VPLS Autodiscovery: BGP Based

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VPLS Autodiscovery enables each Virtual Private LAN Service (VPLS) provider edge (PE) router to discover which other PE routers are part of the same VPLS domain. VPLS Autodiscovery also automatically detects when PE routers are added to or removed from the VPLS domain. You no longer need to manually configure the VPLS and maintain the configuration when a PE router is added or deleted. VPLS Autodiscovery uses the Border Gateway Protocol (BGP) to discover the VPLS members and to set up and tear down pseudowires in the VPLS.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for VPLS Autodiscovery: BGP Based" section on page 48.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Contents

Prerequisites for VPLS Autodiscovery: BGP Based

Before configuring VPLS Autodiscovery, perform the Cisco 7600 router-specific tasks listed in the section called "Virtual Private LAN Services on the Optical Service Modules" in the *Cisco 7600 Series Router IOS Software Configuration Guide, 12.2SR.*

Restrictions for VPLS Autodiscovery: BGP Based

- VPLS Autodiscovery supports only IPV4 addresses.
- VPLS Autodiscovery uses Forwarding Equivalence Class (FEC) 129 to convey endpoint information. Manually configured pseudowires use FEC 128.
- VPLS Autodiscovery is not supported with Layer 2 Tunnel Protocol Version 3 (L2TPv3).
- VPLS Autodisocovery is not supported with interautonomous system configurations.
- You can configure both autodiscovered and manually configured pseudowires in a single virtual forwarding instance (VFI). However, the pseudowires cannot go to the same peer PE router.
- If you manually configure a neighbor using the **neighbor** (VPLS) command after you have enabled VPLS Autodiscovery and both peers are in autodiscovery mode, manually configure the route target (RT) values to prevent each peer from receiving discovery data for that VPLS.
- If you manually configure multiple pseudowires and target different IP addresses on the same PE router for each pseudowire, do not use the same virtual circuit identifier (VC ID) to identify the pseudowires terminated at the same PE router.
- You cannot configure a pseudowire by manually configuring a neighbor on one PE router and using autodiscovery on the other PE router to configure the same pseudowire in the other direction.
- Tunnel selection is not supported with autodiscovered neighbors.
- You can have up to 16 route targets only per VFI.
- The same RT is not allowed in multiple VFIs in the same PE router.
- The BGP autodiscovery process does not support dynamic hierarchical VPLS. User-facing PE (U-PE) routers cannot discover the network-facing PE (N-PE) routers, and N-PE routers cannot discover U-PE routers.
- Pseudowires for autodiscovered neighbors are provisioned with split horizon enabled. Therefore, manually configure the pseudowires for hierarchical VPLS. Make sure the U-PE routers do not participate in BGP autodiscovery for those pseudowires.
- Do not disable split horizon on autodiscovered neighbors. Split horizon is required with VPLS Autodiscovery.
- The provisioned peer address must be a /32 address bound to the peer's Label Distribution Protocol (LDP) router ID.
- The peer PE router must be able to access the IP address that is used as the local LDP router ID. Even though the IP address need not be used in the **xconnect** command on the peer PE router, that IP address must be reachable.
- VPLS Autodiscovery is supported on the Cisco 7600 router hardware. For details on supported shared port adapters and line cards, see the following documents:
  - *Guide to Supported Hardware for Cisco 7600 Series Routers with Release 12.2SR*
  - *Release Notes for Cisco IOS Release 12.2SR for the Cisco 7600 Series Routers*

Information About VPLS Autodiscovery: BGP Based

To understand VPLS Autodiscovery, you should understand the following concepts:

How the VPLS Feature Works

VPLS allows Multiprotocol Label Switching (MPLS) networks to provide multipoint Ethernet LAN services, also known as Transparent LAN Services (TLS). All customer sites in a VPLS appear to be on the same LAN, even though those sites might be in different geographic locations.

How the VPLS Autodiscovery: BGP Based Feature Works

VPLS Autodiscovery enables each VPLS PE router to discover the other PE routers that are part of the same VPLS domain. VPLS Autodiscovery also tracks when PE routers are added to or removed from the VPLS domain. The autodiscovery and signaling functions use BGP to find and track the PE routers.

BGP uses the L2VPN Routing Information Base (RIB) to store endpoint provisioning information, which is updated each time any Layer 2 VFI is configured. Prefix and path information is stored in the L2VPN database, allowing BGP to make decisions on the best path. When BGP distributes the endpoint provisioning information in an update message to all its BGP neighbors, the endpoint information is used to configure a pseudowire mesh to support L2VPN-based services.

The BGP autodiscovery mechanism facilitates the configuration of L2VPN services, which are an integral part of the Cisco IOS Virtual Private LAN Service (VPLS) feature. VPLS enables flexibility in deploying services by connecting geographically dispersed sites as a large LAN over high-speed Ethernet in a robust and scalable IP MPLS network. For more information about BGP and the L2VPN address family in relation to VPLS Autodiscovery, see the following documents:

- The section called "L2VPN Address Family" in the *Cisco BGP Overview*.
- The document called *BGP Support for the L2VPN Address Family*

How Enabling VPLS Autodiscovery Differs from Manually Configuring VPLS

With VPLS Autodiscovery, you no longer need to manually set up the VPLS. The commands you use to set up VPLS Autodiscovery are similar to those you use to manually configure a VPLS, as shown in Table 1. VPLS Autodiscovery uses **neighbor** commands in L2VPN address family mode to distribute endpoint information to configure a pseudowire.

Table 1   VPLS Autodiscovery Configuration versus Manual VPLS Configuration

Manual Configuration of VPLS	VPLS Autodiscovery: BGP Based

<pre>l2 vfi vpls1 manual
 vpn id 100
 neighbor 10.10.10.1 encapsulation mpls
 neighbor 10.10.10.0 encapsulation mpls
 exit</pre>
	<pre>l2 vfi vpls1 autodiscovery
	 vpn id 100
	 exit
	
	router bgp 1
	 no bgp default ipv4-unicast
	 bgp log-neighbor-changes
	 bgp update-delay 1
	 neighbor 10.1.1.2 remote-as 1
	 neighbor 10.1.1.2 update-source Loopback1
	 .
	 .
	 .
	 address-family l2vpn vpls
	 neighbor 10.1.1.2 activate
	 neighbor 10.1.1.2 send-community extended
	exit-address-family</pre>

When you configure VPLS Autodiscovery, you enter the **l2vfi autodiscovery** command. This command allows the VFI to learn and advertise the pseudowire endpoints. As a result, you no longer need to enter the **neighbor** (VPLS) command in L2 VFI configuration mode.

However, the **neighbor** (VPLS) command is still supported with VPLS Autodiscovery in L2 VFI command mode. You can use the **neighbor** (VPLS) command to allow PE routers that do not participate in the autodiscovery process to join the VPLS. You can also use the **neighbor** (VPLS) command with PE routers that have been configured using the Tunnel Selection feature. You can also use the **neighbor** (VPLS) command in hierarchical VPLS configurations that have U-PE routers that do not participate in the autodiscovery process and have split-horizon forwarding disabled.

Show Commands Affected by VPLS Autodiscovery: BGP Based

VPLS Autodiscovery changes the following show commands:

- The **show mpls l2transport vc** command with the **detail** keyword has been updated to include FEC 129 signaling information for the autodiscovered VPLS pseudowires. See the **show mpls l2transport vc** command in the "Command Reference" section for more information.

- The **show vfi** command now displays information related to autodiscovered VFIs. The new information includes the VPLS ID, the route distinguisher (RD), the RT, and the router IDs of the discovered peers. See the **show vfi** command in the "Command Reference" section for more information.

- The **show xconnect** command has been updated with the **rib** keyword to provide RIB information about the pseudowires. See the **show xconnect** command in the "Command Reference" section for more information.

How to Configure VPLS Autodiscovery: BGP Based

To configure VPLS Autodiscovery, perform the following tasks:

- Enabling VPLS Autodiscovery: BGP Based, page 5 (required)
- Configuring BGP to Enable VPLS Autodiscovery, page 6 (required)
- Customizing the VPLS Autodiscovery Settings, page 9 (optional)

Enabling VPLS Autodiscovery: BGP Based

Perform the following task to enable each VPLS PE router to discover the other PE routers that are part of the same VPLS domain.

Prerequisites

Before configuring VPLS Autodiscovery, perform the Cisco 7600 router-specific tasks listed in the " "Virtual Private LAN Services on the Optical Service Modules" section in the *Cisco 7600 Series Router IOS Software Configuration Guide, 12.2SR*.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **l2 vfi** *vfi-name* **autodiscovery**
4. **vpn id** *vpn-id*
5. **exit**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`l2 vfi` *vfi-name* `autodiscovery`
	
	Example:
	`Router(config)# l2 vfi vpls1 autodiscovery`
		Enables VPLS Autodiscovery on the PE router and enters L2 VFI configuration mode.

Step 4	`vpn id` *vpn-id* **Example:** `Router(config-vfi)# vpn id 10`	Configures a VPN ID for the VPLS domain.

Step 5	`exit`
	
	Example:
	`Router(config-vfi)# exit`
		Exits L2 VFI configuration mode. Commands take effect after the router exits L2 VFI configuration mode.

Configuring BGP to Enable VPLS Autodiscovery

In Cisco IOS Release 12.2(33)SRB, the BGP L2VPN address family was introduced with a separate L2VPN RIB that contains endpoint provisioning information for VPLS Autodiscovery. BGP learns the endpoint provisioning information from the L2VPN database which is updated each time a Layer 2 virtual forwarding instance (VFI) is configured. When BGP distributes the endpoint provisioning information in an update message to all its BGP neighbors, the endpoint information is used to configure a pseudowire mesh to support aL2VPN-based services.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **no bgp default ipv4-unicast**
5. **bgp log-neighbor-changes**
6. **neighbor** {*ip-address* | *peer-group-name*} **remote-as** *autonomous-system-number*
7. **neighbor** {*ip-address* | *peer-group-name*} **update-source** *interface*
8. Repeat Step 6 and Step 7 to configure other BGP neighbors.
9. **address-family l2vpn** [**vpls**]

10. **neighbor** {*ip-address* | *peer-group-name*} **activate**

11. **neighbor** {*ip-address* | *peer-group-name*} **send-community** [**both** | **standard** | **extended**]

12. Repeat Step 10 and Step 11 to activate other BGP neighbors under L2VPN address family.

13. **exit-address-family**

14. **exit**

15. **exit**

16. **show vfi**

17. **show ip bgp l2vpn vpls** {**all** | **rd** *vpn-rd*}

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`router bgp` *autonomous-system-number* **Example:** `Router(config)# router bgp 65000`	Enters router configuration mode for the specified routing process.

Step 4	`no bgp default ipv4-unicast`
	
	Example:
	`Router(config-router)# no bgp default`
	`ipv4-unicast`
		Disables the IPv4 unicast address family for the BGP routing process.
		
		Note Routing information for the IPv4 unicast address family is advertised by default for each BGP routing session configured with the **neighbor remote-as** router configuration command unless you configure the **no bgp default ipv4-unicast** router configuration command before configuring the **neighbor remote-as** command. Existing neighbor configurations are not affected.

Step 5	`bgp log-neighbor-changes`
	
	Example:
	`Router(config-router)# bgp log-neighbor-changes`
		Enables logging of BGP neighbor resets.

	Command or Action	Purpose
Step 6	**neighbor** {*ip-address* | *peer-group-name*} **remote-as** *autonomous-system-number* **Example:** Router(config-router)# neighbor 10.10.10.1 remote-as 65000	Adds the IP address or peer group name of the neighbor in the specified autonomous system to the IPv4 multiprotocol BGP neighbor table of the local router. • If the *autonomous-system-number* argument matches the autonomous system number specified in the **router bgp** command, the neighbor is an internal neighbor. • If the *autonomous-system-number* argument does not match the autonomous system number specified in the **router bgp** command, the neighbor is an external neighbor. • In this example, the neighbor at 10.10.10.1 is an internal BGP neighbor.
Step 7	**neighbor** {*ip-address* | *peer-group-name*} **update-source** *interface-type interface-number* **Example:** Router(config-router)# neighbor 10.10.10.1 update-source loopback1	(Optional) Configures a router to select a specific source or interface to receive routing table updates. • This example uses a loopback interface. The advantage to this configuration is that the loopback interface is not affected by the effects of a flapping interface.
Step 8	Repeat Step 6 and Step 7 to configure other BGP neighbors	—
Step 9	**address-family l2vpn** [**vpls**] **Example:** Router(config-router)# address-family l2vpn vpls	Specifies the L2VPN address family and enters address family configuration mode. • The optional **vpls** keyword specifies that VPLS endpoint provisioning information is to be distributed to BGP peers. • In this example, an L2VPN VPLS address family session is created.
Step 10	**neighbor** {*ip-address* | *peer-group-name*} **activate** **Example:** Router(config-router-af)# neighbor 10.10.10.1 activate	Enables the neighbor to exchange information for the L2VPN VPLS address family with the local router.
Step 11	**neighbor** {*ip-address* | *peer-group-name*} **send-community** {**both** | **standard** | **extended**} **Example:** Router(config-router-af)# neighbor 10.10.10.1 send-community extended	Specifies that a communities attribute should be sent to a BGP neighbor. • In this example, an extended communities attribute is sent to the neighbor at 10.10.10.1.
Step 12	Repeat Step 10 and Step 11 to activate other BGP neighbors under an L2VPN address family.	—
Step 13	**exit-address-family** **Example:** Router(config-router-af)# exit-address-family	Exits address family configuration mode and returns to router configuration mode.

	Command or Action	Purpose

Step 14	`exit`
	
	Example:
	`Router(config-router)# exit`
		Exits router configuration mode.

Step 15	`exit`
	
	Example:
	`Router(config)# exit`
		Exits privileged EXEC mode.

Step 16	`show vfi`
	
	Example:
	`Router# show vfi`
		(Optional) Displays information about the configured VFI instances.

Step 17	`show ip bgp l2vpn vpls {all | rd vpn-rd}`
	
	Example:
	`Router# show ip bgp l2vpn vpls all`
		(Optional) Displays information about the Layer2 VPN VPLS address family.

Customizing the VPLS Autodiscovery Settings

Several commands allow you to customize the VPLS environment. You can specify identifiers for the VPLS domain, the route distinguisher, the route target, and the PE router. Perform the following steps to customize these settings.

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **l2 vfi** *vfi-name* **autodiscovery**

4. **vpn id** *vpn-id*

5. **vpls-id** {*autonomous-system-number***:***nn* | *ip-address***:***nn*}

6. **rd** {*autonomous-system-number***:***nn* | *ip-address***:***nn*}

7. **route-target** [**import** | **export** | **both**] {*autonomous-system-number***:***nn*| *ip-address***:***nn*}

8. **l2 router-id** *ip-address*

9. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters global configuration mode.
Step 3	**l2 vfi** *vfi-name* **autodiscovery** **Example:** Router(config)# l2 vfi vpls1 autodiscovery	Enables VPLS Autodiscovery on the PE router and enters L2 VFI configuration mode.
Step 4	**vpn id** *vpn-id* **Example:** Router(config-vfi)# vpn id 10	Configures a VPN ID for the VPLS domain.
Step 5	**vpls-id** {*autonomous-system-number*:*nn* | *ip-address*:*nn*} **Example:** Router(config-vfi)# vpls-id 5:300	(Optional) Specifies the VPLS domain. This command is optional, because VPLS Autodiscovery automatically generates a VPLS ID using the BGP autonomous system number and the configured VFI VPN ID. You can use this command to change the automatically generated VPLS ID. There are two formats for configuring the VPLS ID argument. It can be configured in the *autonomous-system-number:network number* (*ASN:nn*) format, as shown in the example, or it can be configured in the *IP-address:network number* format (*IP-address:nn*).
Step 6	**rd** {*autonomous-system-number*:*nn* | *ip-address*:*nn*} **Example:** Router(config-vfi)# rd 2:3	(Optional) Specifies the RD to distribute endpoint information. This command is optional, because VPLS Autodiscovery automatically generates an RD using the BGP autonomous system number and the configured VFI VPN ID. You can use this command to change the automatically generated route distinguisher. There are two formats for configuring the route distinguisher argument. It can be configured in the *autonomous-system-number:network number* (*ASN:nn*) format, as shown in the example, or it can be configured in the *IP-address:network number* format (*IP-address:nn*).

	Command or Action	Purpose
Step 7	route-target [import | export | both] {autonomous-system-number:nn | ip-address:nn} Example: Router(config-vfi)# route-target 600:2222	(Optional) Specifies the route target (RT). This command is optional, because VPLS Autodiscovery automatically generates a route target using the lower 6 bytes of the RD and VPLS ID. You can use this command to change the automatically generated route target. There are two formats for configuring the route target argument. It can be configured in the *autonomous-system-number:network number* (*ASN:nn*) format, as shown in the example, or it can be configured in the *IP-address:network number* format (*IP-address:nn*).
Step 8	l2 router-id ip-address Example: Router(config-vfi)# l2 router-id 10.10.10.10	(Optional) Specifies a unique identifier for the PE router. This command is optional, because VPLS Autodiscovery automatically generates a Layer 2 router ID using the MPLS global router ID. You can use this command to change the automatically generated ID.
Step 9	exit Example: Router(config-vfi)# exit	Exits L2 VFI configuration mode. Commands take effect after the router exits L2 VFI configuration mode.

What To Do Next

Perform the steps in .
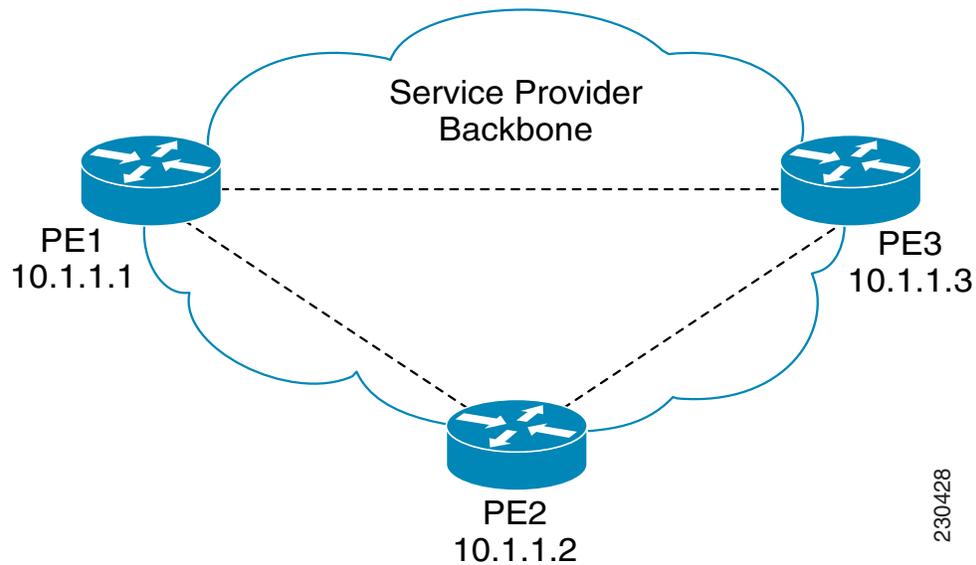
Configuration Examples for VPLS Autodiscovery: BGP Based

The following example shows the configuration of a network using VPLS Autodiscovery:

VPLS Autodiscovery: BGP Based: Basic Example

Figure 1 show a basic configuration of VPLS Autodiscovery.

Figure 1   ***Basic VPLS Autodiscovery Configuration***

PE1

```
l2 router-id 10.1.1.1
l2 vfi auto autodiscovery
 vpn id 100
!
pseudowire-class mpls
 encapsulation mpls
!
interface Loopback1
 ip address 10.1.1.1 255.255.255.255
!
interface Ethernet0/0
 description Backbone interface
 ip address 192.168.0.1 255.255.255.0
 mpls ip
!
router ospf 1
 log-adjacency-changes
 network 10.1.1.0 0.0.0.255 area 0
 network 172.16.0.0 0.0.0.255 area 0
!
router bgp 1
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 bgp update-delay 1
 neighbor 10.1.1.2 remote-as 1
 neighbor 10.1.1.2 update-source Loopback1
 neighbor 10.1.1.3 remote-as 1
```

```
 neighbor 10.1.1.3 update-source Loopback1
!
 address-family ipv4
 no synchronization
 no auto-summary
 exit-address-family
 !
 address-family l2vpn vpls
 neighbor 10.1.1.2 activate
 neighbor 10.1.1.2 send-community extended
 neighbor 10.1.1.3 activate
 neighbor 10.1.1.3 send-community extended
 exit-address-family
```

PE2

```
l2 router-id 10.1.1.2
l2 vfi auto autodiscovery
 vpn id 100
!
 pseudowire-class mpls
 encapsulation mpls
!
interface Loopback1
 ip address 10.1.1.2 255.255.255.255
!
interface Ethernet0/0
 description Backbone interface
 ip address 192.168.0.2 255.255.255.0
 mpls ip
!
router ospf 1
 log-adjacency-changes
 network 10.1.1.0 0.0.0.255 area 0
 network 172.16.0.0 0.0.0.255 area 0
!
router bgp 1
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 bgp update-delay 1
 neighbor 10.1.1.1 remote-as 1
 neighbor 10.1.1.1 update-source Loopback1
 neighbor 10.1.1.3 remote-as 1
 neighbor 10.1.1.3 update-source Loopback1
!
 address-family ipv4
 no synchronization
 no auto-summary
 exit-address-family
 !
 address-family l2vpn vpls
 neighbor 10.1.1.1 activate
 neighbor 10.1.1.1 send-community extended
 neighbor 10.1.1.3 activate
 neighbor 10.1.1.3 send-community extended
 exit-address-family
```

PE3

```
l2 router-id 10.1.1.3
l2 vfi auto autodiscovery
 vpn id 100
```

```
!
pseudowire-class mpls
 encapsulation mpls
!
interface Loopback1
 ip address 10.1.1.3 255.255.255.255
!
interface Ethernet0/0
 description Backbone interface
 ip address 192.168.0.3 255.255.255.0
 mpls ip
!
router ospf 1
 log-adjacency-changes
 network 10.1.1.0 0.0.0.255 area 0
 network 172.16.0.0 0.0.0.255 area 0
!
router bgp 1
 no bgp default ipv4-unicast
 bgp log-neighbor-changes
 bgp update-delay 1
 neighbor 10.1.1.1 remote-as 1
 neighbor 10.1.1.1 update-source Loopback1
 neighbor 10.1.1.2 remote-as 1
 neighbor 10.1.1.2 update-source Loopback1
!
 address-family ipv4
 no synchronization
 no auto-summary
 exit-address-family
 !
 address-family l2vpn vpls
 neighbor 10.1.1.1 activate
 neighbor 10.1.1.1 send-community extended
 neighbor 10.1.1.2 activate
 neighbor 10.1.1.2 send-community extended
 exit-address-family
```

Additional References

The following sections provide references related to the VPLS Autodiscovery: BGP Based feature.

Related Documents

Related Topic	Document Title
Virtual Private LAN Services on the Cisco 7600 series router	"Virtual Private LAN Services on the Optical Service Modules" in the *Cisco 7600 Series Router IOS Software Configuration Guide, 12.2SR*
L2 VPNs on the Cisco 7600 router	Configuration information for Layer 2 VPNs on the Cisco 7600 router is included in the following documents: • The "Configuring PFC3BXL and PFC3B Mode Multiprotocol Label Switching" module of the *Cisco 7600 Series Cisco IOS Software Configuration Guide*, Release 12.2SR • The "Configuring Multiprotocol Label Switching on the Optical Services Modules" module of the *OSM Configuration Note*, Release 12.2SR • The "Configuring Multiprotocol Label Switching on FlexWAN and Enhanced FlexWAN Modules" module of the *FlexWAN and Enhanced FlexWAN Modules Configuration Guide* • The "Configuring Any Transport over MPLS on a SIP" section of the *Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide* • The "Configuring AToM VP Cell Mode Relay Support" section of the *Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide* • The *Release Notes for Cisco IOS Release 12.2SR for the Cisco 7600 Series Routers*

Standards

Standard	Title
draft-ietf-l2vpn-signaling-08.txt	*Provisioning, Autodiscovery, and Signaling in L2VPNs*
draft-ietf-l2vpn-vpls-bgp-08.8	*Virtual Private LAN Service (VPLS) Using BGP for Autodiscovery and Signaling*
draft-ietf-mpls-lsp-ping-03.txt	*Detecting MPLS Data Plane Failures*
draft-ietf-pwe3-vccv-01.txt	*Pseudo-Wire (PW) Virtual Circuit Connection Verification (VCCV)*

MIBs

MIB	MIBs Link
• CISCO-IETF-PW-MIB (PW-MIB) • CISCO-IETF-PW-MPLS-MIB (PW-MPLS-MIB) • CISCO-IETF-PW-ENET-MIB (PW-ENET-MIB) • CISCO-IETF-PW-FR-MIB (PW-FR-MIB) • CISCO-IETF-PW-ATM-MIB (PW-ATM-MIB)	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
RFC 3916	*Requirements for Pseudo-wire Emulation Edge-to-Edge (PWE3)*
RFC 3981	*Pseudo Wire Emulation Edge-to-Edge Architecture*

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register on Cisco.com.	http://www.cisco.com/techsupport

Command Reference

This section documents new and modified commands only.

- **auto-route-target**
- **l2 router-id**
- **l2 vfi autodiscovery**
- **neighbor (VPLS)**
- **rd (VPLS)**
- **route-target (VPLS)**
- **show mpls l2transport vc**
- **show vfi**
- **show xconnect**
- **vpls-id**
- **xconnect**

auto-route-target

To enable the automatic generation of a route target (RT), use the **auto-route-target** command in L2 VFI configuration mode. To remove the automatically generated RTs, use the **no** form of this command.

> **auto-route-target**

> **no auto-route-target**

Syntax Description This command has no arguments or keywords.

Command Default The VPLS Autodiscovery feature automatically generates an RT, so you do not need to enter this command when you configure the feature.

Command Modes L2 VFI configuration

Command History

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

Usage Guidelines This command works with the **l2 vfi autodiscovery** command, which automatically creates route targets. The **no** version of the command allows you to remove the automatically generated route targets. You cannot enter this command if route targets have not been automatically created yet.

Examples The following example removes automatically generated route targets:

```
no auto-route-target
```

Related Commands

Command	Description
l2 vfi autodiscovery	Enables the VPLS PE router to automatically discover other PE routers that are part of the same VPLS domain.
route-target (VPLS)	Specifies an RT for a VPLS VFI.

l2 router-id

To specify a router ID for the provider edge (PE) router to use with Virtual Private LAN Services (VPLS) Autodiscovery pseudowires, use the **l2 router-id** command in L2 VFI configuration mode. To revert to the MPLS global router ID, use the **no** form of this command.

l2 router-id *ip-address*

no l2 router-id *ip-address*

Syntax Description	*ip-address*	Router ID in IP address format.

Defaults The Layer 2 router ID is set to the Multiprotocol Label Switching (MPLS) global router ID.

Command Modes L2 VFI configuration

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

Usage Guidelines You can configure an arbitrary value in the IP address format for each router. However, each router ID must be unique.

The Layer 2 router ID is used in the forward equivalence class (FEC) 129 encoding for pseudowire signaling It is also used in the network layer reachability information (NLRI) for peer discovery.

Examples The following example specifies a Layer 2 router ID:

```
l2 router-id 10.1.1.1
```

Related Commands	Command	Description
	l2 vfi autodiscovery	Enables the VPLS PE router to automatically discover other PE routers that are part of the same VPLS domain.

l2 vfi autodiscovery

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

> **l2 vfi** *vfi-name* **autodiscovery**

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

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

Command Default   Layer 2 VFI autodiscovery is not enabled.

Command Modes   Global configuration

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

Usage Guidelines   VPLS Autodiscovery enables each VPLS PE router to discover other PE routers that are part of the same VPLS domain. VPLS Autodiscovery also automatically detects when PE routers are added to or removed from the VPLS domain. Beginning with Cisco IOS Release 12.2(33)SRB, you no longer need to manually configure the VPLS neighbors and maintain the configuration when a PE router is added or deleted. However, you can still perform manual VPLS configuration even when you enable VPLS Autodiscovery.

Examples   The following example enables VPLS Autodiscovery on a PE router:

```
l2 vfi vfi2 autodiscovery
```

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

neighbor (VPLS)

To specify the type of tunnel signaling and encapsulation mechanism for each Virtual Private LAN Service (VPLS) peer, use the **neighbor** command in L2 VFI manual configuration mode. To disable a split horizon, use the **no** form of this command.

> **neighbor** *remote-router-id vc-id* {**encapsulation** *encapsulation-type* | **pw-class** *pw-name*} [**no-split-horizon**]

> **no neighbor** *remote-router-id*

Syntax Description		
remote-router-id	Remote peering router identifier. The remote router ID can be any IP address, as long as it is reachable.
vc-id	The 32-bit identifier of the virtual circuit between the routers.
encapsulation *encapsulation-type*	Specifies the tunnel encapsulation type; valid values are **l2tpv3** and **mpls**.
pw-class *pw-name*	Specifies the pseudowire class configuration from which the data encapsulation type is taken.
no-split-horizon	(Optional) Disables the Layer 2 split horizon in the data path.

Defaults   Split horizon is enabled.

Command Modes   L2 VFI manual configuration

Command History

Release	Modification
12.2(18)SXF	This command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was updated so that the remote router ID need not be the LDP router ID of the peer.

Usage Guidelines   In a full-mesh VPLS network, keep split horizon enabled to avoid looping.

With the introduction on VPLS Autodiscovery, the remote router ID no longer needs to be the LDP router ID. The address you specify can be any IP address on the peer, as long as it is reachable. When VPLS Autodiscovery discovers peer routers for the VPLS, the peer router addresses might be any routable address.

Examples   This example shows how to specify the tunnel encapsulation type:

```
Router(config-vfi)# l2 vfi vfi-1 manual
Router(config-vfi)# vpn 1
Router(config-vfi)# neighbor 172.16.10.2 4 encapsulation mpls
```

This example shows how to disable the Layer 2 split horizon in the data path:

```
Router(config-vfi)# l2 vfi vfi-1 manual
Router(config-vfi)# vpn 1
Router(config-vfi)# neighbor 172.16.10.2 4 encapsulation mpls no-split-horizon
```

Related Commands	Command	Description
	l2 vfi manual	Creates a Layer 2 VFI.

rd (VPLS)

To specify the route distinguisher (RD) to distribute endpoint information in a Virtual Private LAN Service (VPLS) configuration, use the **rd** command in L2 VFI configuration mode. To remove the manually configured RD and return to the automatically generated RD, use the **no** form of this command.

rd {*autonomous-system-number***:***nn* | *ip-address***:***nn*}

no rd {*autonomous-system-number***:***nn* | *ip-address***:***nn*}

Syntax Description		
	autonomous-system-number:nn	Specifies a 16-bit autonomous system number and 32-bit arbitrary number. The autonomous system number does not have to match the local autonomous system number.
	ip-address:nn	Specifies a 32-bit IP address and a 16-bit arbitrary number. Only IPv4 addresses are supported.

Command Default   VPLS Autodiscovery automatically generates a route distinguisher using the Border Gateway Protocol (BGP) autonomous system number and the configured virtural forwarding instance (VFI) Virtual Private Network (VPN) ID.

Command Modes   L2 VFI configuration

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

Usage Guidelines   VPLS Autodiscovery automatically generates a route distinguisher using the BGP autonomous system number and the configured VFI VPN ID. You can use this command to change the automatically generated route distinguisher.

The same RD value cannot be configured in multiple VFIs.

There are two formats for configuring the route distinguisher argument. It can be configured in the *autonomous-system-number***:***network-number* format, or it can be configured in the *IP address***:***network-number* format.

An RD is either:

- autonomous system-related—Composed of an autonomous system number and an arbitrary number.

- IP address-related—Composed of an IP address and an arbitrary number.

You can enter an RD in either of these formats:

*16-bit-autonomous-system-number***:***32-bit-number*
For example, 101:3.

*32-bit-IP-address***:***16-bit-number*
For example, 192.168.122.15:1.

Examples   The following example shows a configuration using VPLS Autodiscovery that sets the RD to an IP address of 10.4.4.4 and a network address of 70:

```
l2 vfi SP2 autodiscovery
 vpn id 200
 vpls-id 10.4.4.4:70
 rd 10.4.5.5:7
```

The following example shows a configuration using VPLS Autodiscovery that sets the RD to an autonomous system number of 2 and a network address of 3:

```
l2 vfi SP2 autodiscovery
 vpn id 200
 vpls-id 10.4.4.4:70
 rd 2:3
```

Related Commands

Command	Description
l2 vfi autodiscovery	Enable a VPLS PE router to automatically discover other PE routers that are part of the same VPLS domain.

route-target (VPLS)

To specify a route target (RT) for a Virtual Private LAN Service (VPLS) virtual forwarding instance (VFI), use the **route-target** command in L2 VFI configuration mode. To revert to the automatcially generated route target, use the **no** form of this command.

route-target [**import** | **export** | **both**] {*autonomous-system-number***:***nn* | *ip-address***:***nn*}

no route-target {**import** | **export** | **both**} {*autonomous-system-number***:***nn* | *ip-address***:***nn*}

Syntax Description		
import		(Optional) Imports routing information from the target virtual private network (VPN) extended community.
export		(Optional) Exports routing information to the target VPN extended community.
both		(Optional) Imports both import and export routing information to the target VPN extended community.
*autonomous-system-number***:***nn*		The autonomous system number and a 32-bit number.
*ip-address***:***nn*		The IP address and a 16-bit number.

Defaults   VPLS Autodiscovery automatically generates a route target using the lower 6 bytes of the route distinguisher (RD) and VPLS ID.

Command Modes   L2 VFI configuration

Command History

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

Usage Guidelines   The same route target cannot be configured in multiple VFIs.

The route target specifies a target VPN extended community. Like a route distinguisher, an extended community is composed of either an autonomous system number and an arbitrary number or an IP address and an arbitrary number. You can enter the numbers in either of these formats:

*16-bit-autonomous-system-number***:***32-bit-number*
For example, 101:3.

*32-bit-IP-address***:***16-bit-number*
For example, 192.168.122.15:1.

Examples   The following example shows a VPLS Autodiscovery configuration that configures route-target extended community attributes for VFI SP1:

```
l2 vfi SP1 autodiscovery
 vpn id 100
 vpls-id 5:300
```

```
rd 4:4
route-target 10.1.1.1:29
```

Related Commands	Command	Description
	auto-route-target	Automatically generates the route target in a VFI.
	l2 vfi autodiscovery	Enable a VPLS PE router to automatically discover other PE routers that are part of the same VPLS domain.

show mpls l2transport vc

To display information about Any Transport over MPLS (AToM) virtual circuits (VCs) and static pseudowires that have been enabled to route Layer 2 packets on a router, use the **show mpls l2transport vc** command in privileged EXEC mode.

> **show mpls l2transport vc** [**vcid** *vc-id* | **vcid** *vc-id-min vc-id-max*] [**interface** *name*
> [*local-circuit-id*]] [**destination** *ip-address* | *name*] [**detail**]

Syntax Description

vcid	(Optional) Specifies a VC ID to display.
vc-id	(Optional) The VC ID number.
vc-id-min vc-id-max	(Optional) A range of VCs to display. The range is from 1 to 4294967295.
interface	(Optional) Specifies the interface or subinterface of the router that has been enabled to transport Layer 2 packets. Use this keyword to display information about the VCs that have been assigned VC IDs on that interface or subinterface.
name	(Optional) The name of the interface or subinterface.
local-circuit-id	(Optional) The number assigned to the local circuit. This argument value is supported with the following transport types: • For Frame Relay, enter the data-link connection identifier (DLCI) of the permanent virtual circuit (PVC). • For ATM adaptation layer 5 (AAL5) and cell relay, enter the virtual path identifier (VPI) or virtual channel identifier (VCI) of the PVC. • For Ethernet VLANs, enter the VLAN number.
destination	(Optional) Specifies the remote router.
ip-address	(Optional) The IP address of the remote router.
name	(Optional) The name assigned to the remote router.
detail	(Optional) Specifies that detailed information about the VCs be displayed.

Command Modes   Privileged EXEC

Command History

Release	Modification
12.1(8a)E	This command was introduced.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was implemented on the Cisco 10720 router.
12.0(23)S	The **interface** and **destination** keywords were added.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(14)SX	This command was implemented on the Supervisor Engine 720.
12.2(14)SZ	This command was integrated into Cisco IOS Release 12.2(14)SZ.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.2(18)S	This command was implemented on Cisco 7304 routers.

12.0(25)S	This command was updated with new output and fields to display information about tunnel selection and ATM cell relay port mode.
12.2(17d)SXB	Support for this command on the Supervisor Engine 2 was extended to Release 12.2(17d)SXB.
12.2(25)S	This command was updated with new output and fields for nonstop forwarding (NSF), stateful switchover (SSO), and graceful restart (GR) abilities.
12.2(28)SB	This command was implemented on the Cisco 10000 series routers. Example output was changed for the Cisco 10000 series router, and two fields (SSO Descriptor and SSM segment/switch IDs) were removed from the output, because they are not supported.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was updated to include forwarding equivalence class (FEC) 129 signaling information for pseudowires that are configured through VPLS Autodiscovery, and to support provisioning AToM static pseudowires.

Usage Guidelines   If you do not specify any keywords or arguments, the command displays a summary of all the VCs.

Examples   The output of the commands varies, depending on the type of Layer 2 packets being transported over the AToM VCs.

The following sample output shows information about the interfaces and VCs that have been configured to transport various Layer 2 packets on the router:

```
Router# show mpls l2transport vc

Local intf      Local circuit       Dest address     VC ID      Status
-------------   ------------------  ---------------  ----------  ----------
Se5/0           FR DLCI 55          10.0.0.1         55          UP
AT4/0           ATM AAL5 0/100      10.0.0.1         100         UP
AT4/0           ATM AAL5 0/200      10.0.0.1         200         UP
AT4/0.300       ATM AAL5 0/300      10.0.0.1         300         UP
```

Table 2 describes the fields shown in the display.

Table 2   *show mpls l2transport vc Field Descriptions*

Field	Description
Local intf	The interface on the local router that has been enabled to transport Layer 2 packets.
Local circuit	The type and number (if applicable) of the local circuit. The output shown in this column varies, depending on the transport type: • For Frame Relay, the output shows the DLCI of the PVC. • For ATM cell relay and AAL5, the output shows the VPI/VCI of the PVC. • For Ethernet VLANs, the output shows the VLAN number. • For PPP and High-Level Data Link Control (HDLC), the output shows the interface number.
Dest address	The IP address of the remote router's interface that is the other end of the VC.
VC ID	The virtual circuit identifier assigned to one of the interfaces on the router.

Status	The status of the VC. The status can be one of the following:
	
	• ADMIN DOWN—The VC has been disabled by a user.
	
	• DOWN—The VC is not ready to carry traffic between the two VC endpoints. Use the **detail** keyword to determine the reason that the VC is down.
	
	• RECOVERING—The VC is recovering from a stateful switchover.
	
	• UP—The VC is in a state where it can carry traffic between the two VC endpoints. A VC is up when both imposition and disposition interfaces are programmed.
	
	   – The disposition interface is programmed if the VC has been configured and the client interface is up.
	
	   – The imposition interface is programmed if the disposition interface is programmed and you have a remote VC label and an Interior Gateway Protocol (IGP) label. The IGP label can be implicit null in a back-to-back configuration. An IGP label means there is a label switched path (LSP) to the peer.

The following example shows information about the NSF/SSO and graceful restart capability. The SSO portion indicates when checkpointing data has either been sent (on active) or received (on standby). When SSO data has not been successfully sent or has been released, the SSO information is not shown.

```
Router# show mpls l2transport vc detail

Local interface: Fa5/1/1.2 down, line protocol down, Eth VLAN 2 up
  Destination address: 10.55.55.2, VC ID: 1002, VC status: down
    Output interface: Se4/0/3, imposed label stack {16}
    Preferred path: not configured
    Default path: active
    Tunnel label: imp-null, next hop point2point
  Create time: 02:03:29, last status change time: 02:03:26
  Signaling protocol: LDP, peer 10.55.55.2:0 down
    MPLS VC labels: local 16, remote unassigned
```

```
    Group ID: local 0, remote unknown
    MTU: local 1500, remote unknown
    Remote interface description:
  Sequencing: receive disabled, send disabled
  SSO Descriptor: 10.55.55.2/1002, local label: 16
    SSM segment/switch IDs: 12290/8193, PWID: 8193
  VC statistics:
    packet totals: receive 0, send 0
    byte totals:   receive 0, send 0
    packet drops:  receive 0, send 0
```

The following example shows information provided when an AToM static pseudowire has been provisioned and the **show mpls l2transport vc detail** command is used to check the configuration. The Signaling protocol field specifies Manual, because a directed control protocol such as Label Distribution Protocol (LDP) cannot be used to exchange parameters on static pseudowires. The Remote interface description field seen for nonstatic pseudowire configurations is empty, because remote information is exchanged using signaling between the PEs and this is not done on static pseudowires.

```
Router# show mpls l2transport vc detail

Local interface: Et1/0 up, line protocol up, Ethernet up
   Destination address: 10.1.1.2, VC ID: 100, VC status: up
     Output interface: Et2/0, imposed label stack {10003 150}
     Preferred path: not configured
     Default path: active
     Next hop: 10.0.0.2
   Create time: 00:18:57, last status change time: 00:16:10
   Signaling protocol: Manual
     MPLS VC labels: local 100, remote 150
     Group ID: local 0, remote 0
     MTU: local 1500, remote 1500
     Remote interface description:
   Sequencing: receive disabled, send disabled
   VC statistics:
     packet totals: receive 219, send 220
     byte totals:   receive 20896, send 26694
     packet drops:  receive 0, send 0
```

Table 3 describes the significant fields shown in the display.

Table 3   *show mpls l2transport vc detail Field Descriptions*

Field	Description
Local interface	Interface on the local router that has been enabled to send and receive Layer 2 packets. The interface varies, depending on the transport type. The output also shows the status of the interface.
line protocol	Status of the line protocol on the edge-facing interface.
Destination address	IP address of the remote router specified for this VC. You specify the destination IP address as part of the **mpls l2transport route** command.
VC ID	Virtual circuit identifier assigned to the interface on the router.

Table 3   show mpls l2transport vc detail Field Descriptions (continued)

Field	Description

VC status	Status of the VC, which is one of the following:
	
	• ADMIN DOWN—The VC has been disabled by a user.
	
	• DOWN—The VC is not ready to carry traffic between the two VC endpoints.
	
	• Up—The VC is in a state where it can carry traffic between the two VC endpoints. A VC is up when both imposition and disposition interfaces are programmed.
	
	   – The disposition interface is programmed if the VC has been configured and the client interface is up.
	
	   – The imposition interface is programmed if the disposition interface is programmed and a remote VC label and an IGP label exist. The IGP label can be an implicit null in a back-to-back configuration. (An IGP label means there is an LSP to the peer.)

Output interface	Interface on the remote router that has been enabled to transmit and receive Layer 2 packets.
imposed label stack	Summary of the MPLS label stack used to direct the VC to the PE router.
Preferred path	Path that was assigned to the VC and the status of that path. The path can be a Multiprotocol Label Switching (MPLS) traffic engineering tunnel or an IP address or hostname of a peer provider edge (PE) router.
Default path	Status of the default path, which can be disabled or active. By default, if the preferred path fails, the router uses the default path. However, you can disable the router from using the default path when the preferred path fails by specifying the **disable-fallback** keyword with the **preferred-path** command.

Table 3   show mpls l2transport vc detail Field Descriptions (continued)

Field	Description
Tunnel label	An IGP label used to route the packet over the MPLS backbone to the destination router with the egress interface. The first part of the output displays the type of label. The second part of the output displays the route information.
	The tunnel label information can display any of the following states:
	• imp-null: Implicit null means that the provider (P) router is absent and the tunnel label will not be used. Alternatively, imp-null can signify traffic engineering tunnels between the PE routers.
	• unassigned: The label has not been assigned.
	• no route: The label is not in the routing table.
	• no adjacency: The adjacency for the next hop is missing.
	• not ready, no route: An IP route for the peer does not exist in the routing table.
	• not ready, not a host table: The route in the routing table for the remote peer router is not a host route.
	• not ready, Cisco Express Forwarding disabled: Cisco Express Forwarding is disabled.
	• not ready, LFIB disabled: The MPLS switching subsystem is disabled.
	• not ready, Label Forwarding Information Base (LFIB) entry present: The tunnel label exists in the LFIB, but the VC is down.
Create time	The time (in hours, minutes, and seconds) when the VC was provisioned.
last status change time	Last time (in hours, minutes, and seconds) the VC state changed.
Signaling protocol	Type of protocol used to send the MPLS labels on dynamically configured connections. The output also shows the status of the peer router. For AToM statically configured pseudowires, the field indicates Manual, because there is no exchange of labels using a directed control protocol such as LDP.
MPLS VC labels	Local VC label is a disposition label, which determines the egress interface of an arriving packet from the MPLS backbone. The remote VC label is a disposition VC label of the remote peer router.
Group ID	Local group ID is used to group VCs locally. The remote group ID is used by the peer to group several VCs.
MTU	Maximum transmission unit specified for the local and remote interfaces.
Remote interface description	Interface on the remote router that has been enabled to transmit and receive Layer 2 packets.
Sequencing	Indicates whether sequencing of out-of-order packets is enabled or disabled.
SSO Descriptor	Identifies the VC for which the information was checkpointed.
local label	The value of the local label that was checkpointed (that is, sent on the active Route Processor [RP], and received on the standby RP).

Table 3   show mpls l2transport vc detail Field Descriptions (continued)

Field	Description
SSM segment/switch IDs	The IDs used to refer to the control plane and data plane for this VC. This data is not for customer use but for Cisco personnel for troubleshooting purposes. When the Source Specific Multicast (SSM) IDs are followed by the word "used," the checkpointed data has been successfully sent and not released.
PWID	The pseudowire ID used in the data plane to correlate the switching context for the segment mentioned with the MPLS switching context. This data is not for customer use but for Cisco personnel for troubleshooting purposes.
packet totals	Number of packets sent and received. Received packets are those AToM packets received from the MPLS core. Sent packets are those AToM packets sent to the MPLS core. This does not include dropped packets.
byte totals	Number of bytes sent and received from the core-facing interface, including the payload, control word if present, and AToM VC label.
packet drops	Number of dropped packets.

The following example shows the command output of the **show mpls l2transport vc detail** command with when VPLS Autodiscovery has configured the VPLS pseudowires. The output that is specific to VPLS Autodiscovery is show in bold.

```
Router# show mpls l2transport vc detail

Local interface: VFI my_test VFI up
  MPLS VC type is VFI, interworking type is Ethernet
  Destination address: 10.3.3.1, VC ID: 123456, VC status: up
    Next hop PE address: 10.55.55.2
    Output interface: Et3/0, imposed label stack {17 19}
    Preferred path: not configured
    Default path:
    Next hop: 10.1.0.2
  Create time: 2d05h, last status change time: 2d05h

Signaling protocol: LDP, peer 10.55.55.2:0 up
    MPLS VC labels: local 21, remote 19
    AGI: type 1, len 8,  0000 3333 4F4E 44C4
    Local AII:  type 1, len 4, 0909 0909 (10.9.9.9)
    Remote AII: type 1, len 4, 0303 0301 (10.3.3.3)
    Group ID: local 0, remote 0
    MTU: local 1500, remote 1500
    Remote interface description:
  Sequencing: receive disabled, send disabled
  VC statistics:
    packet totals: receive 22611, send 22611
    byte totals:   receive 2346570, send 2853581
    packet drops:  receive 0, send 0
```

Table 4 describes the fields shown in the display.

Table 4   show mpls l2transport vc detail Field Descriptions for VPLS Autodiscovery

Field	Description
Next hop PE address	The IP address of the next-hop router.
AGI	The attachment group identifier (AGI).
Local AII	The attachment individual identier (AII). The local IP address used for signaling.
Remote AII	The remote IP address used for signaling. This address is the provisioned IP address, which might not be the same as the LDP peer IP address.

Related Commands

Command	Description
show mpls l2transport summary	Displays summary information about VCs that have been enabled to route AToM Layer 2 packets on a router.
show xconnect	Displays information about xconnect attachment circuits and pseudowires.

show vfi

To display information related to the virtual forwarding instance (VFI), use the **show vfi** command in privileged EXEC mode.

show vfi [*vfi-name*]

Syntax Description	*vfi-name*	(Optional) Name of the VFI.

Command Modes   Privileged EXEC

Command History

Release	Modification
12.0(31)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was extended to show VPN ID information.
12.2(33)SRB	This command was updated to display VPLS Autodiscovery information.

Examples

This example shows an example of VFI status. The virtual circuit (VC) ID in the output represents the Virtual Private Network (VPN) ID; the VC is identified by the combination of the destination address and the VC ID.

```
Router# show vfi VPLS-2

VFI name: VPLS-2, state: up
  VPN ID: 100
  Local attachment circuits:
    Vlan2
  Neighbors connected via pseudowires:
  Peer Address     VC ID      Split-horizon
  10.1.1.1           2              Y
  10.1.1.2           2              Y
  10.2.2.3           2              N
```

Table 5 describes the significant fields shown in the output.

Table 5   ***show vfi Field Descriptions***

Field	Description
VFI name	The name assigned to the VFI.
state	The status of the VFI (up or down).
Local attachment circuits	The interface or VLAN assigned to the VFI.
Peer Address	The IP address of the peer router.
VC ID	The VC ID assigned to the pseudowire.
Split-horizon	Whether split horizon is enabled (Y) or disabled (N).

For the VPLS Autodiscovery feature, the command output of the **show vfi** command includes autodiscovery information, as shown in the following example:

```
Router# show vfi

Legend: RT= Route-target, S=Split-horizon, Y=Yes, N=No

VFI name: VPLS1, state: up, type: multipoint
  VPN ID: 10, VPLS-ID: 9:10
  RD: 9:10, RT: 10.10.10.10:150
  Local attachment circuits:
    Ethernet0/0.2
  Neighbors connected via pseudowires:
  Peer Address      VC ID       Discovered Router ID      S
  10.7.7.1          10          10.7.7.1                  Y
  10.7.7.2          10          10.1.1.2                  Y
  10.7.7.3          10          10.1.1.3                  Y
  10.7.7.4          10          10.1.1.4                  Y
  10.7.7.5          10          -                         Y

VFI name: VPLS2 state: up, type: multipoint
  VPN ID: 11, VPLS-ID: 10.9.9.9:2345
  RD: 10:11, RT: 10.4.4.4:151
  Local attachment circuits:
    Ethernet0/0.3
  Neighbors connected via pseudowires:
  Peer Address      VC ID       Discovered Router ID      S
  10.7.7.1          11          10.7.7.1                  Y
  10.7.7.2          11          10.1.1.5                  Y
```

Table 6 describes the significant fields in the output related to VPLS Autodiscovery.

Table 6   *show vfi Field Descriptions for VPLS Autodiscovery*

Field	Description
VPLS-ID	The identifier of the VPLS domain. VPLS Autodiscovery automatically generates a VPLS ID using the Border Gateway Protocol (BGP) autonomous system number and the configured VFI VPN ID.
RD	The route distinguisher (RD) to distribute endpoint information. VPLS Autodiscovery automatically generates an RD using the BGP autonomous system number and the configured VFI VPN ID.
RT	The route target (RT). VPLS Autodiscovery automatically generates a route target using the lower 6 bytes of the RD and VPLS ID.
Discovered Router ID	A unique identifier assigned to the PE router. VPLS Autodiscovery automatically generates the router ID using the MPLS global router ID.

Related Commands	**Command**	**Description**
	show xconnect	Displays information about xconnect attachment circuits and pseudowires.

show xconnect

To display information about xconnect attachment circuits and pseudowires, use the **show xconnect** command in privileged EXEC mode.

show xconnect {**all** | **interface** *interface* | **peer** *ip-address* {**all** | **vcid** *vcid*} | **rib**} [**detail**]

Syntax Description		
	all	Displays information about all xconnect attachment circuits and pseudowires.
	interface *interface*	Displays information about xconnect attachment circuits and pseudowires on the specified interface. Valid values for the *interface* argument are as follows:
		• **atm** *number*—Displays xconnect information for a specific ATM interface or subinterface.
		• **atm** *number* **vp** *vpi-value*—Displays virtual path (VP) xconnect information for a specific ATM virtual path identifier (VPI). This command will not display information about virtual circuit (VC) xconnects using the specified VPI.
		• **atm** *number* **vp** *vpi-value*/*vci-value*—Displays VC xconnect information for a specific ATM VPI and virtual circuit identifier (VCI) combination.
		• **ethernet** *number*—Displays port-mode xconnect information for a specific Ethernet interface or subinterface.
		• **fastethernet** *number*—Displays port-mode xconnect information for a specific Fast Ethernet interface or subinterface.
		• **serial** *number*—Displays xconnect information for a specific serial interface.
		• **serial** *number dlci-number*—Displays xconnect information for a specific Frame Relay data-link connection identifier (DLCI).
	peer *ip-address* {**all** | **vcid** *vcid*}	Displays information about xconnect attachment circuits and pseudowires associated with the specified peer IP address.
		• **all**—Displays all xconnect information associated with the specified peer IP address.
		• **vcid** *vcid*—Displays xconnect information associated with the specified peer IP address and the specified VC ID.
	rib	Displays information about the pseudowire Routing Information Base (RIB).
	detail	(Optional) Displays detailed information about the specified xconnect attachment circuits and pseudowires.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0(31)S	This command was introduced.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
	12.2(33)SRB	This command was updated with the **rib** keyword.

Usage Guidelines   The **show xconnect** command can be used to display, sort, and filter basic information about all xconnect attachment circuits and pseudowires.

You can use the **show xconnect** command output to help determine the appropriate steps to take to troubleshoot an xconnect configuration problem. More specific information about a particular type of xconnect can be displayed using the commands listed in the "Related Commands" table.

Examples   The following example shows **show xconnect all** command output in the brief (default) display format:

```
Router# show xconnect all

Legend: XC ST=Xconnect State, S1=Segment1 State, S2=Segment2 State
UP=Up, DN=Down, AD=Admin Down, IA=Inactive, NH=No Hardware
XC ST      Segment 1                          S1 Segment 2                          S2
------+-------------------------------+--+-------------------------------+--
UP     ac   Et0/0(Ethernet)               UP mpls 10.55.55.2:1000           UP
UP     ac   Se7/0(PPP)                    UP mpls 10.55.55.2:2175           UP
UP pri ac   Se6/0:230(FR DLCI)            UP mpls 10.55.55.2:2230           UP
IA sec ac   Se6/0:230(FR DLCI)            UP mpls 10.55.55.3:2231           DN
UP     ac   Se4/0(HDLC)                   UP mpls 10.55.55.2:4000           UP
UP     ac   Se6/0:500(FR DLCI)            UP l2tp 10.55.55.2:5000           UP
UP     ac   Et1/0.1:200(Eth VLAN)         UP mpls 10.55.55.2:5200           UP
UP pri ac   Se6/0:225(FR DLCI)            UP mpls 10.55.55.2:5225           UP
IA sec ac   Se6/0:225(FR DLCI)            UP mpls 10.55.55.3:5226           DN
IA pri ac   Et1/0.2:100(Eth VLAN)         UP ac   Et2/0.2:100(Eth VLAN)     UP
UP sec ac   Et1/0.2:100(Eth VLAN)         UP mpls 10.55.55.3:1101           UP
UP     ac   Se6/0:150(FR DLCI)            UP ac   Se8/0:150(FR DLCI)        UP
```

Table 7 describes the significant fields shown in the display.

Table 7   show xconnect Field Descriptions

Field	Description
XC ST	State of the xconnect attachment circuit or pseudowire. Valid states are: • DN—The xconnect attachment circuit or pseudowire is down. Either segment 1, segment 2, or both segments are down. • IA—The xconnect attachment circuit or pseudowire is inactive. This state is valid only when pseudowire redundancy is configured. • NH—One or both segments of this xconnect no longer have the required hardware resources available to the system. • UP—The xconnect attachment circuit or pseudowire is up. Both segment 1 and segment 2 must be up for the xconnect to be up.
Segment1 or Segment2	Information about the type of xconnect, the interface type, and the IP address the segment is using. Types of xconnects are as follows: • ac—Attachment circuit. • pri ac—Primary attachment circuit. • sec ac—Secondary attachment circuit. • mpls—Multiprotocol Label Switching. • l2tp—Layer 2 Tunnel Protocol.
S1 or S2	State of the segment. Valid states are: • DN—The segment is down. • AD—The segment is administratively down. • UP—The segment is up.

The following example shows **show xconnect all** command output in the detailed display format:

```
Router# show xconnect all detail

Legend: XC ST=Xconnect State, S1=Segment1 State, S2=Segment2 State
UP=Up, DN=Down, AD=Admin Down, IA=Inactive, NH=No HardwareXC
ST      Segment 1                        S1 Segment 2                        S2
------+-------------------------------+--+-------------------------------+--
UP    ac   Et0/0(Ethernet)             UP mpls 10.55.55.2:1000             UP
           Interworking: ip                   Local VC label 16
                                               Remote VC label 16
                                               pw-class: mpls-ip
UP    ac   Se7/0(PPP)                  UP mpls 10.55.55.2:2175             UP
           Interworking: ip                   Local VC label 22
                                               Remote VC label 17
                                               pw-class: mpls-ip
UP pri ac  Se6/0:230(FR DLCI)          UP mpls 10.55.55.2:2230             UP
           Interworking: ip                   Local VC label 21
                                               Remote VC label 18
                                               pw-class: mpls-ip
IA sec ac  Se6/0:230(FR DLCI)          UP mpls 10.55.55.3:2231             DN
           Interworking: ip                   Local VC label unassigned
                                               Remote VC label 19
                                               pw-class: mpls-ip
```

```
UP     ac   Se4/0(HDLC)                  UP mpls 10.55.55.2:4000          UP
                Interworking: none                   Local VC label 18
                                                     Remote VC label 19
                                                     pw-class: mpls
UP     ac   Se6/0:500(FR DLCI)           UP l2tp 10.55.55.2:5000          UP
                Interworking: none                   Session ID: 34183
                                                     Tunnel ID: 62083
                                                     Peer name: pe-iou2
                                                     Protocol State: UP
                                                     Remote Circuit State: UP
                                                     pw-class: l2tp
UP     ac   Et1/0.1:200(Eth VLAN)        UP mpls 10.55.55.2:5200          UP
                Interworking: ip                     Local VC label 17
                                                     Remote VC label 20
                                                     pw-class: mpls-ip
UP pri ac   Se6/0:225(FR DLCI)           UP mpls 10.55.55.2:5225          UP
                Interworking: none                   Local VC label 19
                                                     Remote VC label 21
                                                     pw-class: mpls
IA sec ac   Se6/0:225(FR DLCI)           UP mpls 10.55.55.3:5226          DN
                Interworking: none                   Local VC label unassigned
                                                     Remote VC label 22
                                                     pw-class: mpls
IA pri ac   Et1/0.2:100(Eth VLAN)        UP ac   Et2/0.2:100(Eth VLAN)    UP
                Interworking: none                   Interworking: none
UP sec ac   Et1/0.2:100(Eth VLAN)        UP mpls 10.55.55.3:1101          UP
                Interworking: none                   Local VC label 23
                                                     Remote VC label 17
                                                     pw-class: mpls
UP     ac   Se6/0:150(FR DLCI)           UP ac   Se8/0:150(FR DLCI)       UP
                Interworking: none                   Interworking: none
```

The additional fields displayed in the detailed output are self-explanatory.

For VPLS Autodiscovery, issuing the **show xconnect** command with the **rib** keyword provides Routing Information Base (RIB) detail, as shown in the following:

```
Router# show xconnect rib

Local Router ID: 10.9.9.9

Legend: O=Origin, P=Provisioned, TID=Target ID, B=BGP, Y=Yes, N=No
O P  VPLS/VPWS-ID         TID         Next-Hop        Route-Target
-+-+--------------------+-----------+---------------+--------------------
B Y 10:123               10.7.7.7    10.7.7.7         10:123
B N 10:123               10.7.7.8    10.7.7.8         10:123
B Y 10.100.100.100:1234  10.0.0.2    10.2.2.2         10.111.111.111:12345
                                     10.3.3.3         10.8.8.8:345
                                     10.4.4.4
B Y 128.100.100.100:1234 10.13.1.1   10.1.1.1         10.111.111.111:12345
```

Table 8 describes the significant fields shown in the display.

Table 8   show xconnect rib Field Descriptions

Field	Description
Local Router ID	A unique router identifier. VPLS Autodiscovery automatically generates a router ID using the MPLS global router ID.
O	The origin of the route.
P	Whether the pseudowire has been provisioned using a learned route.
VPLS/WPWS-ID	The Virtual Private LAN Service (VPLS) domain. VPLS Autodiscovery automatically generates a VPLS ID using the Border Gateway Protocol (BGP) autonomous system number and the configured VFI VPN ID.
TID	The target ID. The IP address of the destination router.
Next-Hop	The IP address of the next-hop router.
Route-Target	The route target (RT). VPLS Autodiscovery automatically generates a route target using the lower 6 bytes of the route distinguisher (RD) and VPLS ID.

For VPLS Autodiscovery, issuing the **show xconnect** command with the **rib** and **detail** keywords provides more information about the routing information base, as shown in the following example:

```
Router# show xconnect rib detail

Local Router ID: 10.9.9.9

VPLS-ID 10:123, TID 10.7.7.7
  Next-Hop: 10.7.7.7
  Hello-Source: 10.9.9.9
  Route-Target: 10:123
  Incoming RD: 10:10
  Forwarder: vfi VPLS1
  Origin: BGP
  Provisioned: Yes
VPLS-ID 10:123, TID 10.7.7.8
  Next-Hop: 10.7.7.8
  Hello-Source: 10.9.9.9
  Route-Target: 10:123
  Incoming RD: 10:11
  Forwarder: vfi VPLS1
  Origin: BGP
  Provisioned: No
VPLS-ID 10.100.100.100:1234, TID 0.0.0.2
  Next-Hop: 10.2.2.2, 10.3.3.3, 10.4.4.4
  Hello-Source: 10.9.9.9
  Route-Target: 10.111.111.111:12345, 10.8.8.8:345
  Incoming RD: 10:12
  Forwarder: vfi VPLS2
  Origin: BGP
  Provisioned: Yes
VPLS-ID 10.100.100.100:1234, TID 10.13.1.1
  Next-Hop: 10.1.1.1
  Hello-Source: 10.9.9.9
```

```
Route-Target: 10.111.111.111:12345
Incoming RD: 10:13
Forwarder: vfi VPLS2
Origin: BGP
Provisioned: Yes
```

Table 9 describes the significant fields shown in the display.

Table 9   show xconnect rib detail Field Descriptions

Field	Description
Hello-Source	The source IP address used when Label Distribution Protocol (LDP) hello messages are sent to the LDP peer for the autodiscovered pseudowire.
Incoming RD	The route distinguisher for the autodiscovered pseudowire.
Forwarder	The VFI to which the autodiscovered pseudowire is attached.

Related Commands

Command	Description
show atm pvc	Displays all ATM PVCs and traffic information.
show atm vc	Displays all ATM PVCs and SVCs and traffic information.
show atm vp	Displays the statistics for all VPs on an interface or for a specific VP.
show connect	Displays configuration information about drop-and-insert connections that have been configured on a router.
show frame-relay pvc	Displays statistics about PVCs for Frame Relay interfaces.
show interfaces	Displays statistics for all interfaces configured on the router or access server.
show l2tun session	Displays the current state of Layer 2 sessions and protocol information about L2TP control channels.
show mpls l2transport binding	Displays VC label binding information.
show mpls l2transport vc	Displays information about AToM VCs that have been enabled to route Layer 2 packets on a router.

vpls-id

To assign an identifier to the Virtual Private LAN Service (VPLS) domain, use the **vpls-id** command in L2 VFI configuration mode. To revert to the default VPLS ID, use the **no** form of this command.

> **vpls-id** {*autonomous-system-number***:***nn* | *ip-address***:***nn*}

> **no vpls-id** {*autonomous-system-number***:***nn* | *ip-address***:***nn*}

Syntax Description

autonomous-system-number:nn	Specifies a 16-bit autonomous system number and 32-bit arbitrary number. The autonomous system number need not match the local autonomous system number.
ip-address:nn	Specifies a 32-bit IP address and a 16-bit arbitrary number. Only IPv4 addresses are supported.

Command Default   The VPLS ID is generated automatically by VPLS Autodiscovery.

Command Modes   L2 VFI configuration

Command History

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

Usage Guidelines   VPLS Autodiscovery automatically generates a VPLS ID using the Border Gateway Protocol BGP autonomous system number and the configured VFI VPN ID. You can use the **vpls-id** command to change the automatically generated VPLS ID.

The Label Distribution Protocol (LDP) uses the VPLS ID when signaling VPLS autodiscovered neighbors. The VPLS ID identifies the VPLS domain.

Only one VPLS ID can be configured per virtual forwarding instance (VFI), and the same VPLS ID cannot be configured in multiple VFIs on the same provider edge (PE) router.

The manually configured VPLS ID replaces the internally generated VPLS ID. The manually configured VPLS ID also changes the automatically generated route target (RT).

The **vpls-id** command defines the attachment group identifier (AGI) for the VPLS domain. Therefore, all provider edge (PE) routers in the same VPLS domain must use the same VPLS ID.

For interautonomous system configurations, you must manually configure the VPLS ID instead of using the automatically generated VPLS ID, because all PE routers do not share the same autonomous system number.

Examples   The following example sets the VPLS ID to the autonomous system and network number 5:300:

```
vpls-id 5:300
```

The following example sets the VPLS ID to IP address and network number 10.4.4.4:70:

```
vpls-id 10.4.4.4:70
```

Related Commands	Command	Description
	rd	Creates routing and forwarding tables for a VRF.

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 one of the supported configuration modes. To restore the default values, use the **no** form of this command.

> **xconnect** *peer-ip-address vc-id* **encapsulation** {**l2tpv3** [**manual**] | **mpls** [**manual**]} [**pw-class** *pw-class-name*] [**sequencing** {**transmit** | **receive** | **both**}]

> **no xconnect**

Syntax Description		
peer-ip-address	IP address of the remote provider edge (PE) peer. The remote router ID can be any IP address, as long as it is reachable.	
vc-id	The 32-bit identifier of the virtual circuit (VC) between the PE routers.	
encapsulation {**l2tpv3** [**manual**]	**mpls** [**manual**]}	Specifies the tunneling method to encapsulate the data in the pseudowire:	
	• **l2tpv3**—Specifies Layer 2 Tunneling Protocol, version 3 (L2TPv3) as the tunneling method.	
	• **mpls**—Specifies Multiprotocol Label Switching (MPLS) as the tunneling method.	
	• **manual**—Specifies that no signaling is to be used in the attachment circuit. This keyword places the router in xconnect configuration mode for manual configuration of the attachment circuit. Use this keyword to manually configure an AToM or L2TPv3 static pseudowire.	
pw-class *pw-class-name*	(Optional) Specifies the pseudowire class for advanced configuration.	
sequencing	(Optional) Sets the sequencing method to be used for packets received or sent. This keyword is not supported with the AToM Static Pseudowire Provisioning feature.	
transmit	Sequences data packets received from the attachment circuit.	
receive	Sequences data packets sent into the attachment circuit.	
both	Sequences data packets that are both sent and received from the attachment circuit.	

Command Default   The attachment circuit is not bound to the pseudowire.

Command Modes   Connect configuration
Interface configuration
l2transport configuration (for ATM)

Command History	Release	Modification
	12.0(23)S	This command was introduced.
	12.0(28)S	Support was added for Multilink Frame Relay connections.
	12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
	12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
	12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
	12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
	12.2(33)SRB	This command was updated to add support for AToM static pseudowires, and so that the remote router ID need not be the Label Distribution Protocol (LDP) router ID of the peer.

Usage Guidelines The combination of the *peer-ip-address* and *vcid* arguments must be unique on the router. Each xconnect configuration must have a unique combination of *peer-ip-address* and *vcid* configuration.

Note If the remote router is a Cisco 12000 series Internet router, the *peer-ip-address* argument must specify a loopback address on that router.

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

With the introduction of VPLS Autodiscovery in Cisco IOS Release 12.2(33)SRB, the remote router ID need not be the LDP router ID. The address you specify can be any IP address on the peer, as long as it is reachable. When VPLS Autodiscovery discovers peer routers for the VPLS, the peer router addresses might be any routable address.

Note The VPLS Autodiscovery feature is not supported with L2TPv3.

For L2TPv3, to manually configure the settings used in the attachment circuit, use the **manual** keyword in the **xconnect** command. This configuration is called a static session. The router is placed in xconnect configuration mode, and you can then configure the following options:

- Local and remote session identifiers (using the **l2tp id** command) for local and remote PE routers at each end of the session.

- Size of the cookie field used in the L2TPv3 headers of incoming (sent) packets from the remote PE peer router (using the **l2tp cookie local** command).

- Size of the cookie field used in the L2TPv3 headers of outgoing (received) L2TP data packets (using the **l2tp cookie remote** command).

- Interval used between sending hello keepalive messages (using the **l2tp hello** command).

For L2TPv3, if you do not enter the **encapsulation l2tpv3 manual** keywords in the **xconnect** command, the data encapsulation type for the L2TPv3 session is taken from the encapsulation type configured for the pseudowire class specified with the **pseudowire-class** *pw-class-name* command.

The **pw-class** keyword with the *pw-class-name* value binds the xconnect configuration of an attachment circuit to a specific pseudowire class. In this way, the pseudowire class configuration serves as a template that contains settings used by all attachment circuits bound to it with the **xconnect** command.

Software prior to Cisco IOS Release 12.2(33)(SRB) configured pseudowires dynamically using Label Distribution Protocol (LDP) or another directed control protocol to exchange the various parameters required for these connections. In environments that do not or cannot use directed control protocols, the **xconnect** command allows provisioning an AToM static pseudowire. Use the **manual** keyword in the **xconnect** command to place the router in xconnect configuration mode. MPLS pseudowire labels are configured using the **mpls label** and (optionally) **mpls control-word** commands in xconnect configuration mode.

Examples

The following example configures xconnect service for an Ethernet interface by binding the Ethernet circuit to the pseudowire named 123 with a remote peer 10.0.3.201. The configuration settings in the pseudowire class named vlan-xconnect are used.

```
Router(config)# interface Ethernet0/0.1
Router(config-if)# xconnect 10.0.3.201 123 pw-class vlan-xconnect
```

The following example enters xconnect configuration mode and manually configures L2TPv3 parameters for the attachment circuit:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# xconnect 10.0.3.201 123 encapsulation l2tpv3 manual pw-class ether-pw
Router(config-if-xconn) l2tp id 222 111
Router(config-if-xconn) l2tp cookie local 4 54321
Router(config-if-xconn) l2tp cookie remote 4 12345
Router(config-if-xconn) l2tp hello l2tp-defaults
```

The following example enters xconnect configuration mode and manually configures an AToM static pseudowire. The example shows the configuration for only one side of the connection; the configurations on each side of the connection must be symmetrical.

```
Router# configure terminal
Router(config)# interface Ethernet1/0
Router(config-if)# no ip address
Router(config-if)# xconnect 10.131.191.252 100 encapsulation mpls manual pw-class mpls
Router(config-if-xconn)# mpls label 100 150
Router(config-if-xconn)# exit
Router(config-if)# exit
```

Related Commands

Command	Description
l2tp cookie local	Configures the size of the cookie field used in the L2TPv3 headers of incoming packets received from the remote PE peer router.
l2tp cookie remote	Configures the size of the cookie field used in the L2TPv3 headers of outgoing packets sent from the local PE peer router.
l2tp hello	Specifies the use of a hello keepalive setting contained in a specified L2TP class configuration for a static L2TPv3 session.
l2tp id	Configures the identifiers used by the local and remote provider edge routers at each end of an L2TPv3 session.
l2tp-class	Configures a template of L2TP control plane configuration settings that can be inherited by different pseudowire classes.
mpls control-word	Enables the MPLS control word in an AToM static pseudowire connection.
mpls label	Configures an AToM static pseudowire connection by defining local and remote pseudowire labels.
mpls label range	Configures the range of local labels available for use on packet interfaces.

Command	Description
pseudowire-class	Configures a template of pseudowire configuration settings used by the attachment circuits transported over a pseudowire.
show xconnect	Displays information about xconnect attachment circuits and pseudowires.

Feature Information for VPLS Autodiscovery: BGP Based

Table 10 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Note   Table 10 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 10   *Feature Information for VPLS Autodiscovery: BGP Based*

Feature Name	Releases	Feature Information
VPLS Autodiscovery: BGP Based	12.2(33)SRB	VPLS Autodiscovery enables each Virtual Private LAN Service (VPLS) provider edge (PE) router to discover which other PE routers are part of the same VPLS domain. In 12.2(33)SRB, this feature was introduced on the Cisco 7600 router.