Provision SR-MPLS Policies

Note

- SRv6 policies cannot be provisioned using Crosswork Optimization Engine.
- Throughout this section, the navigation is documented as **Traffic Engineering** > **Traffic Engineering**. However, when using Crosswork Optimization Engine within the Crosswork Network Controller solution, the navigation is **Traffic Engineering & Services** > **Traffic Engineering** > **Traffic Engineering**.

This section contains the following topics:

SR-MPLS Policy Support

Table 1: Supported Features

Capability	Notes
PCE-initiated policies (provisioned or discovered by Crosswork)	—
PCC-initiated polices (discovered by Crosswork)	—
SR-MPLS On-Demand Next Hop (ODN) policies discovered by Crosswork	—
Single consistent Segment Routing Global Block (SRGB) configured on routers throughout domain covered by Crosswork	If index SIDs are used and there are different SRGB bases along a path of a policy, the label can change along the path.
Prefix SID	—

Capability	Notes
Adjacency SID	—
EPE adjacency SID	—
Protected and Unprotected adjacency SIDs	—
Regular and Strict prefix SIDs	—
SR-MPLS policy optimization objective min-metric (IGP, TE, and Latency)	—
SR-MPLS policy path constraints (affinity and disjointness)	Only 2 SR-MPLS policies per disjoint group or sub-id are supported
Binding SID for explicit or dynamic policies	—
Profile ID	—

Table 2: Unsupported Features and Limitations

Description	Notes
Provisioning multiple candidate paths via Crosswork	These paths are not discovered if configured on PCC. Crosswork does not support configuration of these paths.
Weighted Equal-Cost Multipath (WECMP)	—
Multiple segment lists per candidate path	• This configuration is not supported • These segment lists will not be discovered if configured on a PCC.
Visualization of multiple candidate paths	Only the current active path can be seen in the UI.
Binding SIDs as Segment List Hops	—
SR IGP Flexible Algorithm (Flex Algo)	—
Anycast SIDs	—
Hop count metric type for policies	Cisco Crosswork does not support provisioning with this metric type and does not discover this metric type if configured on the PCC
Routers that are not SR-capable	The assumption is that all routers discovered by Cisco Crosswork are SR-capable

Description	Notes
SR-MPLS policies with Loopback IPs other than TE router ID for headend/endpoint and prefix SIDs in segment list	For more information, see the "Onboard and Manage Devices" chapter in the *Cisco Crosswork Infrastructure and Applications Administration Guide*.
SR-MPLS policy provisioned with IPv6 endpoints/hops	—
SRv6	Only 2 SR-TE policies per disjoint group/sub-id
SR-MPLS policy optimization objective min-metric with margin	Not supported for policies provisioned by Cisco Crosswork. Margin is not discovered for PCC-initiated policies.
SR-MPLS policy constraints (resource exclusion or metric bound)	Not supported for policies provisioned by Cisco Crosswork. Constraints are not discovered for PCC-initiated policies.

SR-TE Policy Configuration Sources

SR-TE policies discovered and reported by Crosswork Optimization Engine may have been configured from the following sources:

- PCC initiated—Policies configured on a PCC (see PCC-Initiated SR-TE Policy Example, on page 3). This policy type displays as **Unknown** in the UI.
- PCE initiated—Policies configured on a PCE or created dynamically by Crosswork Optimization Engine. SR-MPLS explicit or dynamic policies that are configured using the UI are the only types of SR-TE policies that you can modify or delete in Crosswork Optimization Engine. PCE Initiated policy types can be one of the following:
  - **Dynamic**
  - **Explicit**
  - **Bandwidth on Demand**
  - **Bandwidth Optimization**
  - **Local Congestion Mitigation**

PCC-Initiated SR-TE Policy Example

The following example shows a configuration of an SR-TE policy at the headend router. The policy has a dynamic path with affinity constraints computed by the headend router. See SR configuration documentation for your specific device to view descriptions and supported configuration commands (for example: *Segment Routing Configuration Guide for Cisco ASR 9000 Series Routers*).

```
segment-routing
 traffic-eng
```

```
policy foo
 color 100 end-point ipv4 1.1.1.2
 candidate-paths
  preference 100
   dynamic
    metric
     type te
    !
   !
   constraints
    affinity
     exclude-any
      name RED
     !
    !
   !
  !
 !
```

Create Explicit SR-MPLS Policies

This task creates SR-MPLS policies using an explicit (fixed) path consisting of a list of prefix or adjacency Segment IDs (SID list), each representing a node or link along on the path.

Step 1 From the main menu, choose **Traffic Engineering** > **Traffic Engineering > SR-MPLS** tab.

Step 2 From the **SR Policies** table, click **+ Create**.

Step 3 Enter the required SR-MPLS policy values. Hover the mouse pointer over ⓘ to view a description of each field.

Tip If you have set up device groups, you can select the device group from the **Device Groups** drop-down menu. Then navigate and zoom in on the topology map to click the device for headend or endpoint selection.

Step 4 Under Policy Path, click **Explicit Path** and enter a path name.

Step 5 Add segments that will be part of the SR-MPLS policy path.

Step 6 Click **Preview**.

Step 7 If you want to commit the policy path, click **Provision**.

Step 8 Validate the SR-MPLS policy creation:

a. Confirm that the new SR-MPLS policy appears in the SR Policy table. You can also click the check box next to the policy to see it highlighted in the map.

Note The newly provisioned SR-TE policy may take some time, depending on the network size and performance, to appear in the **SR Policy** table. The **SR Policy** table is refreshed every 30 seconds.

b. View and confirm the new SR-MPLS policy details. From the **SR Policy** table, click ··· and select **View**.

Note On a scaled setup with high node, policy, or interface counts, a timeout may occur during policy deployment. To configure timeout options, see the *Cisco Crosswork Infrastructure and Applications Administration Guide*.

Configure Link Affinities

Affinities defined on devices are not collected by Crosswork Optimization Engine. The affinity mapping name is only used for visualization in Crosswork Optimization Engine. For this reason, you should manually collect affinities on the device interface, then define affinity mapping in Crosswork Optimization Engine with the same name and bits that are used on the device interface. Crosswork Optimization Engine will only send bit information to SR-PCE during provisioning.

Affinity of an SR-TE policy or RSVP-TE tunnel is used to specify the link attributes for which the SR-TE policy or RSVP-TE tunnel has affinity for. It determines which links are suitable to form a path for the SR-TE policy or RSVP-TE tunnel. It is a 32-bit value, with each bit position (0 - 31) representing a link attribute. Affinity mapping is used to map each bit position or attribute to a color. This makes it easier to refer to link attributes.

See SR configuration documentation for your specific device to view descriptions and supported configuration commands (for example: *Asr9000 Configuration*)

Note To edit or delete an affinity mapping, click the relevant menu options.

Step 1 From the main menu choose **Traffic Engineering** > **Affinities**. You can also define affinities while creating an SR-TE policy or RSVP-TE tunnel by clicking **Manage Mapping**.

Step 2 To add a new affinity mapping, click **+ Create**.

Step 3 Enter the name (color) and the bit it will be assigned.

Step 4 Click **Save** to save the mapping.

Note You should remove the TE tunnel before removing the affinity to avoid orphan TE tunnels. If you have removed an affinity associated to a TE tunnel, the affinity is shown as "UNKNOWN" in the **SR Policy / RSVP-TE Tunnel Details** window.

Create Dynamic SR-MPLS Policies Based on Optimization Intent

This task creates an SR-MPLS policy with a dynamic path. SR-PCE computes a path for the policy based on metrics and path constraints (affinity or disjointness) defined by the user. A user can select from three available metrics to minimize in path computation: IGP, TE, or latency. The SR-PCE will automatically re-optimize the path as necessary based on topology changes. In the event of a link or interface failing, the network will find an alternate path that meets all the criteria specified in the policy. If no path can be found then the packets are dropped.

Tip If you plan to use affinities, collect affinity information from your devices and then map them in Cisco Crosswork before creating a dynamic SR-MPLS policy. For more information, see Configure Link Affinities, on page 5.

Step 1 From the main menu, choose **Traffic Engineering** > **Traffic Engineering** > **SR-MPLS** tab.

Step 2 From the **SR Policy** table, click **+ Create**.

Step 3 Under **Policy Details**, enter the required SR-MPLS policy values. Hover the mouse pointer over ⓘ to view a description of each field.

Tip If you have set up device groups, you can select the device group from the **Device Groups** drop-down menu. Then navigate and zoom in on the topology map to click the device for headend or endpoint selection.

Step 4 Under **Policy Path**, click **Dynamic Path** and enter a path name.

Step 5 Under **Optimization Objective**, select the metric you want to minimize.

Step 6 Define any applicable constraints and disjointness.

Note
- Affinity constraints and disjointness cannot be configured on the same SR-MPLS policy. Also, there cannot be more than two SR-MPLS policies in the same disjoint group or subgroup. The configuration will not be allowed during Preview.
- If there are existing SR-MPLS policies belonging to a disjoint group that you define here, all SR-MPLS policies that belong to that same disjoint group are shown during Preview.

Step 7 Under **Segments**, select whether or not public segments should be used when available.

Step 8 Click **Preview**. The path is highlighted on the map.

Step 9 If you want to commit the policy path, click **Provision**.

Step 10 Validate the SR-MPLS policy creation:

a. Confirm that the new SR-MPLS policy appears in the SR Policy table. You can also click the check box next to the policy to see it highlighted in the map.

Note The newly provisioned SR-MPLS policy may take some time, depending on the network size and performance, to appear in the **SR Policy** table. The **SR Policy** table is refreshed every 30 seconds.

b. View and confirm the new SR-MPLS policy details. From the **SR Policy** table, click ··· and select **View**.

Note On a scaled setup with high node, policy, or interface counts, a timeout may occur during policy deployment. To configure timeout options, see the *Cisco Crosswork Infrastructure and Applications Administration Guide*.

Modify SR-MPLS Policies

To view, modify, or delete an SR-MPLS policy, do the following:

Step 1 From the main menu, choose **Traffic Engineering** > **Traffic Engineering** > **SR-MPLS** tab.

Step 2 From the SR Policy table, locate the SR-MPLS policy you are interested in and click ···.

Step 3 Choose **View** or **Edit/Delete**.

Note

- You can only modify or delete SR-MPLS policies that have been created with the UI.
- After updating the SR-MPLS policy details, you can preview the changes on the map before saving it.