Configuring Any Transport over MPLS

This chapter describes how to configure the Any Transport over MPLS (AToM) feature. This chapter includes the following sections:

- Finding Feature Information, page 27-1
- Information About Any Transport over MPLS, page 27-1
- Licensing Requirements for Any Transport over MPLS, page 27-5
- Guidelines and Limitations for Any Transport over MPLS, page 27-5
- Configuring Any Transport over MPLS, page 27-6
- Verifying Any Transport over MPLS, page 27-16
- Configuration Examples for Any Transport over MPLS, page 27-16
- Additional References for Any Transport over MPLS, page 27-19
- Feature Information for Any Transport over MPLS, page 27-19

Finding Feature Information

Your software release might not support all the features documented in this module. For the latest caveats and feature information, see the Bug Search Tool at https://tools.cisco.com/bugsearch/ and the release notes for your software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the “New and Changed Information” chapter or the Feature History table below.

Information About Any Transport over MPLS

This section includes the following topics:

- Any Transport over MPLS, page 27-2
- Ethernet over MPLS, page 27-2
- Ethernet Remote Port Shutdown, page 27-3
- Estimating Packet Sizes, page 27-3
- Layer 2 VPN Internetworking, page 27-4
- Quality of Service Features Supported in AToM, page 27-4
Any Transport over MPLS

Any Transport over MPLS (AToM) accommodates different types of Layer 2 packets, including Ethernet and VLAN, to enable the service provider to transport different types of traffic over the backbone and accommodate all types of customers. AToM adheres to the standards developed for transporting Layer 2 packets over MPLS. Other Layer 2 solutions are proprietary, which can limit the service provider’s ability to expand the network and can force the service provider to use only one vendor’s equipment. Upgrading to AToM is transparent to the customer. Because the service provider network is separate from the customer network, the service provider can upgrade to AToM without disruption of service to the customer.

The successful transmission of the Layer 2 frames between PE devices is due to the configuration of the PE devices. You can set up the connection, called a pseudowire, between the routers and specify the following information on each PE device:

- The type of Layer 2 data to be transported across the pseudowire, such as Ethernet or VLAN.
- The IP address of the loopback interface of the peer PE device, which enables PE devices to communicate.
- A unique combination of peer PE IP address and virtual circuit (VC) ID that identifies the pseudowire.

AToM encapsulates Layer 2 frames at the ingress provider edge (PE) and sends them to a corresponding PE at the other end of a pseudowire. The egress PE removes the encapsulation and sends out the Layer 2 frame.

Ethernet over MPLS

Any Transport over MPLS (AToM) supports Ethernet over MPLS (EoMPLS) in two modes: VLAN and port mode.

A VLAN is a switched network that is logically segmented by functions, project teams, or applications regardless of the physical location of users. EoMPLS allows you to connect two VLAN networks that are in different locations. You must configure the provider edge (PE) devices at each end of the MPLS backbone and add a point-to-point virtual circuit (VC). Only the two PE devices at the ingress and egress points of the MPLS backbone know about the VCs dedicated to transporting Layer 2 VLAN traffic. All other devices do not have table entries for those VCs. EoMPLS in VLAN mode transports Ethernet traffic from a source 802.1Q VLAN to a destination 802.1Q VLAN over a core MPLS network.

Port mode allows a frame coming into an interface to be packed into an MPLS packet and transported over the MPLS backbone to an egress interface. The entire Ethernet frame without the preamble or frame check sequence (FCS) is transported as a single packet. Each interface is associated with one unique pseudowire VC label.
Ethernet Remote Port Shutdown

Ethernet remote port shutdown allows a service provider edge (PE) device on the local end of an Ethernet over MPLS (EoMPLS) pseudowire to detect a remote link failure and cause the shutdown of the Ethernet port on the local customer edge (CE) device. Because the Ethernet port on the local CE device is shut down, the device does not lose data by continuously sending traffic to the failed remote link. This process is beneficial if the link is configured as a static IP route.

Estimating Packet Sizes

The following calculation helps you to determine the size of the packets that travel through the core network. You must set the maximum transmission unit (MTU) on the core-facing interfaces of the provider (P) and provider edge (PE) devices to accommodate packets of the calculated size. The MTU should be greater than or equal to the total bytes of the items in the following equation:

\[
\text{Core MTU} \geq (\text{Edge MTU} + \text{Transport header} + \text{AToM header} + (\text{MPLS label stack} \times \text{MPLS label size}))
\]

where the following definitions apply:

- The edge MTU is the MTU for customer-facing devices.
- The Transport header depends on the transport type. The table below lists the specific sizes of the headers.

<table>
<thead>
<tr>
<th>Transport Type</th>
<th>Packet Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet VLAN</td>
<td>18 bytes</td>
</tr>
<tr>
<td>Ethernet port</td>
<td>14 bytes</td>
</tr>
</tbody>
</table>

- The AToM header is 4 bytes (control word).
- The MPLS label stack size depends on the configuration of the core MPLS network:
  - AToM uses one MPLS label to identify the AToM VCs (VC label). Therefore, the minimum MPLS label stack is one for directly connected AToM PEs, which are PE devices that do not have a P router between them.
  - If the Label Distribution Protocol (LDP) is used in the MPLS network, the label stack size is two (the LDP label and the VC label).
  - If a traffic engineering (TE) tunnel is used instead of LDP between PE routers in the MPLS network, the label stack size is two (the TE label and the VC label).
  - If a TE tunnel and LDP are used in the MPLS network (for example, a TE tunnel between P routers or between P and PE routers, with LDP on the tunnel), the label stack is three (the TE label, LDP label, and VC label).
  - If you use MPLS fast reroute in the MPLS network, you add a label to the stack. The maximum MPLS label stack in this case is four (the Fast Reroute (FRR) label, TE label, LDP label, and VC label).
  - If AToM is used by the customer carrier in an MPLS VPN Carrier Supporting Carrier environment, you add a label to the stack. The maximum MPLS label stack in the provider carrier network is five (the FRR label, TE label, LDP label, VPN label, and VC label).
  - If an AToM tunnel spans different service providers that exchange MPLS labels using IPv4 Border Gateway Protocol (BGP) (RFC 3107), you add a label to the stack. The maximum MPLS label stack is five (the FRR label, TE label, LDP label, VPN label, and VC label).
Information About Any Transport over MPLS

- Other circumstances can increase the MPLS label stack size. Therefore, analyze the complete data path between the AToM tunnel endpoints, determine the maximum MPLS label stack size for your network, and then multiply the label stack size by the size of the MPLS label.

**Note**

For more information about establishing nondirectly connected MPLS LDP sessions, see the “Configuring MPLS Label Distribution Protocol” chapter.

Applying the following assumptions and using the formula: Edge MTU + Transport header + AToM header + (MPLS label stack * MPLS label) = Core MTU, or 1500 + 18 + 0 + (2 * 4) = 1526, you must configure the P and PE devices in the core to accept packets of 1526 bytes.

- The edge MTU is 1500 bytes.
- The transport type is Ethernet VLAN which is 18 bytes for the transport header.
- The AToM header is 0 because the control word is not used.
- The MPLS label stack is 2 because LDP is used.
- The MPLS label is 4 bytes.

Layer 2 VPN Internetworking

Layer 2 transport over Multiprotocol Label Switching (MPLS) already exists for like-to-like attachment circuits, such as Ethernet-to-Ethernet. Layer 2 Virtual Private Network (L2VPN) internetworking builds on this functionality by allowing disparate attachment circuits to be connected. The internetworking function facilitates the translation between the different Layer 2 encapsulations.

The EoMPLS L2VPN Internetworking feature supports Ethernet and VLAN attachment circuits over MPLS. The features and restrictions for like-to-like functionality also apply to L2VPN internetworking.

Quality of Service Features Supported in AToM

The table below lists the Quality of Service (QoS) features supported in AToM.

<table>
<thead>
<tr>
<th>QoS Feature</th>
<th>EoMPLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service policy</td>
<td>Can be applied to Ethernet Virtual Circuits (EVCs) and switchport interfaces</td>
</tr>
<tr>
<td>Classification</td>
<td>Supports the commands for matching the following:</td>
</tr>
<tr>
<td></td>
<td>• Class of service (CoS) on interfaces and subinterfaces</td>
</tr>
<tr>
<td></td>
<td>• MPLS experimental topmost on interfaces and subinterfaces</td>
</tr>
<tr>
<td></td>
<td>• QoS groups on interfaces (output policy)</td>
</tr>
</tbody>
</table>
Equal Cost Multiple Paths on PWE Label

Equal Cost Multiple Paths (ECMPs) are available between the ingress and egress devices. However, a pseudowire is transported over a single network path to retain the characteristics of the emulated service over the pseudowire.

In the network core, load balancing is performed by checking the first nibble in the frame, after the MPLS label stack. If the destination MAC address (DMAC) starts with 4 or 6, it selects a different link in the core. To avoid a different link and preserve order of frames, a control word is added to the frame transmitted over the pseudowire emulation (PWE) label.

Licensing Requirements for Any Transport over MPLS

The following table shows the licensing requirements for this feature:

<table>
<thead>
<tr>
<th>QoS Feature</th>
<th>EoMPLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policing</td>
<td>Supports the following:</td>
</tr>
<tr>
<td></td>
<td>• Single-rate policing</td>
</tr>
<tr>
<td></td>
<td>• Two-rate policing</td>
</tr>
<tr>
<td></td>
<td>• Color-aware policing</td>
</tr>
<tr>
<td></td>
<td>• Multiple-action policing</td>
</tr>
<tr>
<td>Queuing and shaping</td>
<td>Supports the following:</td>
</tr>
<tr>
<td></td>
<td>• Distributed Low Latency Queueing (dLLQ)</td>
</tr>
<tr>
<td></td>
<td>• Distributed Weighted Random Early Detection (dWRED)</td>
</tr>
<tr>
<td></td>
<td>• Byte-based WRED</td>
</tr>
</tbody>
</table>

Guidelines and Limitations for Any Transport over MPLS

Any Transport over MPLS (AToM) has the following configuration guidelines and limitations:

- Address format—Configure the Label Distribution Protocol (LDP) router ID on all PE routers to be a loopback address with a /32 mask. Otherwise, some configurations might not function properly.

Ethernet over MPLS (EoMPLS) has the following guidelines and limitations:

- EoMPLS supports VLAN packets that conform to the IEEE 802.1Q standard. The 802.1Q specification establishes a standard method for inserting VLAN membership information into Ethernet frames. The Inter-Switch Link (ISL) protocol is not supported between the PE and customer edge (CE) devices.

- The AToM control word is supported. However, if the peer PE does not support a control word, the control word is disabled. This negotiation is done by LDP label binding.
Chapter 27  Configuring Any Transport over MPLS

Configuring Any Transport over MPLS

This section includes the following topics:

- Configuring a Pseudowire, page 27-6
- Configuring Ethernet Remote Port Shutdown (optional), page 27-8
- Configuring Ethernet over MPLS in VLAN Mode, page 27-9
- Configuring Ethernet over MPLS in Port Mode, page 27-12
- Configuring Per-Subinterface MTU for Ethernet over MPLS, page 27-14

Configuring a Pseudowire

BEFORE YOU BEGIN

Ensure that you configured the EFP (service instance) for EoMPLS. For information, see the “Configuring Ethernet over MPLS” chapter.
SUMMARY STEPS

1. `configure terminal`
2. `port-profile type pseudowire profile-name`
3. `encapsulation mpls`
4. `[no] interface pseudowire pw-id`
5. `(Optional) control-word`
6. `neighbor peer-ip-address vc-id`
7. `(Optional) copy running-config start-up config`

DETAILED STEPS

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>configure terminal</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch# configure terminal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch(config)#</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>port-profile type pseudowire profile-name</code></td>
<td>Enters interface port-profile configuration mode and configures a pseudowire port profile.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch(config)# port-profile type pseudowire AToM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch(config-if-prof)#</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>encapsulation mpls</code></td>
<td>Specifies MPLS encapsulation for this profile.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch(config-if-prof)# encapsulation mpls</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 4</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>[no] interface pseudowire pw-id</code></td>
<td>Enters interface pseudowire configuration mode and configures a static pseudowire logical interface.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch(config-prof)# interface pseudowire 12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch(config-if-pseudowire)#</td>
<td></td>
</tr>
</tbody>
</table>

**Note** You can use the `no` form of this command to delete the pseudowire interface and the associated configuration.

<table>
<thead>
<tr>
<th>Step 5</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>control-word</code></td>
<td>(Optional) Enables the control word for this interface.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch(config-if-pseudowire)# control-word</td>
<td></td>
</tr>
</tbody>
</table>
Configuring Ethernet Remote Port Shutdown (optional)

The Remote Ethernet Port Shutdown feature is enabled by default when an image with the feature supported is loaded on the device.

SUMMARY STEPS

1. configure terminal
2. [no] l2vpn xconnect context context-name
3. [no] remote failure notification
4. (Optional) copy running-config start-up config
DETAILED STEPS

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td><strong>configure terminal</strong> Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>switch# configure terminal switch(config)#</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>[no] l2vpn xconnect context context-name Enters Xconnect configuration mode and establishes a Layer 2 VPN (L2VPN) context for identifying the two members in a VPWS, multisegment pseudowire, or local connect service.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>switch(config)# l2vpn context cxt1 switch(config-xconnect)#</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>You can use the no form of this command to delete the context and the associated configuration.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>[no] remote failure notification Enables AToM MPLS remote link failure notification and shutdown.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>switch(config-xconnect)# remote failure notification</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>You can use the no form of this command to disable this feature.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>copy running-config startup-config (Optional) Saves this configuration change.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>switch(config-xconnect)# copy running-config startup-config</td>
</tr>
</tbody>
</table>

Configuring Ethernet over MPLS in VLAN Mode

You can configure EoMPLS (VLAN mode) on the subinterfaces.

BEFORE YOU BEGIN

- Ensure that you configured the EFP (service instance) for EoMPLS. For information, see the “Configuring Ethernet over MPLS” chapter.
- Before configuring Ethernet over MPLS (EoMPLS) in VLAN mode, you must configure EoMPLS on the subinterfaces.

SUMMARY STEPS

1. configure terminal
2. interface ethernet slot/subslot/port[.subinterface]
3. encapsulation dot1q vlan-id
4. [no] l2vpn context context-name
5. (Optional) **internetworking** \{**ethernet** | **vlan**\}

6. [no] **member** interface-type slot/port [**service-instance** service-instance-id] [**group** group-name] [**priority** number]

7. [no] **member** pseudowire pw-id [**group** name] [**priority** number]

8. (Optional) **copy** running-config start-up config

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>switch# configure terminal</td>
<td></td>
</tr>
<tr>
<td>switch(config)#</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> interface ethernet slot/subslot/port [.subinterface]</td>
<td>Enters interface configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>switch(config)# interface ethernet 4/0/0.1</td>
<td></td>
</tr>
<tr>
<td>switch(config-if)#</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> encapsulation dot1q vlan-id</td>
<td>Configures the matching criteria for mapping dot1q frames on an ingress interface to this interface.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>switch(config-if)# encapsulation dot1q 100</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> [no] 12vpn xconnect context context-name</td>
<td>Enters XConnect configuration mode and establishes a Layer 2 VPN (L2VPN) context for identifying the two members in a VPWS, multisegment pseudowire, or local connect service.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>switch(config-if)# 12vpn context cxt1</td>
<td></td>
</tr>
<tr>
<td>switch(config-xconnect)#</td>
<td></td>
</tr>
</tbody>
</table>

**Note** You can use the **no** form of this command to delete the context and the associated configuration.

- Ensure the subinterface on the adjoining CE router is on the same VLAN as this PE router.

- The valid range for the `vlan-id` argument is from 2 to 967.

- The subinterfaces between the CE and PE routers that are running EoMPLS must be in the same subnet. All other subinterfaces and backbone devices do not need to be in the same subnet.
**Chapter 27  Configuring Any Transport over MPLS**

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 5** internetworking {ethernet | vlan} | (Optional) Specifies the type of pseudowire and the type of traffic that can flow across it.  
  - This command is required only if you are configuring a connection between two disparate attachment circuits.  
  - The internetworking type on a provider edge (PE) device must match the internetworking type on its peer PE device.  
  - The **ethernet** keyword causes Ethernet frames to be extracted from the attachment circuit and sent over the pseudowire. Ethernet end-to-end transmission is assumed. Attachment circuit frames that are not Ethernet are dropped.  
  - The **vlan** keyword allows the VLAN ID to be included as part of the Ethernet frame. |
| Example: switch(config-xconnect)# internetworking ethernet | |
| **Step 6** [no] member interface-type slot/port [service-instance service-instance-id] [group group-name] [priority number] | Adds an active Ethernet AC, with or without an Ethernet Flow Point (EFP), to the context.  
  - The **service-instance-id** argument is a unique per-interface identifier for the EFP. The valid range is from 1 to 4000. The range might be restricted due to resource constraints.  
  - (Optional) The **group group-name** keyword and argument combination specifies to which of the redundant groups the member belongs. This configuration is required if the member is backed up by one or more other group members in order to identify to which redundant group each member belongs.  
  - (Optional) The **priority number** keyword and argument combination specifies the priority of the backup pseudowire in instances where multiple backup pseudowires exist. The range is from 1 to 10, with 1 being the highest priority. The default is 0 and is higher than 1.  
  - You can use the **no** form of this command to delete the specified member configuration. |
| Example: switch(config-xconnect)# member ethernet 0/0/0.1 service-instance 300 | |
## Configuring Ethernet over MPLS in Port Mode

Perform this task to configure EoMPLS (port mode) on the subinterfaces.

### SUMMARY STEPS

1. `configure terminal`
2. `interface ethernet slot/subslot/port[,subinterface]`
3. `l2vpn xconnect context context-name`
4. `[no] member interface-type slot/port [service-instance service-instance-id] [group group-name] [priority number]`
5. `[no] member pseudowire pw-id [group name] [priority number]`
6. (Optional) `copy running-config start-up config`
## Detailed Steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>configure terminal</code></td>
<td>Enters global configuration mode.</td>
</tr>
</tbody>
</table>
|      | **Example:** `switch# configure terminal` `switch(config)#` | |}
| 2    | `interface ethernet` `slot/subslot/port.[subinterface]` | Enters interface configuration mode.  
  • Ensure the subinterface on the adjoining CE router is on the same VLAN as this PE router. |
|      | **Example:** `switch(config)# interface ethernet 4/0/0` `switch(config-if)#` | |}
| 3    | `[no] l2vpn xconnect context context-name` | Enters XConnect configuration mode and establishes a Layer 2 VPN (L2VPN) context for identifying the two members in a VPWS, multisegment pseudowire, or local connect service.  
  • The `context-name` argument is a unique per-interface identifier for this context. The maximum range is 100 alphanumeric, case-sensitive characters.  
  **Note** You can use the `no` form of this command to delete the context and the associated configuration. |
|      | **Example:** `switch(config-if)# l2vpn context cxt1` `switch(config-xconnect)#` | |}
| 4    | `[no] member interface-type slot/port [service-instance service-instance-id] [group group-name] [priority number]` | Adds an active Ethernet AC, with or without an Ethernet Flow Point (EFP), to the context.  
  • The `service-instance-id` argument is a unique per-interface identifier for the EFP. The valid range is from 1 to 4000. The range might be restricted due to resource constraints.  
  • (Optional) The `group` keyword specifies which of redundant groups the member belongs. This must be configured if the member is backed up by one or more other group members in order to identify to which redundant group each member belongs.  
  • (Optional) The `priority number` keyword and argument combination specifies the priority of the backup pseudowire in instances where multiple backup pseudowires exist. The range is from 1 to 10, with 1 being the highest priority. The default is 0 and is higher than 1.  
  • You can use the `no` form of this command to delete the specified member configuration. |
|      | **Example:** `switch(config-xconnect)# member ethernet 0/0` | |}
### Configuring Per-Subinterface MTU for Ethernet over MPLS

**SUMMARY STEPS**

1. configure terminal
2. interface ethernet slot/port
3. mtu mtu-value
4. encapsulation dot1q vlan-id
5. [no] l2vpn context context-name encapsulation mpls
6. mtu mtu-value
7. (Optional) copy running-config start-up config

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 5</td>
<td></td>
</tr>
<tr>
<td>[no] member pseudowire pw-id [group name] [priority number]</td>
<td>Adds an active pseudowire to the context.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>switch(config-xconnect)# member pseudowire 12</td>
<td></td>
</tr>
<tr>
<td>Step 6</td>
<td></td>
</tr>
<tr>
<td>copy running-config startup-config</td>
<td>(Optional) Saves this configuration change.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>switch(config-xconnect)# copy running-config startup-config</td>
<td></td>
</tr>
</tbody>
</table>
## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong>&lt;br&gt;configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
</tbody>
</table>

**Example:**<br>switch# configure terminal<br>switch(config)#

| **Step 2**<br>interface ethernet slot/port | Enters interface configuration mode. |

**Example:**<br>switch(config)# interface ethernet 3/1<br>switch(config-if)#

| **Step 3**<br>mtu mtu-value | Configures the maximum transmission unit (MTU) size, in bytes, for this interface. |

**Example:**<br>switch(config-if)# mtu 2000

- The valid range for the **mtu-value** argument is 576 to 9216. The default is 1500.

| **Step 4**<br>encapsulation dot1q vlan-id | Configures the matching criteria for mapping dot1q frames on an ingress interface to this EFP. |

**Example:**<br>switch(config-if)# encapsulation dot1q 100

- The valid range for the **vlan-id** argument is from 2 to 967.
- The subinterfaces between the CE and PE routers that are running EoMPLS must be in the same subnet. All other subinterfaces and backbone devices do not need to be in the same subnet.

| **Step 5**<br>[no] l2vpn context<br>context-name encapsulation mpls | Enters Xconnect configuration mode and establishes a Layer 2 VPN (L2VPN) context for identifying the two members in a VPWS, multisegment pseudowire, or local connect service. |

**Example:**<br>switch(config-if)# l2vpn context ctx1 encapsulation mpls<br>switch(config-xconnect)#

- The **context-name** argument is a unique per-interface identifier for this context. The maximum range is 100 alphanumeric, case-sensitive characters.
- The **encapsulation** and **mpls** keywords specify MPLS encapsulation for this context.

**Note** You can use the **no** form of this command to delete the context and the associated configuration.

| **Step 6**<br>mtu mtu-value | Configures the maximum transmission unit (MTU) size, in bytes, for this context. |

**Example:**<br>switch(config-xconnect)# mtu 1400

- The valid range for the **mtu-value** argument is 576 to 9216. The default is 1500.

| **Step 7**<br>copy running-config<br>startup-config | (Optional) Saves this configuration change. |

**Example:**<br>switch(config-xconnect)# copy running-config startup-config
Verifying Any Transport over MPLS

To verify configuration information, perform one of the following tasks:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>show 12vpn atom vc detail</td>
<td>Displays detailed information about Any Transport over MPLS (AToM) virtual circuits (VCs) and static pseudowires that have been enabled to route Layer 2 packets on a device.</td>
</tr>
<tr>
<td>show 12vpn mpls transport binding</td>
<td>Displays the MTU values assigned to the local and remote interfaces.</td>
</tr>
</tbody>
</table>

Configuration Examples for Any Transport over MPLS

This section includes the following topics:

- Example: Remote Ethernet Port Shutdown, page 27-16
- Example: Configuring per-Subinterface MTU for Ethernet over MPLS, page 27-16
- Example: Configuring MTU for Interworking, page 27-18

Example: Remote Ethernet Port Shutdown

The following example shows how to enable a remote Ethernet port shutdown:

```
interface pseudowire 100
  encapsulation mpls
  neighbor 10.1.1.1 1
  12vpn xconnect context con1
    remote link failure notification
```

The following example shows how to disable a remote Ethernet port shutdown:

```
interface GigabitEthernet1/0/0
  interface pseudowire 100
    encapsulation mpls
    neighbor 10.1.1.1 1
  12vpn xconnect context con1
    no remote link failure notification
```

Example: Configuring per-Subinterface MTU for Ethernet over MPLS

This example shows a configuration that enables matching MTU values between VC endpoints. PE1 is configured in the XConnect subinterface configuration mode with an MTU value of 1500 bytes in order to establish an end-to-end VC with PE2, which also has an MTU value of 1500 bytes.

CE1 Configuration

```
interface gigabitethernet 0/0
  mtu 1500
  no ip address
```
!  interface gigabitethernet 0/0.1
    encapsulation dot1Q 100
    ip address 10.181.182.1 255.255.255.0

PE1 Configuration

interface gigabitethernet 0/0
    mtu 2000
    no ip address
!
interface gigabitethernet 0/0.1
    encapsulation dot1Q 100
!
interface pseudowire 100
    neighbor 10.1.1.152 100
    encapsulation mpls
    mtu 2000
!
l2vpn xconnect context ctx1
    member gigabitethernet0/0.1
    member pseudowire 100
!
interface gigabitethernet 0/0.2
    encapsulation dot1Q 200
    ip address 10.151.150.1 255.255.255.0
    mpls ip

PE2 Configuration

interface gigabitethernet 1/0
    mtu 2000
    no ip address
!
interface gigabitethernet 1/0.2
    encapsulation dot1Q 200
    ip address 10.151.150.2 255.255.255.0
    mpls ip
!
interface fastethernet 0/0
    no ip address
!
interface fastethernet 0/0.1
    description default MTU of 1500 for FastEthernet
    encapsulation dot1Q 100
    xconnect 10.1.1.151 100 encapsulation mpls

CE2 Configuration

interface fastethernet 0/0
    no ip address
    interface fastethernet 0/0.1
    encapsulation dot1Q 100
    ip address 10.181.182.2 255.255.255.0
Example: Configuring MTU for Interworking

The following example shows an L2VPN interworking example. The PE1 device has a serial interface configured with an MTU value of 1492 bytes. The PE2 router is configured with a matching MTU of 1492 bytes, which allows the two devices to form an interworking VC. If the PE2 device was not explicitly configured with a matching MTU value, the interface would be set to 1500 bytes by default and the VC would not come up.

**PE1 Configuration**

```
interface Loopback0
   ip address 10.1.1.151 255.255.255.255
!
interface pseudowire100
   neighbor 10.1.1.152 100
   encapsulation mpls
   mtu 2000
   l2vpn xconnect context ctx1
   member gigabitethernet0/0
   member pseudowire 100
!
router ospf 1
   log-adjacency-changes
   network 10.1.1.151 0.0.0.0 area 0
   network 10.151.100.0 0.0.0.3 area 0
!
mpls ldp router-id Loopback0
```

**PE2 Configuration**

```
pseudowire-class atom-ipiw
   encapsulation mpls
   interworking ip
!
interface Loopback0
   ip address 10.1.1.152 255.255.255.255
!
interface Ethernet0/0
   no ip address
   xconnect 10.1.1.151 123 pw-class atom-ipiw
   mtu 1492
!
interface Serial4/0
   ip address 10.100.152.2 255.255.255.252
   encapsulation ppp
   mpls ip
   serial restart-delay 0
!
router ospf 1
   log-adjacency-changes
   network 10.1.1.152 0.0.0.0 area 0
   network 10.100.152.0 0.0.0.3 area 0
!
mpls ldp router-id Loopback0
```
Additional References for Any Transport over MPLS

For additional information about provisioning static pseudowires for Any Transport over MPLS (AToM), see the following section:

- Related Documents, page 27-19

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface commands</td>
<td>Cisco Nexus 7000 Series NX-OS Interfaces Command Reference</td>
</tr>
<tr>
<td>VLAN commands</td>
<td>Cisco Nexus 7000 Series NX-OS Layer 2 Switching Command Reference</td>
</tr>
<tr>
<td>Ethernet over MPLS</td>
<td>“Configuring Ethernet over MPLS” chapter</td>
</tr>
<tr>
<td>Non directly connected MPLS LDP sessions</td>
<td>“Configuring the MPLS Label Distribution Protocol” chapter</td>
</tr>
</tbody>
</table>

Feature Information for Any Transport over MPLS

Table 27-2 lists the release history for this feature.

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Transport over MPLS</td>
<td>6.2(2)</td>
<td>The Any Transport over MPLS (AToM) feature provides the following capabilities:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transports data link layer (Layer2) packets over a Multiprotocol Label Switching (MPLS) backbone.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enables service providers to connect customer sites with existing Layer 2 networks by using a single, integrated, packet-based network infrastructure—a Cisco MPLS network. Instead of using separate networks with network management environments, service providers can deliver Layer 2 connections over an MPLS backbone.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provides a common framework to encapsulate and transport Ethernet traffic over an MPLS network core.</td>
</tr>
</tbody>
</table>