



VPLS over Backup Pseudowire

Pseudowire redundancy allows you to detect any failure in the network and reroute the Layer 2 service to another endpoint. The other endpoint can continue to provide this service by providing additional backup pseudowire. This feature provides the ability to recover from a failure of either the remote provider edge (PE) router or the link between the PE and customer edge (CE) routers.

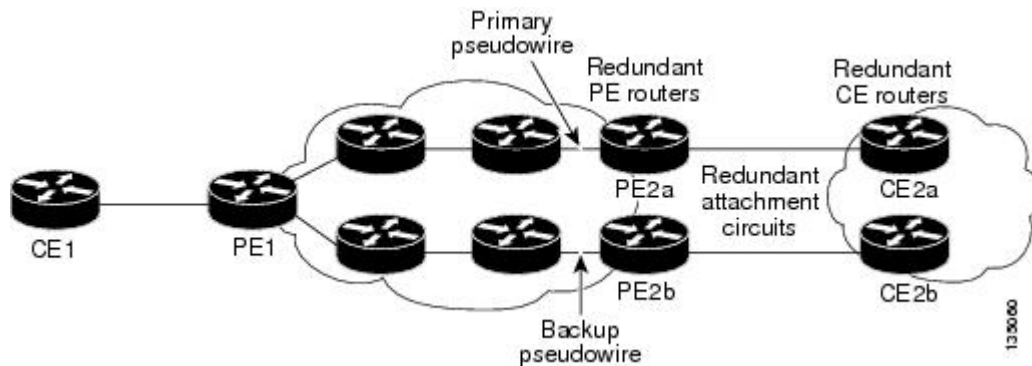
L2VPNs can provide pseudowire resiliency through their routing protocols. When the connectivity between the end-to-end PE routers fails, an alternative path to the directed LDP session and the user data takes over. However, there are some parts of the network in which this rerouting mechanism does not protect against interruptions in service.

RSP3 implementation reuses the EoMPLS configuration to achieve VPLS over the backup pseudowire functionality. The expected convergence in virtual circuit switchover and fallback is approximately 200-300 ms, which increases with scale configuration because only active pseudowire is programmed in hardware.

These are some scenarios in which pseudowire switchover takes place:

- Core link flap
- Access link flap
- Default access interface
- Remote loopback interface flap
- LDP disable or enable
- Control Word change
- VPN ID change within pseudowire configuration
- Cable pull
- Core side interface module reload
- Core side BFD flap (if configured)
- Core side IGP down
- Remote PE or P node reload or crash

Figure 1: Sample Topology for VPLS over Backup Pseudowire Deployment Scenario



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Prerequisites for VPLS over Backup Pseudowire

- IGP and LDP should be up and running between peer devices.
- MTU must be manually configured for MPLS enabled interfaces.

Restrictions for VPLS over Backup Pseudowire

- Only one active and one backup pseudowire (PW) for each bridge domain (BD) is supported.
- Hierarchical Virtual Private Lan Service (HVPLS) is not supported.
- VPLS with BGP auto discovery is not supported.
- 1000 active PW with one backup PW for each VPLS session is supported.
- This feature is supported only with the new VPLS configuration model (on all the PE nodes).
- VFIs configured with the old configuration model cannot coexist with the VFIs of the new configuration model on the same BD.
- The member BDI should not be in the same group as the PW under l2vpn xconnect context configuration.
- More than two PW should not be configured in L2VPN context.
- In an L2VPN cross-connect context, the member BDI and the member physical interface cannot be configured at the same time. It leads to error objects.
- The maximum scale for VPLS session is 1000.
- The BDI used for this feature should not be configured with any IP configuration like MPLS IP, DHCP IP, or static IP.

- Routed PW cannot be configured because BDI interface cannot be configured with IP address.

Convergence Time for the VPLS Sessions

Table 1: Convergence Time (in Milliseconds) with One VPLS Session

Packet Size (Bytes)	Convergence Time (approximate)	Type Of Packet
64	213	IP
128	186	IP
256	173	IP
512	170	IP
1028	186	IP
1400	167	IP

Table 2: Convergence Time (in Milliseconds) with Multiple VPLS Session

Number of Virtual Circuits	Scenario	Convergence Time (approximate)
10	Active Down	373.56
	Reoptimization	15.73
100	Active Down	1880
	Reoptimization	517.93

VPLS over Backup Pseudowire Configuration

The following example shows the configuration on provider edge (PE) router 1 having two links to PE router 2 with IP address 209.165.200.225 and PE router 3 with IP address 209.165.200.226:

Configuration on PE router 1:

```
interface GigabitEthernet0/2/3
  no ip address
  negotiation auto
  service instance 1 ethernet
    encapsulation dot1q 1
    rewrite ingress tag pop 1 symmetric
!
bridge-domain 1000
  member GigabitEthernet0/2/3 service-instance 1
!
interface pseudowire10
  encapsulation mpls
  neighbor 209.165.200.225 1000
!
```

```

interface pseudowire20
  encapsulation mpls
  neighbor 209.165.200.226 2000
!
interface BDI1000
  no ip address
!
l2vpn xconnect context VC_1
  member BDI1000
  member pseudowire10 group Grp_1 priority 1
  member pseudowire20 group Grp_1 priority 2

```

Configuration on PE router 2:

```

interface GigabitEthernet0/2/4
  no ip address
  carrier-delay msec 0
  negotiation auto
  service instance 1 ethernet
    encapsulation dot1q 1
    rewrite ingress tag pop 1 symmetric!
bridge-domain 1
  member GigabitEthernet0/2/4 service-instance 1
!
interface pseudowire10
  encapsulation mpls
  neighbor 209.165.200.224 10
!
interface BDI1
  no ip address
!
l2vpn xconnect context VC_1
  member BDI1
  member pseudowire10 group Grp_1 priority 1

```

Configuration on PE router 3:

```

interface GigabitEthernet0/2/0
  no ip address
  carrier-delay msec 0
  negotiation auto
  service instance 1 ethernet
    encapsulation dot1q 1
    rewrite ingress tag pop 1 symmetric
!
bridge-domain 1
  member GigabitEthernet0/2/0 service-instance 1
!
interface pseudowire10
  encapsulation mpls
  neighbor 209.165.200.224 20
!
interface BDI1
  no ip address
!
l2vpn xconnect context VC_1
  member BDI1
  member pseudowire10 group Grp_1 priority 1

```

Verify VPLS over Backup Pseudowire Configuration

Use the following commands to verify the VPLS over backup pseudowire configuration on the PE router 1 head node:

```
PE1#show mpls l2transport vc
Local intf      Local circuit          Dest address      VC ID      Status
-----
BD1000          Eth VLAN 1000          209.165.200.225  1000       UP
BD1000          Eth VLAN 1000          209.165.200.226  2000       STANDBY
```

```
PE1#show mpls l2transport vc 1000 detail
Local interface: BD1000 up, line protocol up, Eth VLAN 1000 up
Interworking type is Ethernet
Destination address: 209.165.200.225, VC ID: 1000, VC status: up
Output interface: Gi0/2/5, imposed label stack {24 24}
Preferred path: not configured
Default path: active
Next hop: 192.168.1.2
Create time: 00:08:46, last status change time: 00:07:14
Last label FSM state change time: 00:07:12
Signaling protocol: LDP, peer 209.165.200.225:0 up
Targeted Hello: 209.165.200.227(LDP Id) -> 209.165.200.225, LDP is UP
Graceful restart: configured and enabled
Non stop routing: configured and enabled
Status TLV support (local/remote) : enabled/supported
LDP route watch : enabled
Label/status state machine : established, LruRru
Last local dataplane status rcvd: No fault
Last BFD dataplane status rcvd: Not sent
Last BFD peer monitor status rcvd: No fault
Last local AC circuit status rcvd: No fault
Last local AC circuit status sent: No fault
Last local PW i/f circ status rcvd: No fault
Last local LDP TLV status sent: No fault
Last remote LDP TLV status rcvd: No fault
Last remote LDP ADJ status rcvd: No fault
MPLS VC labels: local 24, remote 24
Group ID: local n/a, remote 0
MTU: local 1500, remote 1500
Remote interface description:
Sequencing: receive disabled, send disabled
Control Word: On (configured: autosense)
SSO Descriptor: 209.165.200.225/1000, local label: 24
Dataplane:
SSM segment/switch IDs: 4186/4180 (used), PWID: 6
VC statistics:
transit packet totals: receive 0, send 0
transit byte totals: receive 0, send 0
transit packet drops: receive 0, seq error 0, send 0
```

```
PE1#show mpls l2transport vc 2000 detail
Local interface: BD1000 up, line protocol up, Eth VLAN 1000 up
Interworking type is Ethernet
Destination address: 209.165.200.226, VC ID: 2000, VC status: standby
Output interface: Gi0/2/1, imposed label stack {21 16}
Preferred path: not configured
Default path: active
Next hop: 192.168.3.2
Create time: 00:08:51, last status change time: 00:08:51
```

Verify VPLS over Backup Pseudowire Configuration

```

Last label FSM state change time: 00:05:40
Signaling protocol: LDP, peer 209.165.200.226:0 up
Targeted Hello: 209.165.200.227(LDP Id) -> 209.165.200.226, LDP is UP
Graceful restart: configured and enabled
Non stop routing: configured and enabled
Status TLV support (local/remote)   : enabled/supported
  LDP route watch                    : enabled
  Label/status state machine         : established, LrdRru
  Last local dataplane               status rcvd: No fault
  Last BFD dataplane                 status rcvd: Not sent
  Last BFD peer monitor               status rcvd: No fault
  Last local AC circuit               status rcvd: DOWN(standby)
  Last local AC circuit               status sent: No fault
  Last local PW i/f circ               status rcvd: No fault
  Last local LDP TLV                  status sent: DOWN(standby)
  Last remote LDP TLV                 status rcvd: No fault
  Last remote LDP ADJ                 status rcvd: No fault
MPLS VC labels: local 25, remote 16
Group ID: local n/a, remote 0
MTU: local 1500, remote 1500
Remote interface description:
Sequencing: receive disabled, send disabled
Control Word: On (configured: autosense)
SSO Descriptor: 209.165.200.226/2000, local label: 25
Dataplane:
  SSM segment/switch IDs: 12382/8277 (used), PWID: 7
VC statistics:
  transit packet totals: receive 0, send 0
  transit byte totals:  receive 0, send 0
  transit packet drops:  receive 0, seq error 0, send 0

```

```

PE1#show bridge-domain 1000
Bridge-domain 1000 (3 ports in all)
State: UP                               Mac learning: Enabled
Aging-Timer: 300 second(s)
Maximum address limit: 65534
  BDI1000 (up)
  GigabitEthernet0/2/3 service instance 1
  BDI1000 service instance 1

```

PE1#show l2vpn service all detail

```

Legend: St=State      XC St=State in the L2VPN Service      Prio=Priority
         UP=Up        DN=Down                               AD=Admin Down    IA=Inactive
         SB=Standby   HS=Hot Standby                       RV=Recovering    NH=No Hardware
         m=manually selected

```

Interface	Group	Encapsulation	Prio	St	XC	St
-----	----	-----	----	--	----	-----
VPWS name: VC_1, State: UP						
pw1000	Grp_1	209.165.200.225:1000(MPLS)		1	UP	UP
		Local VC label 24				
		Remote VC label 24				
pw2000	Grp_1	209.165.200.226:2000(MPLS)		2	SB	IA
		Local VC label 25				
		Remote VC label 16				
BD1000		BD1000:1000(Eth VLAN)	0	UP	UP	
		Interworking: ethernet				

```
PE1#show l2vpn service all
```

Legend: St=State XC St=State in the L2VPN Service Prio=Priority
 UP=Up DN=Down AD=Admin Down IA=Inactive
 SB=Standby HS=Hot Standby RV=Recovering NH=No Hardware
 m=manually selected

Interface	Group	Encapsulation	Prio	St	XC	St
-----	-----	-----	----	--	-----	-----
VPWS name: VC_1, State: UP						
pw1000	Grp_1	209.165.200.225:1000(MPLS)			1	UP UP
pw2000	Grp_1	209.165.200.226:2000(MPLS)			2	SB IA
BD1000		BD1000:1000(Eth VLAN)	0	UP		UP

