L2VPN over SR-TE Preferred Path

Table 1: Feature History

Feature Name	Release Information	Description
L2VPN Traffic Steering Using SR-TE Preferred Path with Flexible Algorithm	Cisco IOS XE Bengaluru 17.6.1	This feature allows you to configure an SR policy with as the preferred path for a VPWS or VPLS pseudowire, with Flexible Algorithm. VPWS 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.

Prior to Cisco IOS XE Bengaluru Release 17.6.1, L2VPN (VPLS or VPWS) 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).

Now you configure an SR policy as the preferred path for a VPWS or VPLS pseudowire, with Flexible Algorithm. VPWS or VPLS pseudowires between same PEs can also be routed over different SR policies.

Disable Fallback Option

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

- Restrictions, on page 2
- Configuring L2VPN Traffic Steering Using SR-TE Preferred Path with Flexible Algorithm, on page 2
- Configuration Example 1: VPWS Psuedowire over SR-TE Preferred Path, on page 4
- Configuration Example 2: VPWS Psuedowire over SR-TE Preferred Path, on page 4

• Configuration Example 3: VPLS Psuedowire over SR-TE Preferred Path, on page 5
• Verification of L2VPN over SR-TE Preferred Path Configuration, on page 5

Restrictions

- You cannot add On-Demand (ODN) policies to the preferred path.
- 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.
- This feature is supported only on IS-IS protocol

Configuring L2VPN Traffic Steering Using SR-TE Preferred Path with Flexible Algorithm

To configure IS-IS with Flex Algo:

```
router isis 1

affinity-map green bit-position 0
affinity-map red bit-position 1
affinity-map yello bit-position 2
flex-algo 128
  advertise-definition
  metric-type delay
  priority 200
  affinity
   exclude-any
    name red
    name yellow
!
flex-algo 129
  advertise-definition
  priority 200
  affinity
   exclude-any
    name green
    name red



interface Tunnel100
isis affinity flex-algo
  name green
  !
interface Tunnel101
isis affinity flex-algo
  name yellow
 !
interface Tunnel102
isis affinity flex-algo
  name red
```

```
segment-routing traffic-eng
 policy p-2000
  color 2000 end-point 10.4.4.4
  performance-measurement
   delay-measurement
  candidate-paths
   preference 10
    constraints
     segments
      dataplane mpls
      algorithm 128
     !
     !
    !
    dynamic
```

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 1: VPWS Psuedowire over SR-TE Preferred Path

```
!
interface
gi0/0/1
service instance 1000
ethernet encapsulation
dot1q 1000 !
template type pseudowire l2vpntest
 encapsulation mpls
preferred-path Segment-Routing traffic-eng policy p106
l2vpn xconnect context l2vpn-test
member 10.6.6.6 1000 template
l2vpntest member gi0/0/1
service-instance 1000  !
```

Configuration Example 2: VPWS Psuedowire over SR-TE Preferred Path

```
!
!
interface gi0/0/1
service instance 1000 ethernet
 encapsulation dot1q 1000
 !
template type pseudowire
l2vpntest encapsulation mpls
preferred-path Segment-Routing traffic-eng policy p106 !

interface pseudowire1000
 source template type pseudowire l2vpntest
encapsulation mpls  neighbor 10.1.1.1 1000 !

l2vpn xconnect context l2vpn-test
member pseudowire 1000
 member gi0/0/1 service-instance 1000
```

Configuration Example 3: VPLS Psuedowire over SR-TE Preferred Path

```
interface gi0/0/1

service instance 1000
ethernet   encapsulation
dot1q 1000 !

interface pseudowire106
encapsulation mpls
 neighbor 10.6.6.6 1000

 preferred-path Segment-Routing traffic-eng policy p106 !
interface pseudowire104
 encapsulation mpls
  neighbor 10.4.4.4 1000

preferred-path Segment-Routing traffic-eng policy p104
 !
l2vpn vfi context VC_1000   vpn id 1000  member
 pseudowire106  member pseudowire104
!

bridge-domain 1000

member gi0/0/1 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: 10.12.12.12)
  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: 10.12.12.12, 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: 10.168.1.1
  Create time: 1w4d, last status change time: 22:50:57
    Last label FSM state change time: 22:51:46
  Signaling protocol: LDP, peer 10.1.1.1:0 up
    Targeted Hello: 10.2.2.2(LDP Id) -> 10.1.1.1, 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
```