



# L2VPN Pseudowire Redundancy

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The L2VPN Pseudowire Redundancy feature enables you to configure your network to detect a failure in the network and reroute the Layer 2 (L2) service to another endpoint that can continue to provide service. This feature provides the ability to recover from a failure either of the remote provider edge (PE) router or of the link between the PE and customer edge (CE) routers.

## **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 L2VPN Pseudowire Redundancy](#)” section on page 26.

## **Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images**

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS 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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## Prerequisites for L2VPN Pseudowire Redundancy

- This feature module requires that you understand how to configure basic L2 virtual private networks (VPNs). You can find that information in the following documents:
  - *Any Transport over MPLS*
  - *L2 VPN Interworking*
- The L2VPN Pseudowire Redundancy feature requires that the following mechanisms be in place to enable you to detect a failure in the network:
  - Label-switched paths (LSP) Ping/Traceroute and Any Transport over MPLS Virtual Circuit Connection Verification (AToM VCCV)
  - Local Management Interface (LMI)
  - Operation, Administration, and Maintenance (OAM)

## Restrictions for L2VPN Pseudowire Redundancy

- The default Label Distribution Protocol (LDP) session hold-down timer will enable the software to detect failures in about 180 seconds. That time can be configured so that the software can detect failures more quickly. See the **mpls ldp holdtime** command for more information.
- Pseudowire redundancy is not supported for Layer 2 Tunnel Protocol Version 3 (L2TPv3) xconnect configurations.
- The primary and backup pseudowires must run the same type of transport service. The primary and backup pseudowires must be configured with AToM.
- Only static, on-box provisioning is supported in this release.
- If you use L2VPN Pseudowire Redundancy with L2VPN Interworking, the interworking method must be the same for the primary and backup pseudowires.
- L2VPN Pseudowire Redundancy does support setting the experimental (EXP) bit on the Multiprotocol Label Switching (MPLS) pseudowire.
- L2VPN Pseudowire Redundancy does not support different pseudowire encapsulation types on the MPLS pseudowire.
- The **mpls l2transport route** command is not supported. Use the **xconnect** command instead.
- The ability to have the backup pseudowire fully operational at the same time that the primary pseudowire is operational is not supported. The backup pseudowire becomes active only after the primary pseudowire fails.
- The AToM VCCV feature is supported only on the active pseudowire.
- More than one backup pseudowire is not supported.

# Information About L2VPN Pseudowire Redundancy

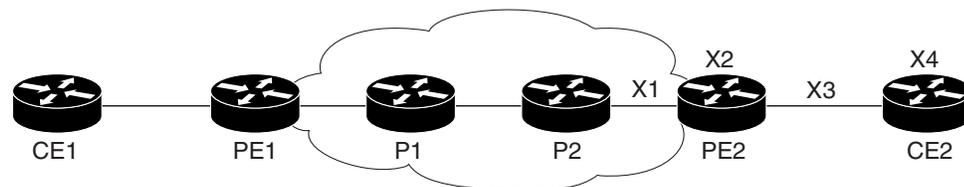
Before configuring L2VPN Pseudowire Redundancy, you should understand the following concept:

- [Introduction to L2VPN Pseudowire Redundancy, page 3](#)

## Introduction to L2VPN Pseudowire Redundancy

L2VPNs can provide pseudowire resiliency through their routing protocols. When connectivity between end-to-end PE routers fails, an alternative path to the directed LDP session and the user data can take over. However, there are some parts of the network where this rerouting mechanism does not protect against interruptions in service. [Figure 1](#) shows those parts of the network that are vulnerable to an interruption in service.

**Figure 1** Points of Potential Failure in an L2VPN Network



X1 = End-to-end routing failure  
 X2 = PE hardware or software failure  
 X3 = Attachment circuit failure from a line break  
 X4 = CE hardware or software failure

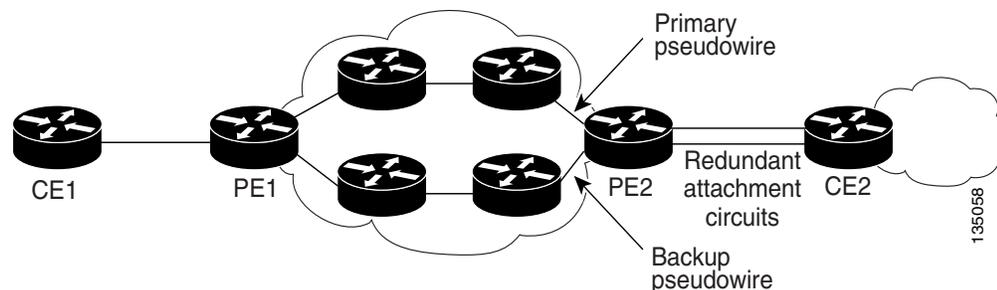
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The L2VPN Pseudowire Redundancy feature provides the ability to ensure that the CE2 router in [Figure 1](#) can always maintain network connectivity, even if one or all the failures in the figure occur.

The L2VPN Pseudowire Redundancy feature enables you to set up backup pseudowires. You can configure the network with redundant pseudowires (PWs) and redundant network elements, which are shown in the following figures.

[Figure 2](#) shows a network with redundant pseudowires and redundant attachment circuits.

**Figure 2** L2 VPN Network with Redundant PWs and Attachment Circuits



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Figure 3 shows a network with redundant pseudowires, attachment circuits, and CE routers.

**Figure 3** L2 VPN Network with Redundant PWs, Attachment Circuits, and CE Routers

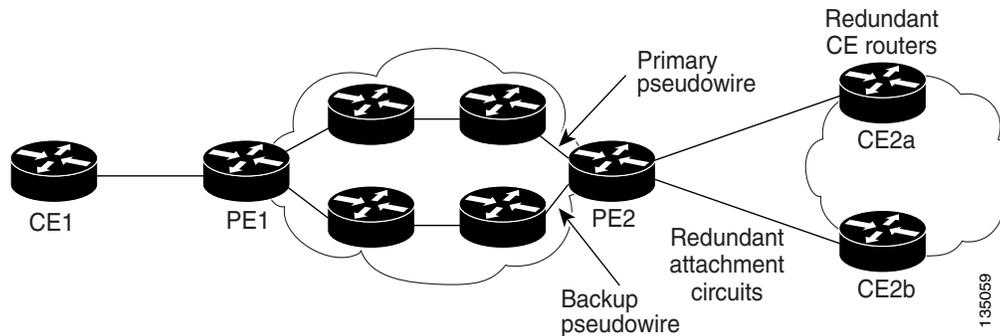
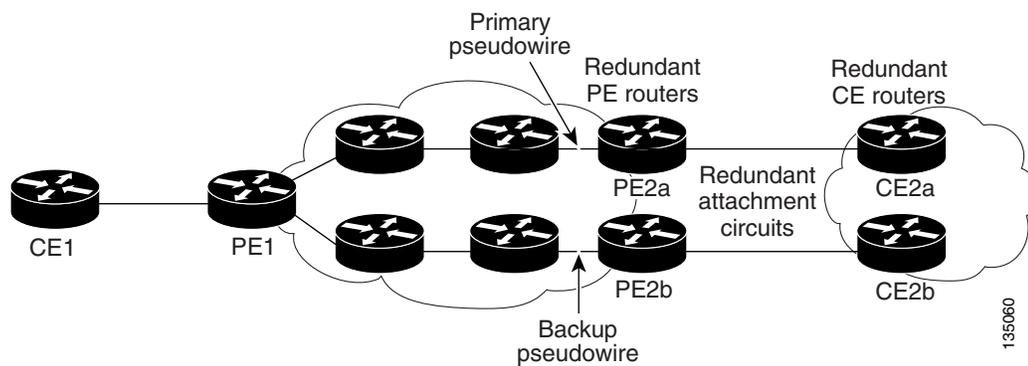


Figure 4 shows a network with redundant pseudowires, attachment circuits, CE routers, and PE routers.

**Figure 4** L2 VPN Network with Redundant PWs, Attachment Circuits, CE Routers, and PE Routers



## How to Configure L2VPN Pseudowire Redundancy

The L2VPN Pseudowire Redundancy feature enables you to configure a backup pseudowire in case the primary pseudowire fails. When the primary pseudowire fails, the PE router can switch to the backup pseudowire. You can have the primary pseudowire resume operation after it comes back up.

The following sections explain how to configure the L2VPN Pseudowire Redundancy feature:

- [Configuring the Pseudowire, page 5](#) (required)
- [Configuring L2VPN Pseudowire Redundancy, page 6](#) (required)
- [Forcing a Manual Switchover to the Backup Pseudowire VC, page 8](#) (optional)
- [Verifying the L2VPN Pseudowire Redundancy Configuration, page 8](#) (optional)

## Configuring the Pseudowire

The successful transmission of the Layer 2 frames between PE routers is due to the configuration of the PE routers. You set up the connection, called a pseudowire, between the routers.

The pseudowire-class configuration group specifies the characteristics of the tunneling mechanism, which are:

- Encapsulation type
- Control protocol
- Payload-specific options

You must specify the **encapsulation mpls** command as part of the pseudowire class for the AToM VCs to work properly. If you omit the **encapsulation mpls** command as part of the **xconnect** command, you receive the following error:

```
% Incomplete command.
```

Perform this task to configure a pseudowire class.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **pseudowire-class *name***
4. **encapsulation mpls**
5. **interworking {ethernet | ip}**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<b>pseudowire-class</b> <i>name</i>  <b>Example:</b> Router(config)# pseudowire-class atom	Establishes a pseudowire class with a name that you specify. Enters pseudowire class configuration mode.
Step 4	<b>encapsulation</b> <i>mpls</i>  <b>Example:</b> Router(config-pw)# encapsulation mpls	Specifies the tunneling encapsulation. For AToM, the encapsulation type is <b>mpls</b> .
Step 5	<b>interworking</b> { <b>ethernet</b>   <b>ip</b> }  <b>Example:</b> Router(config-pw)# interworking ip	(Optional) Enables the translation between the different Layer 2 encapsulations.

## Configuring L2VPN Pseudowire Redundancy

Use the following steps to configure the L2VPN Pseudowire Redundancy feature.

### Prerequisites

For each transport type, the **xconnect** command is configured slightly differently. The following configuration steps use Ethernet VLAN over MPLS, which is configured in subinterface configuration mode. See *Any Transport over MPLS* to determine how to configure the **xconnect** command for other transport types.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *gigabitethernet**slot/interface.subinterface*
4. **encapsulation** *dot1q* *vlan-id*
5. **xconnect** *peer-router-id* *vcid* **encapsulation** *mpls* | **pw-class** *pw-class-name*
6. **backup peer** *peer-router-ip-addr* *vcid* [**pw-class** *pw-class-name*]
7. **backup delay** *enable-delay* {*disable-delay* | **never**}

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><b>enable</b></p> <p><b>Example:</b> Router&gt; enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<p><b>configure terminal</b></p> <p><b>Example:</b> Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p><b>interface</b> <b>gigabitethernet</b><i>slot/interface.subinterface</i></p> <p><b>Example:</b> Router(config)# interface gigabitethernet4/0.1</p>	<p>Specifies the Gigabit Ethernet subinterface and enters subinterface configuration mode.</p> <p>Make sure that the subinterface on the adjoining CE router is on the same VLAN as this PE router.</p>
Step 4	<p><b>encapsulation dot1q</b> <i>vlan-id</i></p> <p><b>Example:</b> Router(config-subif)# encapsulation dot1q 100</p>	<p>Enables the subinterface to accept 802.1Q VLAN packets.</p> <p>The subinterfaces between the CE and PE routers that are running Ethernet over MPLS must be in the same subnet. All other subinterfaces and backbone routers do not.</p>
Step 5	<p><b>xconnect</b> <i>peer-router-id vcid encapsulation mpls</i>   <b>pw-class</b> <i>pw-class-name</i></p> <p><b>Example:</b> Router(config-subif)# xconnect 10.0.0.1 123 pw-class atom</p>	<p>Binds the attachment circuit to a pseudowire VC.</p> <p>The syntax for this command is the same as for all other Layer 2 transports.</p> <p>Enters xconnect configuration mode.</p>
Step 6	<p><b>backup peer</b> <i>peer-router-ip-addr vcid [pw-class</i> <i>pw-class-name]</i></p> <p><b>Example:</b> Router(config-if-xconn)# backup peer 10.0.0.3 125 pw-class atom</p>	<p>Specifies a redundant peer for the pseudowire VC.</p> <p>The pseudowire class name must match the name you specified when you created the pseudowire class, but you can use a different pw-class in the <b>backup peer</b> command than the name that you used in the primary <b>xconnect</b> command.</p>
Step 7	<p><b>backup delay</b> <i>enable-delay {disable-delay  </i> <i>never}</i></p> <p><b>Example:</b> Router(config-if-xconn)# backup delay 5 never</p>	<p>Specifies how long (in seconds) the backup pseudowire VC should wait to take over after the primary pseudowire VC goes down. The range is 0 to 180.</p> <p>Specifies how long the primary pseudowire should wait after it becomes active to take over for the backup pseudowire VC. The range is 0 to 180 seconds. If you specify the <b>never</b> keyword, the primary pseudowire VC never takes over for the backup.</p>

## Forcing a Manual Switchover to the Backup Pseudowire VC

To force the router switch over to the backup or primary pseudowire, you can enter the **xconnect backup force switchover** command in privileged EXEC mode. You can specify either the interface of the primary attachment circuit (AC) to switch to or the IP-address and VC ID of the peer router.

A manual switchover can be made only if the interface or peer specified in the command is actually available and the xconnect will move to the fully active state when the command is entered.

### SUMMARY STEPS

1. **enable**
2. **xconnect backup force-switchover interface *interface-info* | peer *ip-address vcid***

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>xconnect backup force-switchover interface <i>interface-info</i>   peer <i>ip-address vcid</i></b>  <b>Example:</b> Router# xconnect backup force-switchover peer 10.10.10.1 123	Specifies that the router should switch to the backup or to the primary pseudowire.

## Verifying the L2VPN Pseudowire Redundancy Configuration

Use the following commands to verify that the L2VPN Pseudowire Redundancy feature is correctly configured.

### SUMMARY STEPS

1. **show mpls l2transport vc**
2. **show xconnect all**
3. **xconnect logging redundancy**



Activating the backup member:

```
00:01:05: %XCONNECT-5-REDUNDANCY: Activating secondary member 10.55.55.3:1001
```

## Configuration Examples for L2VPN Pseudowire Redundancy

The following sections show the L2VPN Pseudowire Redundancy feature examples. These configuration examples show how the L2VPN Pseudowire Redundancy feature can be configured with the AToM (like-to-like), L2VPN Interworking, and Layer 2 Local Switching features.

- [L2VPN Pseudowire Redundancy and AToM \(Like to Like\): Examples, page 10](#)
- [L2VPN Pseudowire Redundancy and L2VPN Interworking: Examples, page 10](#)
- [L2VPN Pseudowire Redundancy with Layer 2 Local Switching: Examples, page 11](#)

Each of the configuration examples refers to one of the following pseudowire classes:

- AToM (like-to-like) pseudowire class:

```
pseudowire-class mpls
encapsulation mpls
```

- L2VPN IP interworking:

```
pseudowire-class mpls-ip
encapsulation mpls
interworking ip
```

### L2VPN Pseudowire Redundancy and AToM (Like to Like): Examples

The following example shows a High-Level Data Link Control (HDLC) attachment circuit xconnect with a backup pseudowire:

```
interface Serial4/0
xconnect 10.55.55.2 4000 pw-class mpls
backup peer 10.55.55.3 4001 pw-class mpls
```

The following example shows a Frame Relay attachment circuit xconnect with a backup pseudowire:

```
connect fr-fr-pw Serial6/0 225 l2transport
xconnect 10.55.55.2 5225 pw-class mpls
backup peer 10.55.55.3 5226 pw-class mpls
```

### L2VPN Pseudowire Redundancy and L2VPN Interworking: Examples

The following example shows an Ethernet attachment circuit xconnect with L2VPN IP interworking and a backup pseudowire:

```
interface Ethernet0/0
xconnect 10.55.55.2 1000 pw-class mpls-ip
backup peer 10.55.55.3 1001 pw-class mpls-ip
```

The following example shows an Ethernet VLAN attachment circuit xconnect with L2VPN IP interworking and a backup pseudowire:

```
interface Ethernet1/0.1
encapsulation dot1Q 200
```

```
no ip directed-broadcast
xconnect 10.55.55.2 5200 pw-class mpls-ip
backup peer 10.55.55.3 5201 pw-class mpls-ip
```

The following example shows a Frame Relay attachment circuit xconnect with L2VPN IP interworking and a backup pseudowire:

```
connect fr-ppp-pw Serial16/0 250 l2transport
xconnect 10.55.55.2 8250 pw-class mpls-ip
backup peer 10.55.55.3 8251 pw-class mpls-ip
```

The following example shows a PPP attachment circuit xconnect with L2VPN IP interworking and a backup pseudowire:

```
interface Serial7/0
encapsulation ppp
xconnect 10.55.55.2 2175 pw-class mpls-ip
backup peer 10.55.55.3 2176 pw-class mpls-ip
```

## L2VPN Pseudowire Redundancy with Layer 2 Local Switching: Examples

The following example shows an Ethernet VLAN-VLAN local switching xconnect with a pseudowire backup for Ethernet segment E2/0.2. If the subinterface associated with E2/0.2 goes down, the backup pseudowire is activated.

```
connect vlan-vlan Ethernet1/0.2 Ethernet2/0.2
backup peer 10.55.55.3 1101 pw-class mpls
```

The following example shows a Frame Relay-to-Frame Relay local switching connect with a pseudowire backup for Frame Relay segment S8/0 150. If data-link connection identifier (DLCI) 150 on S8/0 goes down, the backup pseudowire is activated.

```
connect fr-fr-ls Serial6/0 150 Serial8/0 150
backup peer 10.55.55.3 7151 pw-class mpls
```

## Additional References

The following sections provide references related to the L2VPN Pseudowire Redundancy feature.

### Related Documents

Related Topic	Document Title
Any Transport over MPLS	<a href="#">Any Transport over MPLS</a>
High Availability for AToM	<a href="#">AToM Graceful Restart</a>
L2VPN Interworking	<a href="#">L2VPN Interworking</a>
Layer 2 Local Switching	<a href="#">Layer 2 Local Switching</a>
PWE3 MIB	<a href="#">Pseudowire Emulation Edge-to-Edge MIBs for Ethernet and Frame Relay Services</a>
Packet Sequencing	<a href="#">Any Transport over MPLS (AToM) Sequencing Support</a>

## Standards

Standards	Title
None	—

## MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## RFCs

RFCs	Title
None	—

## 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.	<a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a>

# Command Reference

This section documents modified commands only.

- [backup delay \(L2VPN local switching\)](#)
- [backup peer](#)
- [show xconnect](#)
- [xconnect backup force-switchover](#)
- [xconnect logging redundancy](#)

## backup delay (L2VPN local switching)

To specify how long a backup pseudowire virtual circuit (VC) should wait before resuming operation after the primary pseudowire VC goes down, use the **backup delay** command in interface configuration mode or xconnect configuration mode.

**backup delay** *enable-delay* { *disable-delay* | **never** }

### Syntax Description

<i>enable-delay</i>	Number of seconds that elapse after the primary pseudowire VC goes down before the Cisco IOS software activates the secondary pseudowire VC. The range is 0 to 180. The default is 0.
<i>disable-delay</i>	Number of seconds that elapse after the primary pseudowire VC comes up before the Cisco IOS software deactivates the secondary pseudowire VC. The range is 0 to 180. The default is 0.
<b>never</b>	The secondary pseudowire VC will not fall back to the primary pseudowire VC if the primary pseudowire VC becomes available again unless the secondary pseudowire VC fails.

### Command Default

If a failover occurs, the xconnect redundancy algorithm will immediately switch over or fall back to the backup or primary member in the redundancy group.

### Command Modes

Interface configuration  
Xconnect configuration

### 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 integrated into Cisco IOS Release 12.2(33)SRB.

### Examples

The following example shows a Multiprotocol Label Switching (MPLS) xconnect with one redundant peer. Once a switchover to the secondary VC occurs, there will be no fallback to the primary VC unless the secondary VC fails.

```
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls

Router(config)# connect frpw1 serial10/1 50 l2transport
Router(config-if)# xconnect 10.0.0.1 50 pw-class mpls
Router(config-if-xconn)# backup peer 10.0.0.2 50
Router(config-if-xconn)# backup delay 0 never
```

The following example shows an MPLS xconnect with one redundant peer. The switchover will not begin unless the Layer 2 Tunnel Protocol (L2TP) pseudowire has been down for 3 seconds. After a switchover to the secondary VC occurs, there will be no fallback to the primary until the primary VC has been reestablished and is up for 10 seconds.

```
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls

Router(config)# connect frpwl serial10/1 50 l2transport
Router(config-if)# xconnect 10.0.0.1 50 pw-class mpls
Router(config-if-xconn)# backup peer 10.0.0.2 50
Router(config-if-xconn)# backup delay 3 10
```

---

**Related Commands**

Command	Description
<b>backup peer</b>	Configures a redundant peer for a pseudowire VC.

# backup peer

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

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

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

## Syntax Description

<i>peer-router-ip-addr</i>	IP address of the remote peer.
<i>vcid</i>	The 32-bit identifier of the virtual circuit between the routers at each end of the layer control channel.
<b>pw-class</b>	(Optional) Pseudowire type. If not specified, the pseudowire type is inherited from the parent xconnect.
<i>pw-class-name</i>	(Optional) Name of the pseudowire you created when you established the pseudowire class.

## Command Default

No redundant peer is established.

## Command Modes

Interface configuration  
Xconnect configuration

## 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 integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

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

## Examples

The following example shows a Multiprotocol Label Switching (MPLS) xconnect with one redundant peer:

```
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls

Router(config)# interface serial10/0
Router(config-if)# xconnect 10.0.0.1 100 pw-class mpls
Router(config-if-xconn)# backup peer 10.0.0.2 200
```

The following example shows a local-switched connection between ATM and Frame Relay using Ethernet interworking. The Frame Relay circuit is backed up by an MPLS pseudowire.

```
Router(config)# pseudowire-class mpls
Router(config-pw-class)# encapsulation mpls
Router(config-pw-class)# interworking ethernet

Router(config)# connect atm-fr atm1/0 100/100 s2/0 100 interworking ethernet
Router(config-if)# backup peer 10.0.0.2 100 pw-class mpls
```

---

**Related Commands**

Command	Description
<b>backup delay</b>	Specifies how long the backup pseudowire VC should wait before resuming operation after the primary pseudowire VC goes down.

---

# 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* } } [**detail**]

Syntax Description	
<b>all</b>	Displays information about all xconnect attachment circuits and pseudowires.
<b>interface</b> <i>interface</i>	<p>Displays information about xconnect attachment circuits and pseudowires on the specified interface. Valid values for the <i>interface</i> argument are as follows:</p> <ul style="list-style-type: none"> <li>• <b>atm number</b>—Displays xconnect information for a specific ATM interface or subinterface.</li> <li>• <b>atm number vp vpi-value</b>—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.</li> <li>• <b>atm number vp vpi-value/vci-value</b>—Displays VC xconnect information for a specific ATM VPI and virtual circuit identifier (VCI) combination.</li> <li>• <b>ethernet number</b>—Displays port-mode xconnect information for a specific Ethernet interface or subinterface.</li> <li>• <b>fastethernet number</b>—Displays port-mode xconnect information for a specific Fast Ethernet interface or subinterface.</li> <li>• <b>serial number</b>—Displays xconnect information for a specific serial interface.</li> <li>• <b>serial number dlci-number</b>—Displays xconnect information for a specific Frame Relay data-link connection identifier (DLCI).</li> </ul>
<b>peer</b> <i>ip-address</i> { <b>all</b>   <b>vcid</b> <i>vcid</i> }	<p>Displays information about xconnect attachment circuits and pseudowires associated with the specified peer IP address.</p> <ul style="list-style-type: none"> <li>• <b>all</b>—Displays all xconnect information associated with the specified peer IP address.</li> <li>• <b>vcid vcid</b>—Displays xconnect information associated with the specified peer IP address and the specified VC ID.</li> </ul>
<b>detail</b>	(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 integrated into Cisco IOS Release 12.2(33)SRB.

**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 1 describes the significant fields shown in the display.

**Table 1** *show xconnect Field Descriptions*

Field	Description
XC ST	<p>State of the xconnect attachment circuit or pseudowire. Valid states are:</p> <ul style="list-style-type: none"> <li>• UP—The xconnect attachment circuit or pseudowire is up. Both segment 1 and segment 2 must be up for the xconnect to be up.</li> <li>• DN—The xconnect attachment circuit or pseudowire is down. Either segment 1, segment 2, or both segments are down.</li> <li>• IA—The xconnect attachment circuit or pseudowire is inactive. This state is valid only when pseudowire redundancy is configured.</li> <li>• NH—One or both segments of this xconnect no longer have the required hardware resources available to the system.</li> </ul>
Segment1 or Segment2	<p>Information about the type of xconnect, the interface type, and the IP address the segment is using. Types of xconnects are as follows:</p> <ul style="list-style-type: none"> <li>• ac—Attachment circuit.</li> <li>• pri ac—Primary attachment circuit.</li> <li>• sec ac—Secondary attachment circuit.</li> <li>• mpls—Multiprotocol Label Switching.</li> <li>• l2tp—Layer 2 Tunnel Protocol.</li> </ul>
S1 or S2	<p>State of the segment. Valid states are:</p> <ul style="list-style-type: none"> <li>• UP—The segment is up.</li> <li>• DN—The segment is down.</li> <li>• AD—The segment is administratively down.</li> </ul>

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
                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
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.

### Related Commands

Command	Description
<b>show atm pvc</b>	Displays all ATM PVCs and traffic information.
<b>show atm vc</b>	Displays all ATM PVCs and SVCs and traffic information.
<b>show atm vp</b>	Displays the statistics for all VPs on an interface or for a specific VP.
<b>show connect</b>	Displays configuration information about drop-and-insert connections that have been configured on a router.
<b>show frame-relay pvc</b>	Displays statistics about PVCs for Frame Relay interfaces.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show l2tun session</b>	Displays the current state of Layer 2 sessions and protocol information about L2TP control channels.

<b>Command</b>	<b>Description</b>
<b>show mpls l2transport binding</b>	Displays VC label binding information.
<b>show mpls l2transport vc</b>	Displays information about AToM VCs that have been enabled to route Layer 2 packets on a router.

# xconnect backup force-switchover

To manually force a switchover to an attachment circuit or a pseudowire peer, use the **xconnect backup force-switchover** command in privileged EXEC mode.

```
xconnect backup force-switchover interface {interface-info | peer ip-address vcid}
```

Syntax Description	interface	Specifies the interface to be used for the switchover.
	<i>interface-</i>	
	<b>peer</b>	Specifies the IP address and virtual circuit (VC) ID of the VC to be used for the switchover.
	<i>ip-address vcid</i>	

**Command Default** The pseudowire VC will not be changed.

**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 integrated into Cisco IOS Release 12.2(33)SRB.

**Usage Guidelines** You can perform a switchover only to an available member in the redundancy group. That is, if the member being specified in the **xconnect backup force-switchover** command is not available, the command will be rejected.

**Examples** The following example shows a Multiprotocol Label Switching (MPLS) xconnect with two redundant peers. The primary xconnect is using IP address 10.55.55.1, VC ID 500.

```
Router(config)# interface fastethernet1/0
Router(config-if)# xconnect 10.55.55.1 500 encapsulation mpls
Router(config-if-xconn)# backup peer 10.55.55.2 501
!
Router# xconnect backup force-switchover peer 10.55.55.2 501
```

Entering the **xconnect backup force-switchover** command will cause the router to switch to the pseudowire with an IP address of 10.55.55.2, VC ID 501.

To switch back to the primary pseudowire, enter the following command:

```
Router# xconnect backup force-switchover peer 10.55.55.1 500
```

If the xconnect cannot be switched over to the redundant pseudowire specified by the user, the standard redundancy algorithm will run and select either the primary or the highest secondary VC, depending on current availability.

The following example shows a local switching connection with two redundant peers. The primary xconnect is VLAN subinterface FastEthernet0/1.1 using dot1q tag 10. The xconnect is currently established with one of the backup peers when the manual switchover is issued to the primary xconnect.

```
Router(config)# interface FastEthernet0/0
!
Router(config)# interface FastEthernet0/1.1
Router(config-if)# encapsulation dot1q 10
!
Router(config)# connect eth-vln FastEthernet0/0 FastEthernet0/1.1 interworking ethernet
Router(config-if)# backup peer 10.55.55.2 501
!
Router# xconnect backup force-switchover interface FastEthernet0/1.1
```

Entering the **xconnect backup force-switchover** command will cause the router to switch back to the VLAN subinterface FastEthernet0/1.1. If the xconnect cannot be switched over to the primary VLAN subinterface specified by the user, the standard redundancy algorithm will run and select the highest secondary VC, depending on current availability.

#### Related Commands

Command	Description
<b>backup delay</b>	Specifies how long a backup pseudowire VC should wait before taking over after the primary pseudowire VC goes down.
<b>backup peer</b>	Configures a redundant peer for a pseudowire VC.

# xconnect logging redundancy

To enable system message log (syslog) reporting of the status of the xconnect redundancy group, use the **xconnect logging redundancy** command in global configuration mode. To disable syslog reporting of the status of the xconnect redundancy group, use the **no** form of this command.

**xconnect logging redundancy**

**no xconnect logging redundancy**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Syslog reporting of the status of the xconnect redundancy group is disabled.

## Command Modes

Global configuration

## 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 integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

Use this command to enable syslog reporting of the status of the xconnect redundancy group.

## Examples

The following example enables syslog reporting of the status of the xconnect redundancy group and shows the messages that are generated during switchover events:

```
Router(config)# xconnect logging redundancy
```

Activating the primary member:

```
00:01:07: %XCONNECT-5-REDUNDANCY: Activating primary member 10.55.55.2:1000
```

Activating the backup member:

```
00:01:05: %XCONNECT-5-REDUNDANCY: Activating secondary member 10.55.55.3:1001
```

## Related Commands

Command	Description
<b>xconnect</b>	Binds an Ethernet, 802.1q VLAN, or Frame Relay attachment circuit to an L2TPv3 pseudowire for xconnect service and enters xconnect configuration mode.

# Feature Information for L2VPN Pseudowire Redundancy

Table 2 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.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS 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 2 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 2** Feature Information for L2VPN Pseudowire Redundancy

Feature Name	Releases	Feature Information
L2VPN Pseudowire Redundancy	12.0(31)S 12.2(28)SB 12.4(11)T 12.2(33)SRB	<p>This feature enables you to set up your network to detect a failure in the network and reroute the Layer 2 service to another endpoint that can continue to provide service.</p> <p>In 12.0(31)S, the L2VPN Pseudowire Redundancy feature was introduced for Any Transport over MPLS (AToM) on the Cisco 12000 series routers.</p> <p>This feature was integrated into Cisco IOS Release 12.2(28)SB.</p> <p>This feature was integrated into Cisco IOS Release 12.4(11)T.</p> <p>Use <a href="#">Cisco Feature Navigator</a> to find information about platform support and Cisco IOS software image support.</p>

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