

Segment Routing over MPLS

Table 1: Feature History Table

Feature name	Release information	Feature description
Segment Routing over MPLS	Release 26.2.1	Starting from Cisco IOS XE Release 26.2.1, you can configure Segment Routing over Multiprotocol Label Switching (SR-MPLS) on supported WAN ports. SR-MPLS encodes an ordered list of segments in the packet and integrates with MPLS services such as Layer 3 VPN and Ethernet VPN.

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Segment Routing over MPLS

Segment Routing over Multi-protocol Label Switching (SR-MPLS) on WAN ports is a routing architecture that provides a flexible and scalable approach to source routing. It allows the source to define a path and encode it in the packet header as an ordered list of segments. Each segment is identified by a Segment ID (SID). When operating using the MPLS dataplane, segment routing integrates with the multi-service capabilities of MPLS, including Layer 3 VPN (L3VPN) and Ethernet VPN (EVPN).

Note SR-MPLS is applied specifically to the WAN ports of the supported routers. Ensure the WAN interfaces are active and configured with the appropriate routing protocols (OSPF or IS-IS) before proceeding.

Benefits of using SR-MPLS

SR-MPLS helps in:

- Scalability: The network does not need to maintain per-application or per-flow states.
- Traffic Engineering: Offers lower latency and more effective bandwidth utilization than traditional MPLS networks.
- Automatic Protection: Provides automatic traffic protection against link and node failures without requiring additional signaling.

Prerequisites

Before configuring SR-MPLS on your router, you must ensure that:

- Cisco Catalyst routers with active WAN ports are used.
- The software image supports SR-MPLS configuration for these routers.
- Intermediate System to Intermediate System (IS-IS) and Open Shortest Path First (OSPF) routing protocols are enabled and configured for SR-MPLS operation.

Configure Segment Routing over MPLS

Use this task to enable SR-MPLS mode.

Procedure

Step 1 Use the **configure terminal** command to enter the global configuration mode.

Example:

```
Router# configure terminal
```

Step 2 Use the **segment-routing mpls** command to enable segment routing MPLS.

Example:

```
Router(config)# segment-routing mpls
```

Step 3 Use the **global-block** *start-range end-range* command to enable Segment Routing Global Block (SRGB) to define the label range for Prefix-SIDs.

Example:

```
Router(config)# global-block 16000 23999
```

For more information, see Segment Routing Global Block

Step 4 Use the **connected-prefix-sid-map** command to enter the sub-mode for configuring address-family specific mappings.

Example:

```
Router(config-srmpls)# connected-prefix-sid-map
```

Step 5 Use the **address-family** *ipv4* command to specify the IPv4 address family.

Example:

```
Router(config-srmpls-conn)# address-family ipv4
```

Step 6 Use the *ip-address/mask* **index** *sid-index* **range** *range-value* command to associate a Segment Identifier (SID) with the IP address.

Example:

```
Router(config-srmpls-conn-af)# 4.4.4.4/32 index 4 range 1
```

Step 7 Use the **exit-address-family** command to exit the address family configuration mode and return to the **connected-prefix-sid-map** sub-mode.

Example:

```
Router(config-srmpls-conn-af)# exit-address-family
```

Configure Segment Routing MPLS on OSPF network

Use this task to define the network topology, select OSPF as the control protocol, and configure the necessary SID mappings.

Procedure

Step 1 Use the **configure terminal** command to enter global configuration mode.

Example:

```
Router# configure terminal
```

Step 2 Use the **router ospf** *process-id* command to enable the OSPF routing process.

Example:

```
Router(config)# router ospf 10
```

Step 3 Use the **router-id** *id* command to manually configure the OSPF router ID.

Example:

```
Router(config-router)# router-id 10.0.0.1
```

Step 4 Use the **segment-routing mpls** command to enable segment routing under the OSPF process.

Example:

```
Router(config-router)# segment-routing mpls
```

Step 5 Use the **segment-routing area** *area-id* **mpls** command to configure segment routing MPLS mode for a specific OSPF area.

Example:

```
Router(config-router)# segment-routing area 0 mpls
```

Configure Prefix-SID for OSPF

This task allows you to map a specific Prefix-SID to a loopback or interface address. Mapping the Prefix-SID to a loopback address creates a Node-SID, which serves as the node's unique identity. This enables other routers to forward traffic to this specific prefix using the associated SID label.

Before you begin

Ensure that segment routing is enabled on the corresponding address family.

Procedure

Step 1 Use the **configure terminal** command to enter global configuration mode.

Example:

```
Router# configure terminal
```

Step 2 Use the **segment-routing mpls** command to enable segment routing MPLS mode.

Example:

```
Router(config)# segment-routing mpls
```

Step 3 Use the **connected-prefix-sid-map** command to enter the sub-mode for configuring address-family specific mappings.

Example:

```
Router(config-srmpls)# connected-prefix-sid-map
```

Step 4 Use the **address-family** *ipv4* command to specify the IPv4 address family.

Example:

```
Router(config-srmpls-conn)# address-family ipv4
```

Step 5 Use the *ip-address/mask* **index** *sid-index* **range** *range-value* command to associate a SID with the specified IPv4 prefix.

Example:

```
Router(config-srmpls-conn-af)# 10.1.1.1/32 index 100 range 1
```

Step 6 Use the **exit** command to exit to global configuration mode.

Example:

```
Router(config-srmpls-conn-af)# exit
```

Verify SR-MPLS configuration

Use this task to validate connectivity, path establishment, and resilience of your SR-MPLS deployment.

Before you begin

Verify the node SID reachability to ensure each node in the SR-MPLS domain can reach its designated node SID.

Procedure

Step 1 Use the **show segment-routing mpls connected-prefix-sid-map local ipv4** command to verify the SR-MPLS configuration on the router.

Example:

```
Router# show segment-routing mpls connected-prefix-sid-map local ipv4
```

Step 2 Use the **show mpls forwarding-table** command to check the MPLS label table.

Example:

```
Router# show mpls forwarding-table
```

Step 3 Use the **ping mpls** command to validate the end-to-end connectivity between critical devices.

Note

- You can simulate link or node failures to ensure traffic is automatically rerouted along available alternate paths.
- You can also test adjacency SID reachability between adjacent nodes.