MPLS over Routed Pseudowire

Note This feature is supported only on the Cisco RSP3 Module.

Routed pseudowire provides the ability to route layer 3 in addition to the layer 2 bridge frames to and from pseudowire. Routed pseudowire is configured by assigning IP address under the bridge domain interface (BDI) in addition to the **vfi** command.

Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP), and Border Gateway Protocol (BGP) configurations are supported over routed pseudowire BDI.

Restrictions for MPLS over Routed Pseudowire

- IPv6 traffic is not supported over routed pseudowire.
- Loop Free Alternate/Remote Loop Free Alternate feature is not supported over routed pseudowire.
- Bidirectional Forwarding (BFD) is not supported over routed pseudowire.
- Precision Time Protocol (PTP) is not supported over routed pseudowire.
- QoS is not supported over routed pseudowire.
- Multicast is not supported over routed pseudowire.
- Virtual Router Redundancy Protocol (VRRP) and Hot Standby Redundancy Protocol (HSRP) is not supported over routed pseudowire.
- Access control lists (ACL) is not supported over routed pseudowire.

Configuring MPLS over Routed Pseudowire and VPLS

```
l2 vfi VPLS100 manual
 vpn id 100
 bridge-domain 100
 neighbor 4.4.4.4 encapsulation mpls
!

interface BDI100
 ip address 192.0.41.1 255.255.255.0
 ip ospf network point-to-point
 mpls ip
!
```

MPLS over Routed Pseudowire and BDI Configuration

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface bdi** *bdi-number*
4. **ip address** *ip address subnet mask*
5. **mpls ip**
6. **no shut**
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface bdi** *bdi-number* **Example:** `Router(config)# interface bdi 3000`	Configures the bridge domain interface.
Step 4	**ip address** *ip address subnet mask* **Example:** `Router(config-if)# ip address 209.165.201.10 255.255.255.224`	Specifies the IP address for the bridge domain.

	Command or Action	Purpose
Step 5	**mpls ip** **Example:** `Router(config-if)# mpls ip`	Enables MPLS support over bridge domain interface.
Step 6	**no shut** **Example:** `Router(config-if)# no shutdown`	Enables the bridge domain interface.
Step 7	**end** **Example:** `Router(config-if)# end`	Exits interface configuration mode.

Verify MPLS over Routed Pseudowire BDI Configuration

The following command shows the virtual circuit operational status:

```
router#show mpls l2transport vc

Local intf       Local circuit              Dest address    VC ID      Status
-------------  -------------------------- --------------- ---------- ----------
VFI VPLS100       vfi                          209.165.201.1        100       UP


R1-Act#show mpls l2transport summary
Destination address: 209.165.201.1, total number of vc: 1167
  0 unknown, 1167 up, 0 down, 0 admin down, 0 recovering, 0 standby, 0 hotstandby
1167 ive vc on MPLS interface Te0/2/8
```

The following command shows the virtual circuit details:

```
router#show mpls l2transport vc 100 detail
Local interface: VFI VPLS100 vfi up
  Interworking type is Ethernet
  Destination address: 209.165.201.1, VC ID: 100, VC status: up
    Output interface: Te0/2/8, imposed label stack {1204 794}
    Preferred path: not configured
    Default path: active
    Next hop: 209.165.201.10
  Create time: 1d17h, last status change time: 1d17h
    Last label FSM state change time: 1d17h
  Signaling protocol: LDP, peer 209.165.201.1:0 up
    Targeted Hello: 209.165.201.2(LDP Id) -> 209.165.201.1, 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 2352, remote 794
    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: 209.165.201.1/100, local label: 2352
  Dataplane:
    SSM segment/switch IDs: 25556223/16931917 (used), PWID: 2337
  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
```

The following command shows the virtual forwarding instance details:

```
router#show l2vpn vfi detail
Legend: RT=Route-target, S=Split-horizon, Y=Yes, N=No

VFI name: VPLS100, state: up, type: multipoint, signaling: LDP
  VPN ID: 100
  Bridge-Domain 100 attachment circuits:
  Pseudo-port interface: pseudowire100001
  Interface          Peer Address     VC ID        S
  pseudowire100002   209.165.201.1         100         Y
```

The following command shows the MPLS LDP neighbor details:

```
router#show mpls ldp neighbor
    Peer LDP Ident: 209.165.201.1:0; Local LDP Ident 209.165.201.2:0
        TCP connection: 209.165.201.1.26053 - 209.165.201.2.646
        State: Oper; Msgs sent/rcvd: 7022/5737; Downstream
        Up time: 2d01h
        LDP discovery sources:
          TenGigabitEthernet0/2/8, Src IP addr: 209.165.201.5
          Targeted Hello 209.165.201.2 -> 209.165.201.6, active, passive
        Addresses bound to peer LDP Ident:
          209.165.201.1   209.165.201.3     209.165.201.4      209.165.201.5
          192.0.45.2      192.0.43.2      192.0.49.2      192.0.50.2
          192.0.56.2      192.0.55.2      192.0.62.2      192.0.48.2
          192.0.61.2      192.0.41.2      192.0.46.2      192.0.52.2
          192.0.63.2      192.0.60.2      192.0.57.2      192.0.58.2
          192.0.64.2      192.0.47.2      192.0.54.2      192.0.59.2
          192.0.51.2      192.0.42.2      192.0.65.2      192.0.44.2
          192.0.53.2
```

The following command shows the label allocated by the LDP protocol:

```
router#show mpls ldp bindings
  lib entry: 209.165.201.7/24, rev 27617
        local binding:  label: imp-null
        remote binding: lsr: 209.165.201.1:0, label: imp-null
```

The following command shows the LFIB entries:

```
router#show mpls forwarding-table
Local      Outgoing   Prefix           Bytes Label   Outgoing   Next Hop
Label      Label      or Tunnel Id     Switched      interface
3543       1206       210.210.210.0/24 0             BD2778     209.165.201.10
```

The following command shows the PI CEF chain:

```
router#show ip cef 209.165.202.129 internal
209.165.201.7/24, epoch 3, flags [att, cnn, cover, deagg], RIB[C], refcnt 6, per-destination
 sharing
  sources: RIB
  feature space:
    IPRM: 0x0003800C
    Broker: linked, distributed at 2nd priority
    LFD:  209.165.201.7/24 0 local labels
        contains path extension list
  subblocks:
    gsb Connected chain head(1): 0x4E597FA0
    Covered dependent prefixes: 2
      need deagg: 2
  ifnums:
    BDI100(37)
  path list 4DF8B8A8, 3 locks, per-destination, flags 0x49 [shble, rif, hwcn]
    path 4DC54A08, share 1/1, type connected prefix, for IPv4
      MPLS short path extensions: [none] MOI flags = 0x1 label implicit-null
      connected to BDI100, glean
  output chain:
    glean
```

The following command shows the hardware programming for VPLS pseudowire:

```
router#show platform hardware pp active pw vpls
pw             : VFI557085844    bdomain         : 100        vsi       : 0x3
peer_ip        : 209.165.201.1        vc_id           : 100        has_cw    : 1
STP            : FWD             status          : Enabled     sh_group  : 0
local_label    : 17              remote_label    : 16          sh_type   : Hub
imp_oce        : 0x28116624      disp_oce        : 0x25D9A014  label_oce : 0x288241CC
pwe_lif        : 0x95FE          psn_fec         : 0x200004B1  encap_id  : 0x95FE
dest_gport     : 0x6C0000D1      ing_gport       : 0x189095FE  egr_gport : 0x18A095FE
imp_flow_label : No              disp_flow_label : No
```

The following command shows the BGP neighbourship status:

```
router#show ip bgp summary
BGP router identifier 13.13.13.13, local AS number 100
BGP table version is 9, main routing table version 9
8 network entries using 1152 bytes of memory
11 path entries using 968 bytes of memory
6/6 BGP path/bestpath attribute entries using 1008 bytes of memory
4 BGP rrinfo entries using 96 bytes of memory
2 BGP community entries using 48 bytes of memory
34 BGP extended community entries using 1360 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4632 total bytes of memory
BGP activity 42/0 prefixes, 239/0 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
209.165.202.129      4          100    1117    1122        9    0    0 16:49:00        0
```

Note With scaled up OSPF interfaces over router pseudowire, there is a possibility of OSPF PDU size going beyond egress interface default MTU, causing instability in OSPF adjacency. Hence, it is recommended to have higher egress interface MTU (> 1540 byte) over which the above sessions are created.