



L2VPN Pseudowire Switching

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This feature module explains how to configure L2VPN Pseudowire Switching, which extends layer 2 virtual private network (L2VPN) pseudowires across an interautonomous system (inter-AS) boundary or across two separate multiprotocol label switching (MPLS) networks.

Finding Feature Information

For the latest feature information and caveats, see the release notes for your platform and 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 “[Feature Information for L2VPN Pseudowire Switching](#)” section on [page 9](#).

Use Cisco Feature Navigator to find information about platform support and Cisco IOS XE software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

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Restrictions for L2VPN Pseudowire Switching

- In Cisco IOS XE Release 2.4, Pseudowire Switching is supported on Ethernet over MPLS attachment circuits.
- L2VPN Pseudowire Switching is supported with AToM.
- Only static, on-box provisioning is supported.
- Sequencing numbers in AToM packets are not processed by L2VPN Pseudowire Switching. The feature blindly passes the sequencing data through the xconnect packet paths, a process that is called transparent sequencing. The endpoint PE-CE connections enforce the sequencing.
- You can ping the adjacent next-hop PE router. End-to-end LSP pings are not supported.
- Do not configure IP or Ethernet interworking on a router where L2VPN Pseudowire Switching is enabled. Instead, configure interworking on the routers at the edge PEs of the network.
- The control word negotiation results must match. If either segment does not negotiate the control word, the control word is disabled for both segments.
- AToM Graceful Restart is negotiated independently on each pseudowire segment. If there is a transient loss of the LDP session between two AToM PE routers, packets continue to flow.
- Per-pseudowire quality of service (QoS) is not supported. Traffic Engineering (TE) tunnel selection is supported.
- Attachment circuit interworking is not supported.

Information About L2VPN Pseudowire Switching

To configure the L2VPN Pseudowire Switching feature, you should understand the following concepts:

- [How L2VPN Pseudowire Switching Works, page 2](#)
- [How Packets Are Manipulated at the L2VPN Pseudowire Switching Aggregation Point, page 3](#)

How L2VPN Pseudowire Switching Works

L2VPN Pseudowire Switching allows the user to extend L2VPN pseudowires across an inter-AS boundary or across two separate MPLS networks, as shown in [Figure 1](#) and [Figure 2](#). L2VPN Pseudowire Switching connects two or more contiguous pseudowire segments to form an end-to-end multihop pseudowire. This end-to-end pseudowire functions as a single point-to-point pseudowire.

As shown in [Figure 2](#), L2VPN Pseudowire Switching enables you to keep the IP addresses of the edge PE routers private across inter-AS boundaries. You can use the IP address of the autonomous system boundary routers (ASBRs) and treat them as pseudowire aggregation (PE-agg) routers. The ASBRs join the pseudowires of the two domains.

L2VPN Pseudowire Switching also enables you to keep different administrative or provisioning domains to manage the end-to-end service. At the boundaries of these networks, PE-agg routers delineate the management responsibilities.

Figure 1 *L2VPN Pseudowire Switching in an Intra-AS Topology*



Figure 2 *L2VPN Pseudowire Switching in an Inter-AS Topology*



How Packets Are Manipulated at the L2VPN Pseudowire Switching Aggregation Point

Switching AToM packets between two AToM pseudowires is the same as switching any MPLS packet. The MPLS switching data path switches AToM packets between two AToM pseudowires. The following list explains exceptions:

- The outgoing virtual circuit (VC) label replaces the incoming VC label in the packet. New Internal Gateway Protocol (IGP) labels and Layer 2 encapsulation are added.
- The incoming VC label time-to-live (TTL) field is decremented by one and copied to the outgoing VC label TTL field.
- The incoming VC label EXP value is copied to the outgoing VC label EXP field.
- The outgoing VC label ‘Bottom of Stack’ S bit in the outgoing VC label is set to 1.
- AToM control word processing is not performed at the L2VPN Pseudowire Switching aggregation point. Sequence numbers are not validated. Use the Router Alert label for LSP Ping; do not require control word inspection to determine an LSP Ping packet.

How to Configure L2VPN Pseudowire Switching

This section explains how to perform the following tasks:

- [Configuring L2VPN Pseudowire Switching, page 4](#)

Configuring L2VPN Pseudowire Switching

Use the following procedure to configure L2VPN Pseudowire Switching on each of the PE-aggregating routers.

Prerequisites

- This procedure assumes that you have configured basic AToM L2VPNs. This procedure does not explain how to configure basic AToM L2VPNs that transport Layer 2 packets over an MPLS backbone. For information on the basic configuration, see [Any Transport over MPLS](#).
- For inter-Autonomous configurations, ASBRs require a labeled interface.

Restrictions

In this configuration, you are limited to two **neighbor** commands after entering the **l2 vfi** command.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **l2 vfi name point-to-point**
4. **neighbor ip-address vcid encapsulation mpls | pw-class pw-class-name**
5. **exit**
6. **exit**
7. **show mpls l2transport vc [vcid [vc-id | vc-id-min vc-id-max]] [interface name [local-circuit-id]] [destination ip-address | name] [detail]**
8. **show vfi [vfi-name]**
9. **ping [protocol] [tag] {host-name | system-address}**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	l2 vfi name point-to-point Example: Router(config)# l2 vfi atomtunnel point-to-point	Creates a point-to-point Layer 2 virtual forwarding interface (VFI) and enters VFI configuration mode.

	Command or Action	Purpose
Step 4	<p>neighbor <i>ip-address</i> <i>vcid</i> encapsulation mpls pw-class <i>pw-class-name</i></p> <p>Example: Router(config-vfi)# neighbor 10.0.0.1 100 pw-class mpls</p>	<p>Sets up an emulated VC. Specify the IP address and the VC ID of the remote router. Also specify the pseudowire class to use for the emulated VC.</p> <p>Note Only two neighbor commands are allowed for each I2 vfi point-to-point command.</p>
Step 5	<p>exit</p> <p>Example: Router(config-vfi)# exit</p>	Exits VFI configuration mode.
Step 6	<p>exit</p> <p>Example: Router(config)# exit</p>	Exits global configuration mode.
Step 7s	<p>show mpls l2transport vc [vcid [<i>vc-id</i> [<i>vc-id-min</i> <i>vc-id-max</i>]]] [interface <i>name</i> [<i>local-circuit-id</i>]] [destination <i>ip-address</i> <i>name</i>] [detail]</p> <p>Example: Router# show mpls l2transport vc</p>	Verifies that the L2VPN Pseudowire Switching session has been established.
Step 8	<p>show vfi [<i>vfi-name</i>]</p> <p>Example: Router# show vfi atomtunnel</p>	Verifies that a point-to-point VFI has been established.
Step 9	<p>ping [<i>protocol</i>] [tag] {<i>host-name</i> <i>system-address</i>}</p> <p>Example: Router# ping 10.1.1.1</p>	When issued from the CE routers, this command verifies end-to-end connectivity.

Examples

The following example displays the output of the **show mpls l2transport vc** command:

```
Router# show mpls l2transport vc

Local intf      Local circuit          Dest address      VC ID Status
-----
MPLS PW        10.0.1.1:100          10.0.1.1         100  UP
MPLS PW        10.0.1.1:100          10.0.1.1         100  UP
```

The following example displays the output of the **show vfi** command:

```
Router# show vfi

VFI name: test, type: point-to-point
Neighbors connected via pseudowires:
  Router ID      Pseudowire ID
  10.0.1.1       100
  10.0.1.1       100
```

Configuration Examples for L2VPN Pseudowire Switching

This section provides the following configuration example:

- [L2VPN Pseudowire Switching in an Inter-AS Configuration: Example, page 6](#)

L2VPN Pseudowire Switching in an Inter-AS Configuration: Example

Two separate autonomous systems are able to pass L2VPN packets, because the two PE-agg routers have been configured with L2VPN Pseudowire Switching. This example configuration is shown in [Figure 3](#).

Figure 3 *L2VPN Pseudowire Switching in an InterAutonomous System*



CE1	CE2
<pre> version 12.0 service timestamps debug uptime service timestamps log uptime service password-encryption ! hostname [ce1] ! boot-start-marker boot-end-marker ! enable secret 5 \$1\$o9N6\$LSrxHufTn0vjCY0nW8hQX. ! ip subnet-zero ip cef no ip domain-lookup ! interface FastEthernet0/0/0 ip address 10.0.0.1 255.255.255.252 no ip directed-broadcast ! ip classless ! control-plane ! line con 0 exec-timeout 0 0 line aux 0 line vty 0 4 login ! no cns aaa enable end </pre>	<pre> version 12.0 service timestamps debug uptime service timestamps log uptime service password-encryption ! hostname [ce2] ! boot-start-marker boot-end-marker ! enable secret 5 \$1\$YHo6\$LQ4z5PdrF5B9dnL75Xvvm1 ! ip subnet-zero ip cef no ip domain-lookup ! interface FastEthernet0/0/0 ip address 10.0.0.2 255.255.255.252 no ip directed-broadcast ! ip classless ! control-plane ! line con 0 exec-timeout 0 0 line aux 0 line vty 0 4 login ! no cns aaa enable end </pre>

Additional References

The following sections provide references related to L2VPN Pseudowire Switching.

Related Documents

Related Topic	Document Title
Description of commands associated with MPLS and MPLS applications	Cisco IOS Multiprotocol Label Switching Command Reference
Any Transport over MPLS	Any Transport over MPLS
Pseudowire redundancy	L2VPN Pseudowire Redundancy
High availability for AToM	AToM Graceful Restart
L2VPN interworking	L2VPN Interworking
Layer 2 local switching	Layer 2 Local Switching

Related Topic	Document Title
PWE3 MIB	Pseudowire Emulation Edge-to-Edge MIBs for Ethernet and Frame Relay Services
Packet sequencing	Any Transport over MPLS (AToM) Sequencing Support

Standards

Standard	Title
draft-ietf-pwe3-control-protocol-14.txt	Pseudowire Setup and Maintenance using LDP
draft-martini-pwe3-pw-switching-01.txt	Pseudo Wire Switching

MIBs

MIB	MIBs Link
<ul style="list-style-type: none"> • CISCO-IETF-PW-MIB • CISCO-IETF-PW-MPLS-MIB • CISCO-IETF-PW-ENET-MIB • CISCO-IETF-PW-FR-MIB 	<p>To locate and download MIBs for selected platforms, Cisco IOS XE software releases, and feature sets, use Cisco MIB Locator found at the following URL:</p> <p>http://www.cisco.com/go/mibs</p>

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/techsupport

Feature Information for L2VPN Pseudowire Switching

Table 1 lists the features in this module and provides links to specific configuration information.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS XE software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.



Note

Table 1 lists only the Cisco IOS XE software release that introduced support for a given feature in a given Cisco IOS XE software release train. Unless noted otherwise, subsequent releases of that Cisco IOS XE software release train also support that feature.

Table 1 Feature Information for L2VPN Pseudowire Switching

Feature Name	Releases	Feature Information
L2VPN Pseudowire Switching	Cisco IOS XE Release 2.4	<p>The L2VPN Pseudowire Switching feature extends layer 2 virtual private network (L2VPN) pseudowires across an interautonomous system (inter-AS) boundary or across two separate multiprotocol label switching (MPLS) networks.</p> <p>In Cisco IOS XE Release 2.4, The L2VPN Pseudowire Switching feature is supported with Ethernet over MPLS.</p> <p>The following section provides information about this feature:</p> <ul style="list-style-type: none"> • Information About L2VPN Pseudowire Switching, page 2 • How to Configure L2VPN Pseudowire Switching, page 3 <p>The following commands were introduced or modified: l2 vfi point-to-point, neighbor (L2VPN Pseudowire Switching), show vfi.</p>

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