# L2VPN Multisegment Pseudowires

The L2VPN Multisegment Pseudowires feature enables you to configure two or more Layer 2 pseudowire segments that function as a single pseudowire. Layer 2 Virtual Private Network (L2VPN) multisegment pseudowires span multiple cores or autonomous systems of the same or different carrier networks. L2VPN multisegment pseudowires are also used in L2VPN Virtual Private LAN Services (VPLS) Inter-AS Option B networks.

This document explains Multiprotocol Label Switching (MPLS) Operations, Administration, and Maintenance (OAM) Support for L2VPN Multisegment Pseudowires and the MPLS OAM Support for the L2VPN VPLS Inter-AS Option B feature. These features allow you to use **ping mpls** and **trace mpls** commands to ensure pseudowire connectivity.



# Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

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

# Prerequisites for L2VPN Multisegment Pseudowires

Before configuring this feature, see the following documents:

- Any Transport over MPLS
- L2VPN Pseudowire Switching
- MPLS LSP Ping/Traceroute for LDP/TE, and LSP Ping for VCCV
- Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP) (RFC 4447)

# Restrictions for L2VPN Multisegment Pseudowires

- Only Multiprotocol Label Switching (MPLS) Layer 2 pseudowires are supported.
- In Cisco IOS Release 12.3(33)SRE, only static configuration of the pseudowires is supported for the L2VPN Multisegment Pseudowires feature.
- In Cisco IOS Release 15.1(1)S, dynamic configuration of the pseudowires is supported and required for the L2VPN VPLS Inter-AS Option B feature.
- In Cisco IOS Release 12.3(33)SRE, only pseudowires advertised with forwarding equivalence class (FEC) 128 are supported for the L2VPN Multisegment Pseudowires feature. FEC 129 is not supported.
- In Cisco IOS Release 15.1(1)S, FEC 129 is supported and used to exchange information about the pseudowires for the L2VPN VPLS Inter-AS Option B feature.
- The S-PE router is limited to 1600 pseudowires.

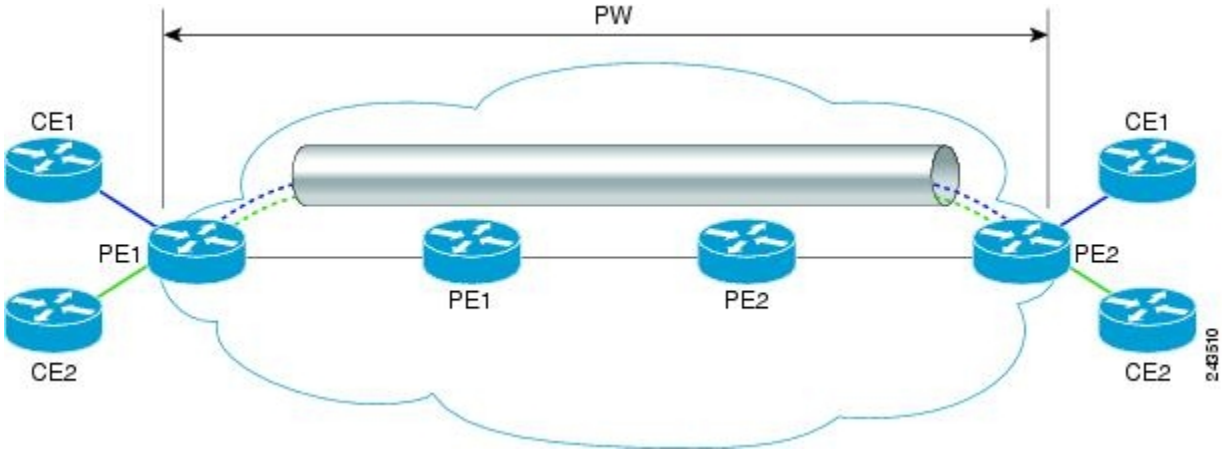
# Information About L2VPN Multisegment Pseudowires

## L2VPN Pseudowire Defined

An L2VPN pseudowire (PW) is a tunnel established between two provider edge (PE) routers across the core carrying the Layer 2 payload encapsulated as MPLS data, as shown in the figure below. This helps carriers migrate from traditional Layer 2 networks such as Frame Relay and ATM to an MPLS core. The PWs between

two PE routers are located within the same autonomous system (AS). Routers PE1 and PE2 are called terminating PE routers (T-PEs). Attachment circuits are bounded to the PW on these PE routers.

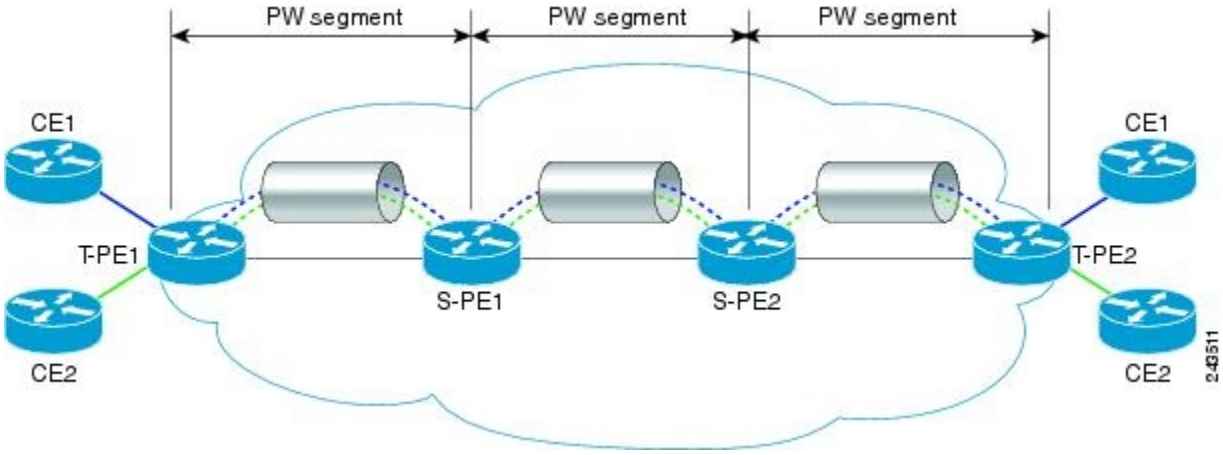
***Figure 1: An L2VPN Pseudowire***




# L2VPN Multisegment Pseudowire Defined

An L2VPN multisegment pseudowire (MS-PW) is a set of two or more PW segments that function as a single PW, as shown in the figure below. It is also known as switched PW. MS-PWs span multiple cores or autonomous systems of the same or different carrier networks. An L2VPN MS-PW can include up to 254 PW segments.

***Figure 2: A Multisegment Pseudowire***




The end routers are called terminating PE routers (T-PEs), and the switching routers are called S-PE routers. The S-PE router terminates the tunnels of the preceding and succeeding PW segments in an MS-PW. The S-PE router can switch the control and data planes of the preceding and succeeding PW segments of the MS-PW. An MS-PW is declared to be up when all the single-segment PWs are up. For more information, see the L2VPN Pseudowire Switching document.

With the L2VPN Multisegment Pseudowire feature introduced in Cisco IOS Release 12.2(33)SRE, the pseudowires are created statically, and FEC 128 information is used to exchange the information about each AS.

# MPLS OAM Support for Multisegment Pseudowires

You can use the **ping mpls** and **trace mpls**commands to verify that all the segments of the MPLS multisegment pseudowire are operating.

You can use the **ping mpls** command to verify connectivity at the following pseudowire points:

- From one end of the pseudowire to the other
- From one of the pseudowires to a specific segment
- The segment between two adjacent S-PE routers

You can use the **trace mpls**command to verify connectivity at the following pseudowire points:

- From one end of the pseudowire to the other
- From one of the pseudowires to a specific segment
- The segment between two adjacent S-PE routers
- A range of segments

# MPLS OAM Support for L2VPN VPLS Inter-AS Option B

The L2VPN VPLS Inter-AS Option B feature introduced in Cisco IOS Release 15.1(1)S uses multisegment pseudowires to connect Autonomous System Border Routers (ASBRs) in different autonomous systems. With this feature, the pseudowires are created dynamically, and FEC 129 information is used to exchange the information about each ASBR.

The differences between static multisegment pseudowires and dynamic multisegment pseudowires are listed in the table below.

***Table 1: Comparison of Static and Dynamic Multisegment Pseudowires***

| Static Multisegment Pseudowires | Dynamic Multisegment Pseudowires |
|---|---|
| Are statically stitched and dynamically signalled. | Are dynamically stitched and dynamically signalled. |
| Label Distribution Protocol (LDP) exchanges the type length value (TLV) and FEC 128 information is exchanged between segments. | Border Gateway Protocol (BGP) exchanges the TLV and FEC 129 information is exchanged between ASBRs. |

For more information about the L2VPN VPLS Inter-AS Option B feature, see L2VPN VPLS Inter-AS Option B.

# How to Configure L2VPN Multisegment Pseudowires

## Configuring L2VPN Multisegment Pseudowires

Perform the following steps on the S-PE routers to create L2VPN multisegment pseudowires.

### Cisco 7600 Router-Specific Instructions

If the Cisco 7600 router is the penultimate hop router connected to the S-PE or T-PE router, issue the following commands on the S-PE or T-PE routers:

- **mpls ldp explicit-null**
- **no mls mpls explicit-null propagate-ttl**

#### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **mpls label protocol ldp**
4. **mpls ldp router-id** *interface* **force**
5. **pseudowire-class** *name*
6. **encapsulation mpls**
7. **switching tlv**
8. **exit**
9. **l2 vfi** *name* **point-to-point**
10. **description** *string*
11. **neighbor** *ip-address vcid* { **encapsulation mpls** | **pw-class** *pw-class-name* }

#### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br><br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br><br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 3** | **mpls label protocol ldp**<br>**Example:**<br>`Router(config)# mpls label protocol ldp` | Configures the use of Label Distribution Protocol (LDP) on all interfaces. |
| **Step 4** | **mpls ldp router-id** *interface* **force**<br>**Example:**<br>`Router(config)# mpls ldp router-id loopback0 force` | Specifies the preferred interface for determining the LDP router ID. |
| **Step 5** | **pseudowire-class** *name*<br>**Example:**<br>`Router(config)# pseudowire-class atom` | Establishes a pseudowire class with a name that you specify, and enters pseudowire class configuration mode. |
| **Step 6** | **encapsulation mpls**<br>**Example:**<br>`Router(config-pw-class)# encapsulation mpls` | Specifies the tunneling encapsulation.<br>• For MPLS L2VPNs, the encapsulation type is **mpls**. |
| **Step 7** | **switching tlv**<br>**Example:**<br>`Router(config-pw-class)# switching tlv` | (Optional) Enables the advertisement of the switching point type-length variable (TLV) in the label binding.<br>• This command is enabled by default. |
| **Step 8** | **exit**<br>**Example:**<br>`Router(config-pw-class)# exit` | Exits pseudowire class configuration mode. |
| **Step 9** | **l2 vfi** *name* **point-to-point**<br>**Example:**<br>`Router(config)# l2 vfi atomtunnel point-to-point` | Creates a point-to-point Layer 2 virtual forwarding interface (VFI) and enters VFI configuration mode. |
| **Step 10** | **description** *string*<br>**Example:**<br>`Router(config-vfi)# description segment1` | Provides a description of the switching provider edge router for a multisegment pseudowire. |
| **Step 11** | **neighbor** *ip-address vcid* { **encapsulation mpls** \| **pw-class** *pw-class-name* } | Sets up an emulated VC. |

| | Command or Action | Purpose |
|---|---|---|
| | **Example:**<br>`Router(config-vfi)# neighbor 10.0.0.1 100 pw-class mpls` | • Specify the IP address and the VC ID of the peer router. Also specify the pseudowire class to use for the emulated VC.<br>**Note** Only two **neighbor**commands are allowed for each **l2 vfi point-to-point** command. |

# Displaying Information About the L2VPN Multisegment Pseudowires

Perform the following task to display the status of L2VPN multisegment pseudowires.

## SUMMARY STEPS

1. **show mpls l2transport binding**
2. **show mpls l2transport vc detail**

## DETAILED STEPS

**Step 1** **show mpls l2transport binding**

Use the **show mpls l2transport binding** command to display information about the pseudowire switching point, as shown in bold in the output. (In the following examples PE1 and PE4 are the T-PE routers.)

**Example:**

```
Router# show mpls l2transport binding

  Destination Address: 10.1.1.1,  VC ID: 102
    Local Label:  17
        Cbit: 1,    VC Type: Ethernet,    GroupID: 0
        MTU: 1500,   Interface Desc: n/a
        VCCV: CC Type: CW [1], RA [2], TTL [3]
              CV Type: LSPV [2]
    Remote Label: 16
        Cbit: 1,    VC Type: Ethernet,    GroupID: 0
        MTU: 1500,   Interface Desc: n/a
        VCCV: CC Type: CW [1], RA [2], TTL [3]
              CV Type: LSPV [2]
        PW Switching Point:
             Vcid   local IP addr      remote IP addr      Description
             101        10.11.11.11    10.20.20.20         PW Switching Point PE3
             100        10.20.20.20    10.11.11.11            PW Switching Point PE2
```

**Step 2** **show mpls l2transport vc detail**

Use the **show mpls l2transport vc detail** command to display status of the pseudowire switching point. In the following example, the output (shown in bold) displays the segment that is the source of the fault of the multisegment pseudowire:

**Example:**

```
Router# show mpls l2transport vc detail
Local interface: Se3/0 up, line protocol up, HDLC up
  Destination address: 12.1.1.1, VC ID: 100, VC status: down
    Output interface: Se2/0, imposed label stack {23}
    Preferred path: not configured
    Default path: active
    Next hop: point2point
  Create time: 00:03:02, last status change time: 00:01:41
  Signaling protocol: LDP, peer 10.1.1.1:0 up
    Targeted Hello: 10.1.1.4(LDP Id) -> 10.1.1.1, LDP is UP
    Status TLV support (local/remote)   : enabled/supported
      LDP route watch                   : enabled
      Label/status state machine        : established, LruRrd
      Last local dataplane   status rcvd: No fault
      Last local SSS circuit status rcvd: No fault
      Last local SSS circuit status sent: DOWN(PW-tx-fault)
      Last local  LDP TLV    status sent: No fault
      Last remote LDP TLV    status rcvd: DOWN(PW-tx-fault)
       PW Switching Point:
       Fault type  Vcid   local IP addr   remote IP addr   Description
       PW-tx-fault  101   10.1.1.1        10.1.1.1         S-PE2
      Last remote LDP ADJ    status rcvd: No fault
    MPLS VC labels: local 19, remote 23
    Group ID: local 0, remote 0
    MTU: local 1500, remote 1500
    Remote interface description:
  Sequencing: receive disabled, send disabled
  VC statistics:
    packet totals: receive 16, send 27
    byte totals:   receive 2506, send 3098
    packet drops:  receive 0, seq error 0, send 0
```

# Verifying Multisegment Pseudowires with ping mpls and trace mpls Commands

You can use **ping mpls** and **trace mpls** commands to verify connectivity in multisegment pseudowires.

**Note** Some **ping mpls** and **trace mpls**keywords that are available with IPv4 LDP or traffic engineering (TE) are not available with pseudowire.

The following keywords are not available with the **ping mpls pseudowire** command:

- **dsmap**
- **flags**
- **force-explicit-null**
- **output**
- **revision**
- **ttl**

The following keywords are not available with the **trace mpls pseudowire** command:

- **flags**
- **force-explicit-null**
- **output**
- **revision**
- **ttl**

>

## SUMMARY STEPS

1. **ping mpls pseudowire** *destination-address vc-id* [**segment** *segment-number*]
2. **trace mpls pseudowire** *destination-address vc-id* **segment** *segment-number* [*segment-number ]*

## DETAILED STEPS

**Step 1** **ping mpls pseudowire** *destination-address vc-id* [**segment** *segment-number*]
Where:

- *destination-address* is the address of the S-PE router, which is the end of the segment from the direction of the source.
- *vc-id* is the VC ID of the segment from the source to the next PE router.
- **segment** *segment-number is optional and specifies the segment you want to ping.*

The following examples use the topology shown in the second figure above:

- To perform an end-to-end ping operation from T-PE1 to T-PE2, enter the following command. *destination-address* is S-PE1 and *vc-id*is the VC between T-PE1 and S-PE1.

**ping mpls pseudowire** *destination-address vc-id*

- To perform a ping operation from T-PE1 to segment 2, enter the following command. destination-*address* is S-PE1 and *vc-id*is the VC between T-PE1 and S-PE1.

**ping mpls pseudowire** *destination-address vc-id* **segment 2**

**Example:**

**Step 2** **trace mpls pseudowire** *destination-address vc-id* **segment** *segment-number* [*segment-number ]*
Where:

- *destination-address is the address of the next S-PE router from the origin of the trace.*
- *vc-id* is the VC ID of the segment from which the **trace** command is issued.
- *segment-number* indicates the segment upon which the trace operation will act. If you enter two segment numbers, the traceroute operation will perform a trace on that range of routers.

The following examples use the topology shown in the second figure above:

- To perform a trace operation from T-PE1 to segment 2 of the multisegment pseudowire, enter the following command. *destination-address* is S-PE1 and *vc-id*is the VC between T-PE1 and S-PE1.

**trace mpls pseudowire** *destination-address vc-id* **segment 2**

This example performs a trace from T-PE1 to S-PE2.

- To perform a trace operation on a range of segments, enter the following command. This example performs a trace from S-PE2 to T-PE2. *destination-address* is S-PE1 and *vc-id* is the VC between T-PE1 and S-PE1.

**trace mpls pseudowire** *destination-address vc-id* **segment 2 4**

The following commands perform trace operations on S-PE router 10.10.10.9, first on segment 1, then on segment 2.

Segment 1 trace:

**Example:**

```
Router# trace mpls pseudowire 10.10.10.9 220 segment 1
Tracing MS-PW segments within range [1-1] peer address 10.10.10.9 and timeout 2 seconds
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no label entry,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0
Type escape sequence to abort.
L 1 10.10.9.9 0 ms [Labels: 18 Exp: 0]
    local 10.10.10.22 remote 10.10.10.9 vc id 220
Segment 2 trace:
Router# trace mpls pseudowire 10.10.10.9 220 segment 2
Tracing MS-PW segments within range [1-2] peer address 10.10.10.9 and timeout 2 seconds
Codes: '!' - success, 'Q' - request not sent, '.' - timeout,
  'L' - labeled output interface, 'B' - unlabeled output interface,
  'D' - DS Map mismatch, 'F' - no FEC mapping, 'f' - FEC mismatch,
  'M' - malformed request, 'm' - unsupported tlvs, 'N' - no label entry,
  'P' - no rx intf label prot, 'p' - premature termination of LSP,
  'R' - transit router, 'I' - unknown upstream index,
  'X' - unknown return code, 'x' - return code 0
```

```
Type escape sequence to abort.
L 1 10.10.9.9 4 ms [Labels: 18 Exp: 0]
    local 10.10.10.22 remote 10.10.10.9 vc id 220
! 2 10.10.3.3 4 ms [Labels: 16 Exp: 0]
    local 10.10.10.9 remote 10.10.10.3 vc id 220
```

# Verifying L2VPN VPLS Inter-AS Option B with ping mpls and trace mpls Commands

You can use **ping mpls**and **trace mpls** commands to verify connectivity in configurations using the L2VPN VPLS Inter-AS Option B feature. For end-to-end ping and trace operations, you enter the destination address of the T-PE router at the other end of the pseudowire.

**Note** Some **ping mpls**and **trace mpls**keywords that are available with IPv4 LDP or traffic engineering (TE) are not available with pseudowire.

The following keywords are not available with the **ping mpls pseudowire** command:

- **dsmap**
- **flags**
- **force-explicit-null**
- **output**
- **revision**
- **ttl**

The following keywords are not available with the **trace mpls pseudowire** command:

- **flags**
- **force-explicit-null**
- **output**
- **revision**
- **ttl**

>

## SUMMARY STEPS

1. **ping mpls pseudowire** *destination-address vc-id* [**segment** *segment-number*]
2. **trace mpls pseudowire** *destination-address vc-id* **segment** *segment-number* [*segment-number ]*

## DETAILED STEPS

**Step 1** **ping mpls pseudowire** *destination-address vc-id* [**segment** *segment-number*]
Where:

- *destination-address* is the address of the T-PE2 router at the other end of the pseudowire.
- *vc-id* is the VC ID between T-PE1 and S-PE1.
- **segment** *segment-number* *is optional and specifies the segment you want to ping.*

The following examples use the topology shown in the second figure above:

- To perform an end-to-end ping operation from T-PE1 to T-PE2, enter the following command. destination-*address* is T-PE2 and *vc-id*is the VC between T-PE1 and S-PE1.

**ping mpls pseudowire** *destination-address vc-id*

**Example:**

**Step 2** **trace mpls pseudowire** *destination-address vc-id* **segment** *segment-number* [*segment-number ]*
Where:

- *destination-address* is the address of the T-PE2 router at the other end of the pseudowire.
- *vc-id* is the VC ID between T-PE1 and S-PE1.
- *segment-number* indicates the segment upon which the trace operation will act. If you enter two segment numbers, the traceroute operation will perform a trace on that range of routers.

The following examples use the topology shown in the second figure above:

- To perform a trace operation from T-PE1 to T-PE2, enter the following command. *destination-address*is T-PE2 and *vc-id*is the VC between T-PE1 and S-PE1.

**trace mpls pseudowire** *destination-address vc-id* **segment 2**

This example performs a trace from T-PE1 to T-PE2.

- To perform a trace operation on a range of segments, enter the following command. This example performs a trace from S-PE2 to T-PE2. *destination-address*is S-PE1 and *vc-id* is the VC between T-PE1 and S-PE1.

**trace mpls pseudowire** *destination-address vc-id* **segment 2 4**

# Configuration Examples for L2VPN Multisegment Pseudowires

## Example Configuring an L2VPN Multisegment Pseudowire

The following example does not include all the commands. Unconfigured interfaces are not shown. Portions of the example relevant to L2VPN Multisegment Pseudowires are shown in bold.

### T-PE1 Configuration

```
no ipv6 cef
multilink bundle-name authenticated
frame-relay switching
mpls traffic-eng tunnels
mpls ldp discovery targeted-hello accept
no mpls ip propagate-ttl forwarded
mpls label protocol ldp
!
policy-map exp2
!
interface Loopback0
 ip address 10.131.191.252 255.255.255.255
 no clns route-cache
!
interface Ethernet0/0
 ip address 10.131.191.230 255.255.255.252
 mpls label protocol ldp
 mpls ip
 no clns route-cache
 ip rsvp bandwidth 1500 1500
 ip rsvp signalling dscp 0
!
interface Ethernet1/0
 ip address 10.131.159.246 255.255.255.252
shutdown
 no clns route-cache
!
interface Ethernet2/0
 no ip address
 no cdp enable
!
interface Ethernet2/0.1
 encapsulation dot1Q 1000
 xconnect 10.131.191.251 333 encapsulation mpls
!
router ospf 1
 log-adjacency-changes
 passive-interface Loopback0
 network 10.131.159.244 0.0.0.3 area 0
 network 10.131.191.228 0.0.0.3 area 0
 network 10.131.191.232 0.0.0.3 area 0
 network 10.131.191.252 0.0.0.0 area 0
 network 11.0.0.0 0.0.0.3 area 0
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
!
ip classless
!
no ip http server
!
mpls ldp router-id Loopback0 force
end
```

### S-PE1 Configuration

```
no ipv6 cef
multilink bundle-name authenticated
mpls traffic-eng tunnels
no mpls traffic-eng auto-bw timers
mpls ldp discovery targeted-hello accept
no mpls ip propagate-ttl forwarded
mpls label protocol ldp
!
policy-map exp2
!
l2 vfi sam-sp point-to-point
 neighbor 10.131.191.252 333 encapsulation mpls
 neighbor 10.131.159.251 222 encapsulation mpls
!
interface Tunnel3
 ip unnumbered Loopback0
 shutdown
 mpls label protocol ldp
 mpls accounting experimental input
 mpls ip
 tunnel mode mpls traffic-eng
 tunnel destination 10.131.159.252
 tunnel mpls traffic-eng autoroute announce
 tunnel mpls traffic-eng priority 2 2
 tunnel mpls traffic-eng bandwidth 512
 tunnel mpls traffic-eng path-option 1 dynamic
 no clns route-cache
 service-policy output exp2
!
interface Loopback0
 ip address 10.131.191.251 255.255.255.255
 no clns route-cache
!
interface Ethernet0/0
 ip address 10.131.191.229 255.255.255.252
 mpls traffic-eng tunnels
 mpls label protocol ldp
 mpls ip
 no clns route-cache
 ip rsvp bandwidth 1500 1500
 ip rsvp signalling dscp 0
!
interface Ethernet1/0
 ip address 10.131.159.226 255.255.255.252
 mpls traffic-eng tunnels
 mpls ip
 no clns route-cache
service-policy output exp2
 ip rsvp bandwidth 1500 1500
 ip rsvp signalling dscp 0
!
interface Serial2/0
 ip unnumbered Loopback0
 mpls ip
 no fair-queue
 no keepalive
 serial restart-delay 0
 no clns route-cache
!
router ospf 1
 log-adjacency-changes
 passive-interface Loopback0
 network 10.131.159.224 0.0.0.3 area 0
 network 10.131.191.228 0.0.0.3 area 0
 network 10.131.191.251 0.0.0.0 area 0
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
!
ip classless
```

```
!
end
```

### T-PE2 Configuration

```
no ipv6 cef
no l2tp congestion-control
multilink bundle-name authenticated
frame-relay switching
mpls traffic-eng tunnels
no mpls traffic-eng auto-bw timers frequency 0
mpls ldp discovery targeted-hello accept
no mpls ip propagate-ttl forwarded
mpls label protocol ldp
!
interface Loopback0
 ip address 10.131.159.252 255.255.255.255
 no clns route-cache
!
interface Ethernet0/0
 ip address 10.131.159.230 255.255.255.252
interface Ethernet0/0
 ip address 10.131.159.230 255.255.255.252
 mpls traffic-eng tunnels
 mpls ip
 no clns route-cache
 ip rsvp bandwidth 1500 1500
 ip rsvp signalling dscp 0
!
interface Ethernet1/0
 ip address 10.131.159.245 255.255.255.252
 shutdown
 mpls ip
 no clns route-cache
!
interface Ethernet3/0.1
 encapsulation dot1Q 1000
 xconnect 10.131.159.251 111 encapsulation mpls
!
router ospf 1
 log-adjacency-changes
 passive-interface Loopback0
 network 10.131.122.0 0.0.0.3 area 0
 network 10.131.159.228 0.0.0.3 area 0
 network 10.131.159.232 0.0.0.3 area 0
 network 10.131.159.244 0.0.0.3 area 0
 network 10.131.159.252 0.0.0.0 area 0
 network 11.0.0.0 0.0.0.3 area 0
 network 19.0.0.0 0.0.0.255 area 0
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
end
```

### S-PE2 configuration

```
no ipv6 cef
no l2tp congestion-control
multilink bundle-name authenticated
mpls traffic-eng tunnels
no mpls traffic-eng auto-bw timers frequency 0
mpls ldp discovery targeted-hello accept
no mpls ip propagate-ttl forwarded
mpls label protocol ldp
!
l2 vfi sam-sp point-to-point
 neighbor 10.131.159.252 111 encapsulation mpls
 neighbor 10.131.191.251 222 encapsulation mpls
!
!
```

```
interface Loopback0
 ip address 10.131.159.251 255.255.255.255
!
interface Ethernet0/0
interface Ethernet0/0
 ip address 10.131.159.229 255.255.255.252
 mpls traffic-eng tunnels
 mpls accounting experimental input
 mpls ip
 ip rsvp bandwidth 1500 1500
 ip rsvp signalling dscp 0
!
interface Ethernet1/0
 ip address 10.131.159.225 255.255.255.252
 mpls traffic-eng tunnels
 mpls ip
 ip rsvp bandwidth 1500 1500
 ip rsvp signalling dscp 0
!
router ospf 1
 log-adjacency-changes
 passive-interface Loopback0
 network 10.131.159.224 0.0.0.3 area 0
 network 10.131.159.228 0.0.0.3 area 0
 network 10.131.159.251 0.0.0.0 area 0
 network 19.0.0.0 0.0.0.255 area 0
 mpls traffic-eng router-id Loopback0
 mpls traffic-eng area 0
!
end
```

# Additional References

### Related Documents

| Related Topic | Document Title |
|---|---|
| Cisco IOS commands | Cisco IOS Master Commands List, All Releases |
| MPLS commands | *Cisco IOS Multiprotocol Label Switching Command Reference* |
| Layer 2 VPNS | • Any Transport over MPLS<br>• L2VPN Pseudowire Switching<br>• MPLS LSP Ping/Traceroute for LDP/TE, and LSP Ping for VCCV |
| L2VPN VPLS Inter-AS Option B | L2VPN VPLS Inter-AS Option B |

### Standards

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

### MIBs

| MIB | MIBs Link |
|---|---|
| No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature. | To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:<br>http://www.cisco.com/go/mibs |

### RFCs

| RFC | Title |
|---|---|
| RFC 4379 | http://tools.ietf.org/html/rfc4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures |
| RFC 4447 | Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP) |
| RFC 5085 | Pseudowire Virtual Circuit Connectivity Verification (VCCV) |

### Technical Assistance

| Description | Link |
|---|---|
| The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password. | http://www.cisco.com/cisco/web/support/index.html |

# Feature Information for L2VPN Multisegment Pseudowires

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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

***Table 2: Feature Information for L2VPN Multisegment Pseudowires***

| Feature Name | Releases | Feature Information |
|---|---|---|
| L2VPN Multisegment Pseudowires | 12.2(33)SRE | This feature enables you to configure two or more Layer 2 pseudowire segments that function as a single pseudowire. The feature spans multiple cores or autonomous systems of the same or different carrier networks. |
| MPLS OAM Support for Multisegment Pseudowires | 12.2(33)SRE | This feature enables you to use the **ping mpls** and **trace mpls**commands to verify that all the segments of the MPLS multisegment pseudowire are operating. |
| MPLS OAM Support for L2VPN VPLS Inter-AS Option B | 15.1(1)S | This feature is an enhancement to the MPLS OAM Support for Multisegment Pseudowires feature. This feature allows you to use the **ping mpls** and **trace mpls**commands to verify the pseudowire used in a L2VPN VPLS Inter-AS Option B configuration. |