>Sets the network type to point-to-multipoint. The optional <code>non-broadcast</code> keyword sets the point-to-multipoint network to be nonbroadcast. If you use the <code>non-broadcast</code> keyword, the <code>neighbor</code> command is required.</td>
</tr>
<tr>
<td>point-to-point</td>
<td>Sets the network type to point-to-point.</td>
</tr>
</tbody>
</table>

**Command Default**

Depends on the network type.

**Command Modes**

- Interface configuration (config-if)
- Virtual network interface (config-if-vnet)

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Fuji 16.8.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Using this feature, you can configure broadcast networks as NBMA networks when, for example, routers in your network do not support multicast addressing. You can also configure nonbroadcast multiaccess networks (such as X.25, Frame Relay, and Switched Multimegabit Data Service (SMDS)) as broadcast networks. This feature saves you from needing to configure neighbors.

Configuring NBMA networks as either broadcast or nonbroadcast assumes that there are virtual circuits from every router to every router or fully meshed networks. However, there are other configurations where this assumption is not true. For example, a partially meshed network. In these cases, you can configure the OSPF network type as a point-to-multipoint network. Routing between two routers that are not directly connected will go through the router that has virtual circuits to both routers. You need not configure neighbors when using this feature.

If this command is issued on an interface that does not allow it, this command will be ignored.

OSPF has two features related to point-to-multipoint networks. One feature applies to broadcast networks; the other feature applies to nonbroadcast networks:

- On point-to-multipoint, broadcast networks, you can use the `neighbor` command, and you must specify a cost to that neighbor.
- On point-to-multipoint, nonbroadcast networks, you must use the `neighbor` command to identify neighbors. Assigning a cost to a neighbor is optional.
Examples

The following example sets your OSPF network as a broadcast network:

```
Device(config)# interface serial 0
Device(config-if)# ip address 192.168.77.17 255.255.255.0
Device(config-if)# ip ospf network broadcast
Device(config-if)# encapsulation frame-relay
```

The following example illustrates a point-to-multipoint network with broadcast:

```
Device(config)# interface serial 0
Device(config-if)# ip address 10.0.1.1 255.255.255.0
Device(config-if)# encapsulation frame-relay
Device(config-if)# ip ospf cost 100
Device(config-if)# ip ospf network point-to-multipoint
Device(config-if)# frame-relay map ip 10.0.1.3 202 broadcast
Device(config-if)# frame-relay map ip 10.0.1.4 203 broadcast
Device(config-if)# frame-relay map ip 10.0.1.5 204 broadcast
Device(config-if)# frame-relay local-dlci 200
!
Device(config-if)# router ospf 1
Device(config-if)# network 10.0.1.0 0.0.0.255 area 0
Device(config-if)# neighbor 10.0.1.5 cost 5
Device(config-if)# neighbor 10.0.1.4 cost 10
```

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>frame-relay map</td>
<td>Defines mapping between a destination protocol address and the DLCI used to connect to the destination address.</td>
</tr>
<tr>
<td>neighbor (OSPF)</td>
<td>Configures OSPF routers interconnecting to nonbroadcast networks.</td>
</tr>
<tr>
<td>x25 map</td>
<td>Sets up the LAN protocols-to-remote host mapping.</td>
</tr>
</tbody>
</table>
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.

Syntax Description

- `vrf vrf-name` (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

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mrinfo</td>
<td>Queries a multicast device about which neighboring multicast devices are peering with it.</td>
</tr>
</tbody>
</table>
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**

| 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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

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

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**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip pim</td>
<td>Enables PIM on an interface.</td>
</tr>
</tbody>
</table>
show mpls label range

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

**show mpls label range**

**Syntax Description**
This command has no arguments or keywords.

**Command Modes**
Privileged EXEC

**Command History**
<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.5.1a</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mpls label range</td>
<td>Configures a range of values for use as local labels.</td>
</tr>
</tbody>
</table>
show platform software fed switch l2vpn

To display device-specific software information, use the `show platform software fed switch l2vpn` 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**: Enter the 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**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Examples**

The following is a sample output of the `show platform software fed switch l2vpn atom-disposition all` 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:0x11 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
```
show platform software fed switch l2vpn

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:0xbd000139
disp flags (FED) in detail CW_IN_USE VCCV ETHERNET_ITW
AAL: id:2902458681, port_id:311, adj_flags:0xc pw_id:991 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
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:0x7f1c6b88f0e8(16886) di_id:24265 rih:0x7f1c6b89358(518)
ATOM_DISP:17325 ac_ifhdl:1249 xconid:3201 dot1q_etype:0
disp_flags:0x211 pdflags:0 hw_handle:0xdd000184
AAL: id:370765124, port_id:1249, adj_flags:0xc pw_id:991 ref_cnt:1
adj_flags in detail: TYPE5 VC CW Enabled
port_hdl:0xe1211 pdflags:0 hw_handle:0xb1000182
disp flags (FED) in detail CW_IN_USE VCCV VLAN_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:0x8d0101fd, dot1q:0, is_vfi_seg:0 vfi_seg_hdl:0 stats_valid:1
drop_adj_flag:0 unsupported_feature:0
sih:0x7f1c6b88f0e8(16886) di_id:3212 rih:0x7f1c6b89358(522)
ATOM_DISP:17335 ac_ifhdl:1250 xconid:3202 dot1q_etype:0
disp_flags:0x411 pdflags:0 hw_handle:0xb1000182
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:0x8d0101fd, dot1q:0, is_vfi_seg:0 vfi_seg_hdl:0 stats_valid:1
drop_adj_flag:0 unsupported_feature:0
sih:0x7f1c6b88f0e8(16886) di_id:3212 rih:0x7f1c6b89358(526)
ATOM_DISP:17340 ac_ifhdl:1250 xconid:3202 dot1q_etype:0
disp_flags:0x1411 pdflags:0 hw_handle:0x3e000181
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:0x8d0101fd, dot1q:0, is_vfi_seg:0 vfi_seg_hdl:0 stats_valid:1
drop_adj_flag:0 unsupported_feature:0
sih:0x7f1c6b88f0e8(16886) di_id:3212 rih:0x7f1c6b89358(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 MPLS-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

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### 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: 21665/2993/17150
  # 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 unsupported_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
  lsp a: 0/32769
  label_stack_id: 26/65537

MPLS Commands
show platform software l2vpn switch

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

```shell
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 AToM internal state and statistics.

**Command Modes**

- User EXEC (>
- Privileged EXEC (#)

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XE Everest 16.6.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Examples**

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

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

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 0x34a6(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 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 0x4e3, ifnumber 0x4e3
   AC VLAN(IW:ETHERNET) -> 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
**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

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

### Command Default

The attachment circuit is not bound to the pseudowire.

### Command Modes

Interface configuration (config-if)

### Command History

<table>
<thead>
<tr>
<th>Release</th>
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</tr>
</tbody>
</table>

### Usage Guidelines

The use of the `xconnect` command and the interface configuration mode `bridge-group` commands 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

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>encapsulation mpls</td>
<td>Specifies MPLS as the data encapsulation method.</td>
</tr>
</tbody>
</table>