L2VPN over SR-TE Preferred Path

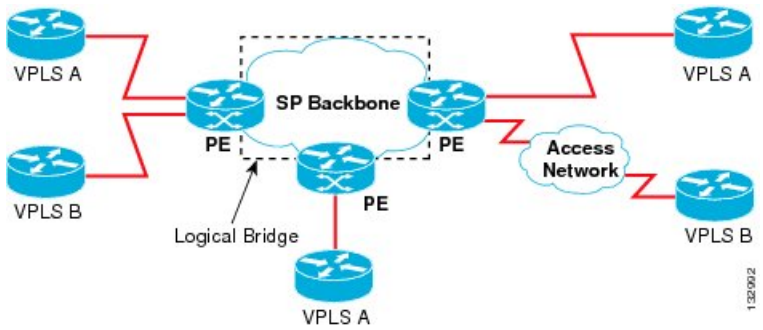
Table 1: Feature History

Feature Name	Release Information	Description
L2VPN over SR-TE Preferred Path	Cisco IOS XE Bengaluru 17.4.1	This feature allows you to configure an SR policy as the preferred path for a EoMPLS or VPLS pseudowire. EoMPLS or VPLS pseudowires between same PEs can be routed over different SR policies based on the requirements. Prior to this release, you could only steer the traffic using the SR policy for routing IPv4 traffic to a destination pseudowire (over IGP or BGP-LU).

Virtual Private LAN Services (VPLS) enables enterprises to link together multiple Ethernet-based LANs via the infrastructure provided by their service provider.

VPLS uses the service provider core to join multiple attachment circuits of an enterprise to simulate a virtual bridge. From the enterprise point of view, there is no topology for VPLS. All customer edge (CE) devices appear to connect to a logical bridge emulated by the service provider core.

Figure 1: VPLS Topology



Prior to Cisco IOS XE Bengaluru Release 17.4.1, L2VPN (VPLS or EoMPLS) traffic over SR policies could not be steered. You could only steer IPv4 traffic using the SR policy for routing IPv4 traffic to a destination pseudowire (over IGP or BGP-LU).

With Cisco IOS XE Bengaluru Release 17.4.1, you can now configure an SR policy as the preferred path for a EoMPLS or VPLS pseudowire. EoMPLS or VPLS pseudowires between same PEs can also be routed over different SR policies.

Note For SR labels till five, on the Cisco RSP3 module, you must use the **sr_5_label_push_enable** template to enable L2VPN over SR-TE preferred path.

Disable Fallback Option

The disable fallback option disables the router from using the default path when the preferred path SR policy goes down.

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Restrictions

- A traffic loss of approximately 10 seconds is observed while removing the preferred path configuration.
- NETCONF-YANG data model does *not* support template-based configuration.
- You cannot add On-Demand (ODN) policies to the preferred path.
- On the Cisco ASR 900 RSP3 module, you cannot use additional templates to support VPLS stats.
- The maximum number of SR labels supported is five. This includes one or two SR service labels.
- L2VPN over SR-TE preferred path is *only* supported on SR Per Destination Policy (PDP); and not on the SR Per-Flow Policy (PFP).
- L2VPN over SR-TE preferred path can *only* be configured using the pseudowire interface.

Configuring L2VPN over SR-TE Preferred Path

You must create the SR static policy to configure L2VPN over SR-TE preferred path.

To create SR static policy for MPLS label:

```
configure terminal
segment-routing traffic-eng
 segment-list name segment-name
  index 1 mpls label first hop label
  index 2 mpls label second hop label
 !
 policy policy-name
  color color-code end-point destination IP Address
```

```
candidate-paths
 preference preference
  explicit segment-list segment-name
  constraints
   segments
    dataplane mpls
```

You can also create SR static policy for the following:

- MPLS adjacency
- MPLS prefix

L2VPN over SR-TE preferred path can be configured in the following ways:

- Non-Template based Configuration
- Template-based Configuration

Non-template Based Configuration:

- **Create Pseudowire**

  To create pseudowire:

  ```
  interface pseudowire 1
   encapsulation mpls
   neighbor peer-address vc-id
  ```

- **Attach Policy Using Preferred Path**

  To attach a policy using the preferred path:

  ```
  interface pseudowire1
   preferred-path segment-routing traffic-eng policy policy-name [disable-fallback]
  ```

Template-based Configuration:

- **Create Template Type Pseudowire**

  To create template type pseudowire:

  ```
  template type pseudowire name
   encapsulation mpls
   preferred-path segment-routing traffic-eng policy name [disable-fallback]
  ```

- **Attach Policy Using Preferred Path**

  To attach a policy using the preferred path:

  ```
  interface pseudowire 1
   source template type pseudowire name
  ```

Configuration Example: L2VPN over SR-TE Preferred Path

This example shows how to configure L2VPN over SR-TE preferred path.

```
!
segment-routing traffic-eng
 segment-list name CE11-PE12-Seg
  index 1 mpls label 16005
  index 2 mpls label 16008
```

```
  index 3 mpls label 16010
 !
 policy CE11-PE12
  color 50 end-point 12.12.12.12
  candidate-paths
   preference 100
    explicit segment-list Inter_IGP
    !
    constraints
     segments
      dataplane mpls
!
interface pseudowire1000
 encapsulation mpls
 signaling protocol ldp
 neighbor 12.12.12.12 1000
 preferred-path segment-routing traffic-eng policy CE11-PE12
!
l2vpn vfi context VC_1000
 vpn id 1000
 member pseudowire1000
bridge-domain 1000
member GigabitEthernet0/1/0 service-instance 1000
member vfi VC_1000
!
```

Verification of L2VPN over SR-TE Preferred Path Configuration

Use the **show segment-routing traffic-eng policy name** *policy name* **detail** command to verify the policy configuration:

```
Router#show segment-routing traffic-eng policy name CE11-PE12 detail

Name: CE11-PE12 (Color: 50 End-point: 12.12.12.12)
  Owners : CLI
  Status:
    Admin: up, Operational: up for 70:04:00 (since 08-17 07:55:36.536)
  Candidate-paths:
    Preference 100 (CLI):
      Explicit: segment-list IntraDomain (active)
        Weight: 1, Metric Type: TE
16005
16008
16010
Attributes:
    Binding SID: 20
      Allocation mode: dynamic
      State: Programmed
  Tunnel ID: 65538 (Interface Handle: 0x20)
  Per owner configs:
    CLI
      Binding SID: dynamic
  Stats:
    Packets: 0  Bytes: 0

  Event history:
    Timestamp                  Client                  Event type              Context:
Value
    ----------------           ------                  --------------
---------: ---------
    10-28 04:05:37.028         L2VPN                   Policy created          Name: L2VPN
```

```
    10-28 04:05:37.048          L2VPN                   BSID allocated           FWD: label
 20
    10-28 04:05:37.494          L2VPN                    Client removed           Owner:
Destroyed
    10-28 04:05:37.494          CLI                      Set colour                 Colour:
 230
    10-28 04:05:37.494          CLI                      Set end point            End-point:
 12.12.12.12
    10-28 04:05:37.496          CLI                     Set explicit path       Path option:
 IntraDomain
    10-28 04:08:22.873          FH Resolution            Policy state UP          Status:
PATH RESOLVED
    10-28 04:08:45.630          FH Resolution            REOPT triggered          Status:
REOPTIMIZED
```

Use **show mpls l2transport vc 1000 detail** command to verify the L2VPN over SR-TE preferred path:

```
Router#show mpls l2transport vc 1000 detail
Local interface: VFI VC_1000 vfi up
  Interworking type is Ethernet
  Destination address: 12.12.12.12, VC ID: 1000, VC status: up
    Output interface: tu65538, imposed label stack {16005 16008 16010 32}
    Preferred path: not configured
    Default path: active
    Next hop: 182.168.1.1
  Create time: 1w4d, last status change time: 22:50:57
    Last label FSM state change time: 22:51:46
  Signaling protocol: LDP, peer 10.0.0.1:0 up
    Targeted Hello: 2.2.2.2(LDP Id) -> 10.0.0.1, LDP is UP
    Graceful restart: not configured and not enabled
    Non stop routing: not configured and not 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 26, remote 21
    Group ID: local n/a, remote 16
    MTU: local 9000, remote 9000
    Remote interface description:
    MAC Withdraw: sent:0, received:301
  Sequencing: receive disabled, send disabled
  Control Word: On (configured: autosense
```