# Visualize SR-MPLS and SRv6 Policies

Crosswork Optimization Engine allows you to visualize SR-MPLS and SRv6 policies in your network. The SR-PCE discovers policies and displays them in the Traffic Engineering topology map.

**SRv6 Notes and Limitations**

- SRv6 visualization with IS-IS IGP is only supported with SR-PCE running Cisco IOS XR 7.3.2.
- Traffic collection on SRv6 policies is not currently supported.
- OSPFv3 IGP (PCE-initiated) SRv6 policies are not supported.
- When viewing metrics on an IPv6 network that has both IPv4 and IPv6 links, you need to check the **Show Participating Only** checkbox (**Traffic Engineering** > **Traffic Engineering** > > **Metrics**).
- IPv4 and IPv6 topologies must be congruent. Different link metrics for IPv4 and IPv6 are not supported.
- SRv6 is not supported on Bandwidth Optimization, Bandwidth on Demand, or Local Congestion Mitigation feature packs.
- Visualization of PCC-initiated dynamic path SRV6 policies. PCE-initiated and explicit path visualization of SRv6 is not supported.

This section contains the following topics:



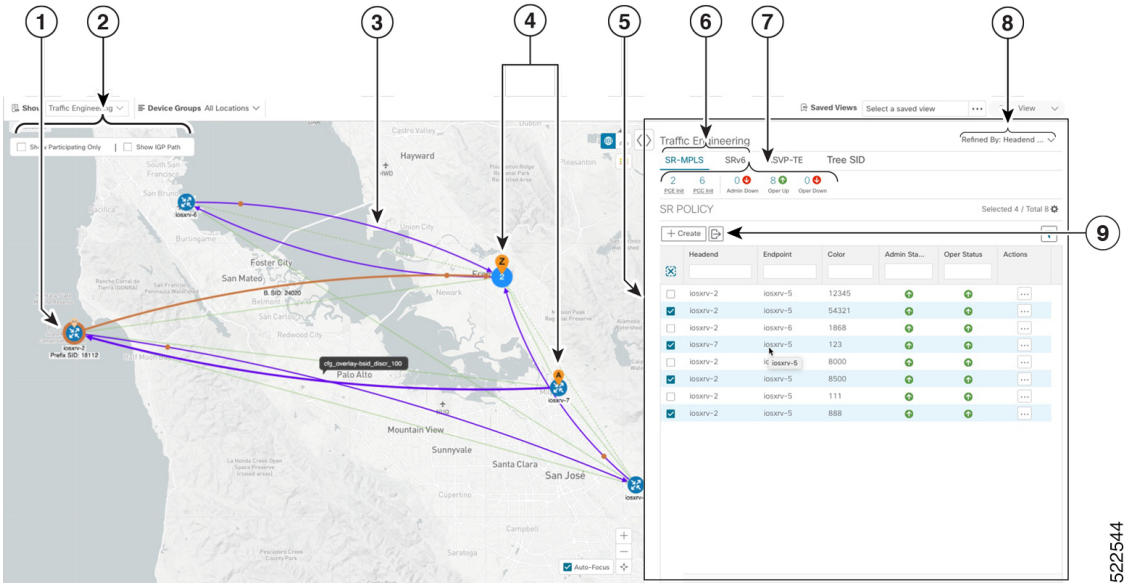
# View SR-MPLS and SRv6 Policies on the Topology Map

Crosswork Optimization Engine visualization provides the most value by giving you the ability to easily view and manage SR-MPLS and SRv6 policies. By visually examining your network, the complexity of provisioning and managing these SR-TE policies is significantly reduced.

To get to the Traffic Engineering topology map, choose **Traffic Engineering** > **Traffic Engineering**.

**Note** 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** and select either the **SR-MPLS** or **SRv6** tabs.

***Figure 1: Traffic Engineering UI : SR-MPLS and SRv6 Policies***



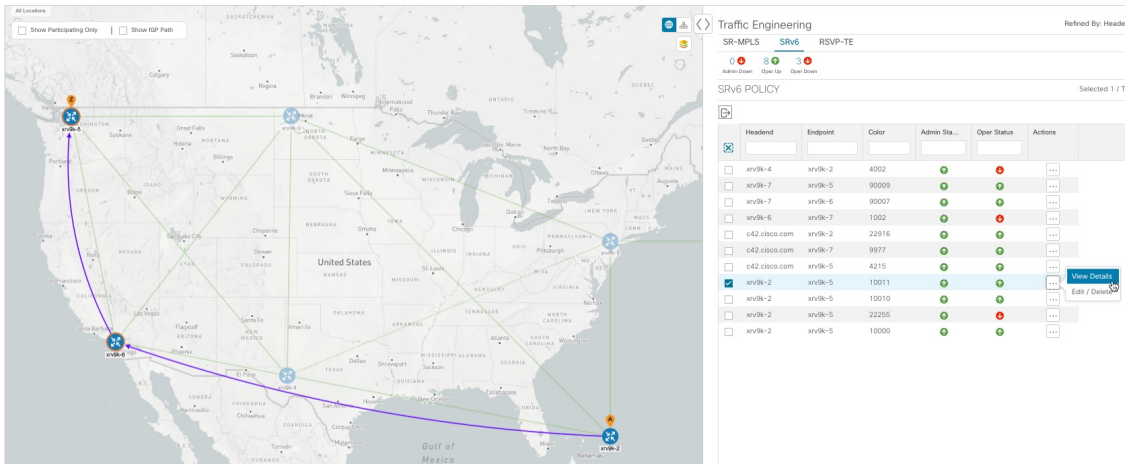

| Callout No. | Description |
|---|---|
| 1 | A device with an orange ( ) outline indicates there is a node SID associated with that device or a device in the cluster. |
| 2 | Click the appropriate check box to enable the following options:<br>• **Show IGP Path**—Displays the IGP path for the selected SR-TE policy.<br>• **Show Participating Only**—Displays only links that belong to selected SR-TE policy. All other links and devices disappear. |
| 3 | When SR-TE policies are selected in the SR-MPLS or SRv6 tables, they show as purple directional lines on the map indicating source and destination.<br>An adjacency segment ID (SID) is shown as an orange circle on a link along the path ( ). |
| 4 | **SR-MPLS and SRv6 Policy Origin and Destination**: If both **A** and **Z** are displayed in a device cluster, at least one node in the cluster is a source and another is a destination. The **A+** denotes that there is more than one SR-TE policy that originates from a node. The **Z+** denotes that the node is a destination for more than one SR policy. |

| Callout No. | Description |
|---|---|
| 5 | The content of this window depends on what has been selected or filtered. In this example, the SR-MPLS tab is selected and the SR Policy table is displayed. Depending on what is selected on the topology map, or whether you are in the process of viewing and managing SR-TE policies, you can do the following:<br>• Visualize SR-MPLS or SRv6 Policies Example, on page 6<br>• Provision SR-MPLS Policies<br>• View Device and Link Details |
| 6 | Click on either the **SR-MPLS** or **SRv6** tabs to view the respective list of SR-TE policies. |
| 7 | The **Mini Dashboard** provides a summary of the operational SR-MPLS or SRv6 policy status. If filters are applied, the **Mini Dashboard** is updated to reflect what is displayed in the SR Policy and SRv6 Policy tables. In addition to the policy status, the **SR-MPLS Mini Dashboard** table displays the number of PCC and PCE initiated tunnels that are *currently* listed in the SR Policy table. |
| 8 | This option allows you to choose how the group filter (when in use) should be applied on the table data. For example, if **Headend only** was selected, then it would only display policies where the headend device of the policy is in the selected group. This filter allows you to see specific configurations and is useful when you have a large network.<br>Filter options:<br>• **Headend or Endpoint**—Show policies with either the headend or endpoint device in the selected group.<br>• **Headend and Endpoint**—Show policies if both the headend and endpoint are in the group.<br>• **Headend only**—Show policies if the headend device of the policy is in the selected group.<br>• **Endpoint only**—Show policies if endpoint device of the policy is in the selected group. |
| 9 | Exports *all* data into a CSV file. You cannot export selected or filtered data. |

# View SR-MPLS and SRv6 Policy Details

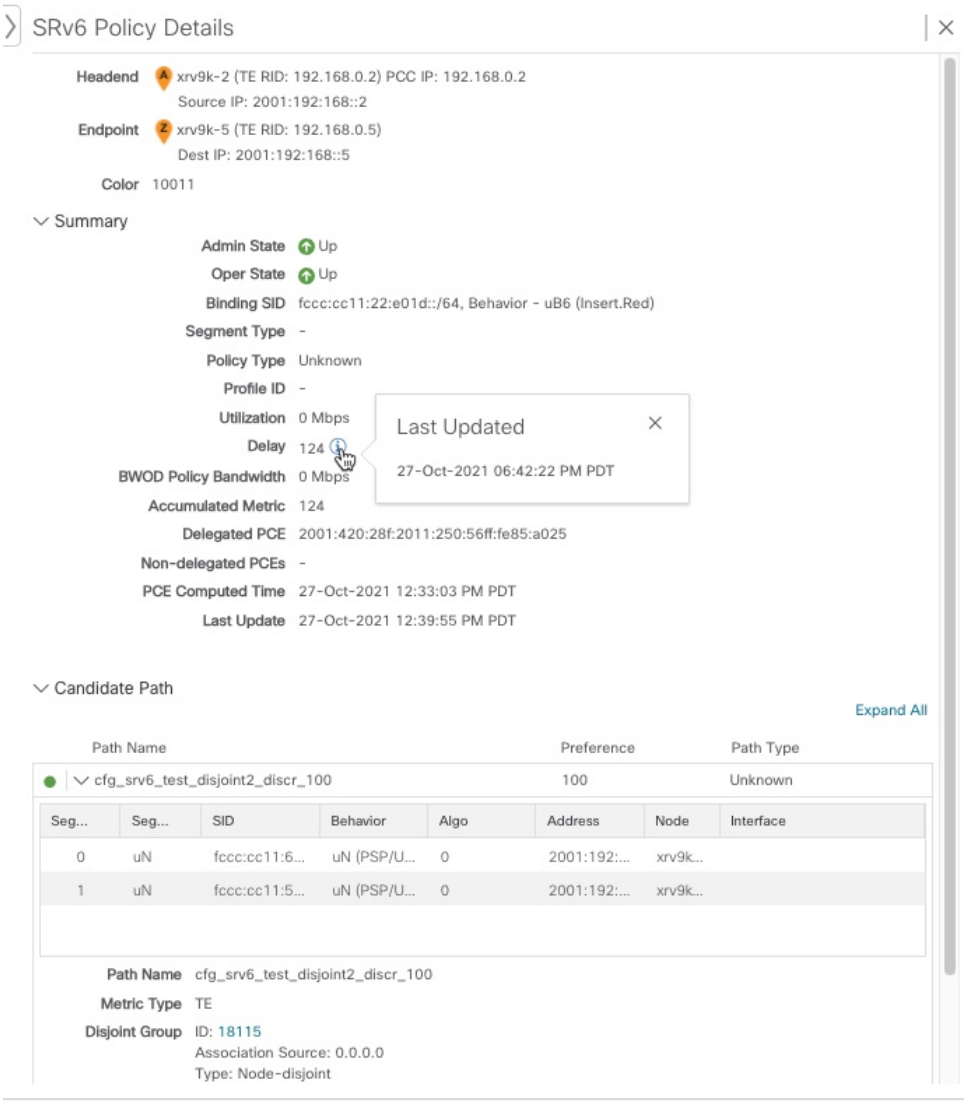
View SR-MPLS or SRv6 policy details such as disjoint groups, metric type, candidate path, segment hop information, and so on.

**Step 1** From the **Actions** column, click ··· > **View Details** for one of the SR-MPLS or SRv6 policies.




**Step 2** View SR-MPLS or SRv6 policy details.

**Note** The Delay value is calculated for all policies every 10 minutes. Hover your mouse over the "i" icon (next to the Delay value) to view the last time the value was updated.



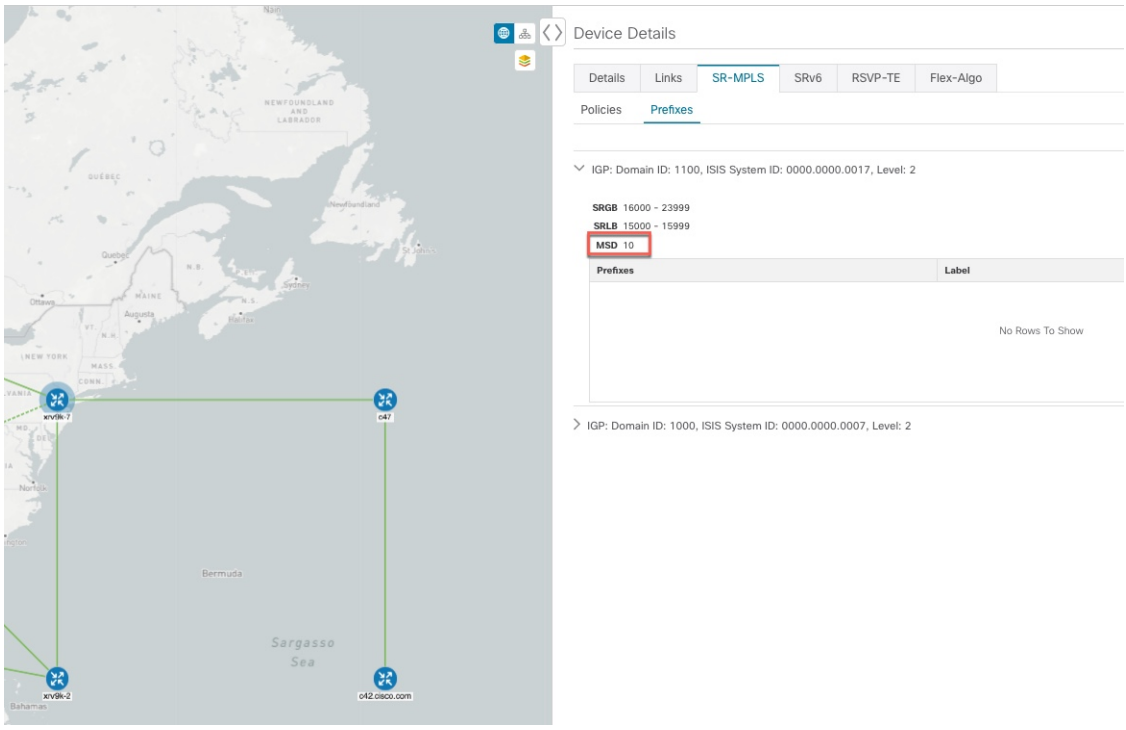

# View Traffic Engineering Device Details

To view Traffic Engineering Device details (SR-MPLS, SRv6, RSVP-TE, and Flexible Algorithm information), do the following:

**Step 1** From the main menu choose **Traffic Engineering > Traffic Engineering**.

**Step 2** From the Traffic Engineering map, click on a device.

**Step 3** From the **Device Details** page, click on the traffic engineering tab you are interested in. The tab displays associated data for that device. The following example shows SR-MPLS Prefix information which includes the MSD value for the device.




# Visualize SR-MPLS or SRv6 Policies Example

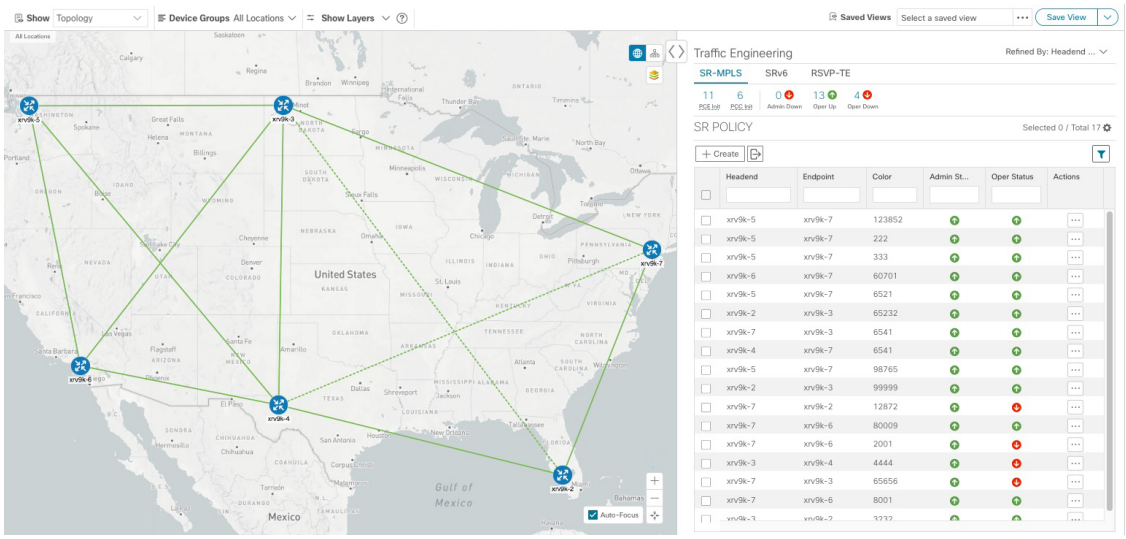
This example walks you through several SR-TE (SR-MPLS and SRv6) policy visualization features that are available from the topology map. The topology map displays SR-TE policies that are provisioned using the UI along with policies that are discovered from the network by SR-PCE. Then you can drill down to details and visualization of participating SR-TE policies.

In this example, we assume that devices and SR-MPLS policies have been added and device groups have been created.

**Note** Although this example uses SR-MPLS policies, the basic functionality of the maps for both SR-MPLS policies and SRv6 policies are the same.

Click images to zoom in for a closer look.

*Figure 2: Topology Map Example*



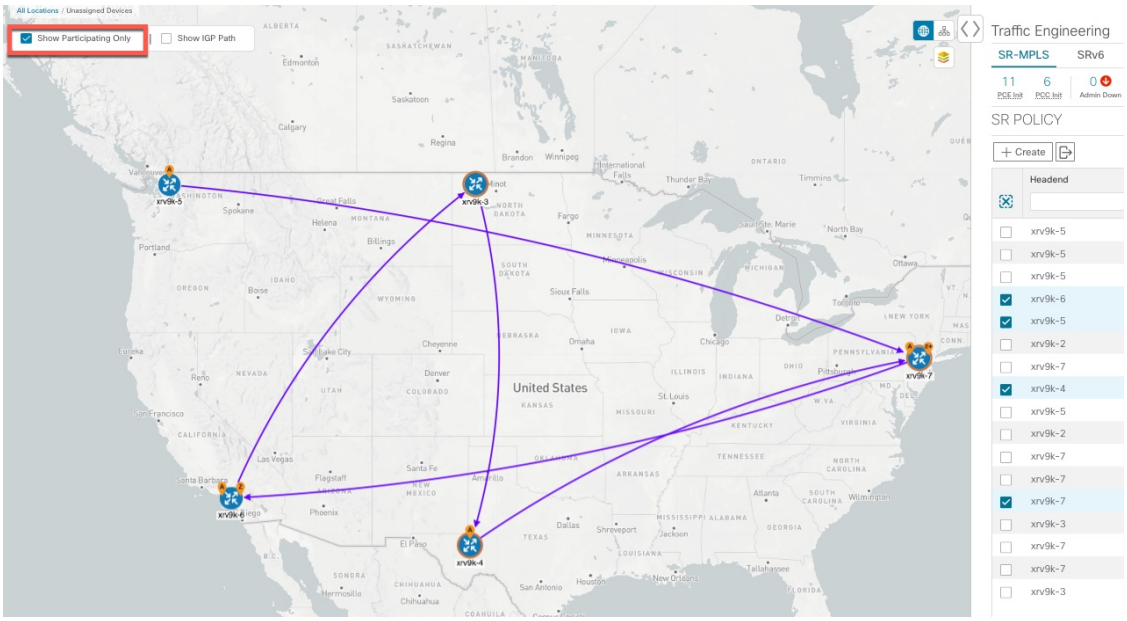

**Step 1** Select SR-MPLS policies for visualization and isolate them on the map.

a) From the main menu, choose **Traffic Engineering** > **Traffic Engineering**.

b) From the **SR Policy** table, check the check box next to the SR-MPLS policies you are interested in.

c) Check the check box next to **Show Participating Only** so that other links and devices that are not part of the selected SR-TE policies are hidden.
In the following example, the topology map displays the following:

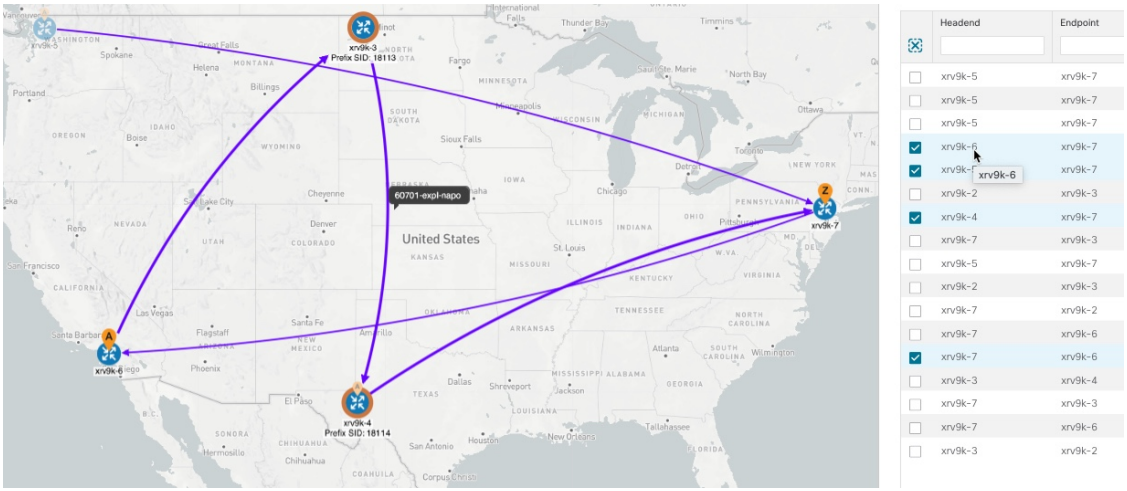
- Four SR-MPLS policies are selected.
- SR-MPLS policies appear as purple links with arrows that indicate the path direction.
- The **xrv9k-7** node is the destination for two of the selected policies. Both **xrv9k-3** and **xrv9k-2** are destinations for the selected policies. SR-MPLS policy origin and destination are marked with **A** and **Z**, respectively. The **A+** denotes that there is more than one policy that originates from a device. A **Z+** denotes that the device is a destination for more than one policy.
- The orange outline ( ) indicates that **xrv9k-3**, **xrv9k-7**, and **xrv9k-4** have node SIDs.




**Step 2** Highlight and view more details for a particular SR-MPLS policy.

a) From the **SR Policy** table, *hover* over a selected policy.
The topology map displays the following details:

- The path is emphasized on the map. The path goes through **xrv9k-6 > xrv9k-3 > xrv9k-4 > xrv9k-7**.
- The prefix SID for xrv9k-3 and xrv9k-4 are displayed.
- The path name is displayed: **60701-expl-napo**




**Step 3** View the physical path and metrics between the endpoints of the selected SR-MPLS policies.

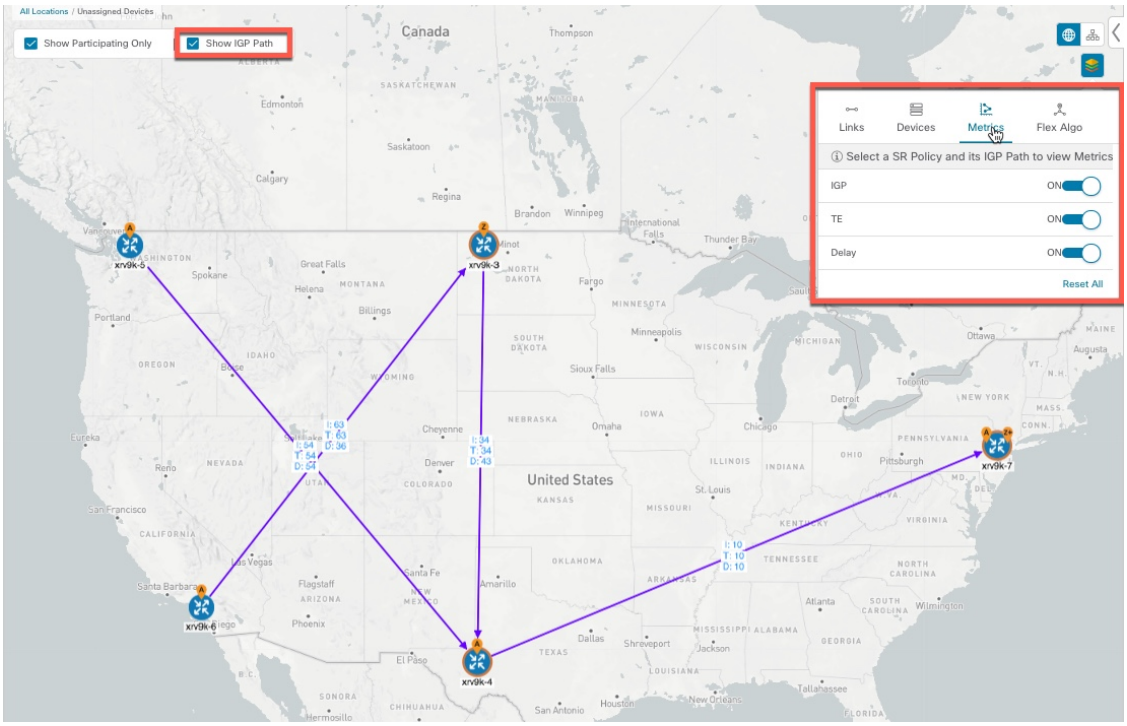
a) Check the **Show IGP Path** check box. The IGP paths for the selected SR-MPLS policies are displayed, with straight lines, instead of the segment hops.

b) Click .

c) Click the **Metrics** tab.

d) Toggle applicable metrics to **ON**.

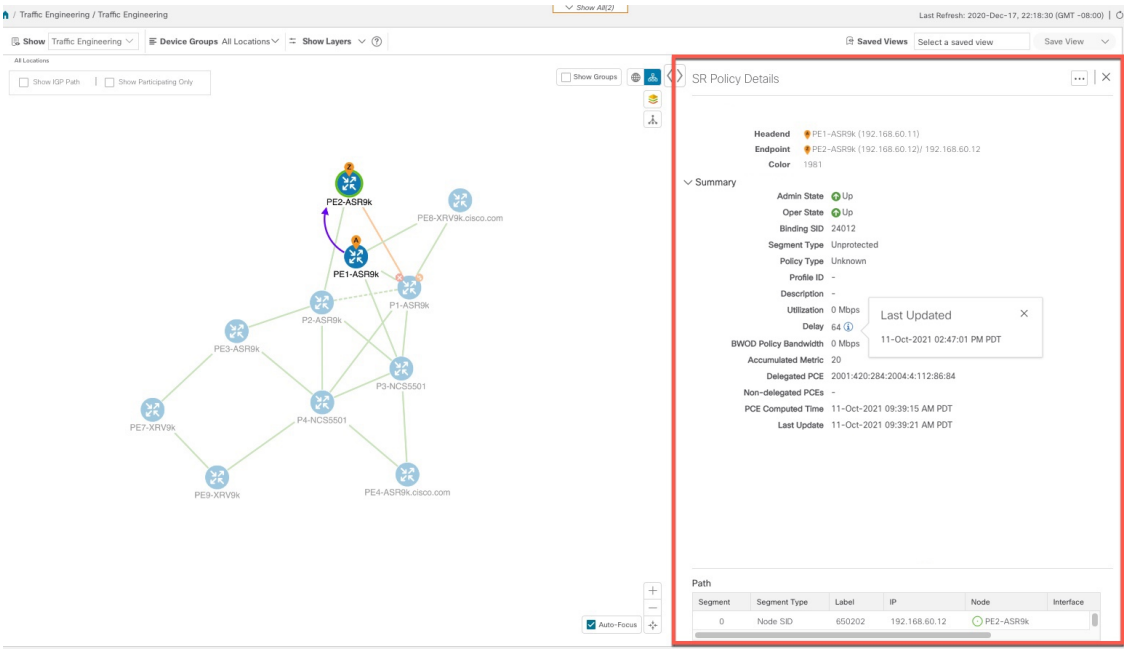
**Note** You must check the **Show IGP Path** check box in order to view metrics.




**Step 4** View SR-MPLS policy details such as disjoint groups, metric type, segment hop information, delay (calculated for all policies every 10 minutes), and so on.

a) From the **Actions** column, click ... > **View Details** for one of the SR-MPLS policies.

The **SR Policy Details** window is displayed in the side panel. Note that only the selected policy is displayed on the topology map.

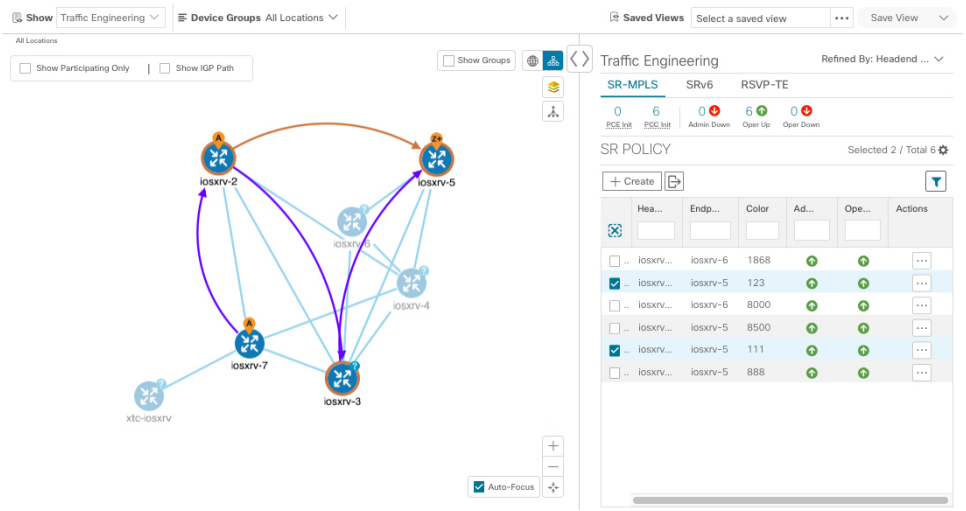



**Step 5** Customize and save a logical view of the topology.

a) Click  to display the logical view of selected SR-MPLS policies.
b) Arrange the nodes to your preference.
c) To save the topology layout (*not SR-MPLS policy selection*), clear all selected SR-MPLS policies, and click **Save View**.

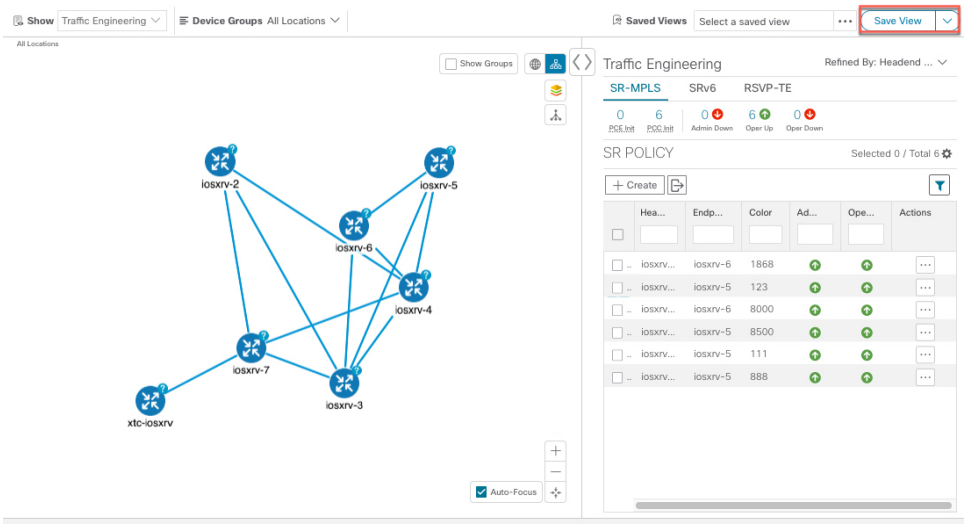
**Example:**

***Figure 3: Logical Map (SR-MPLS Policies Selected)***



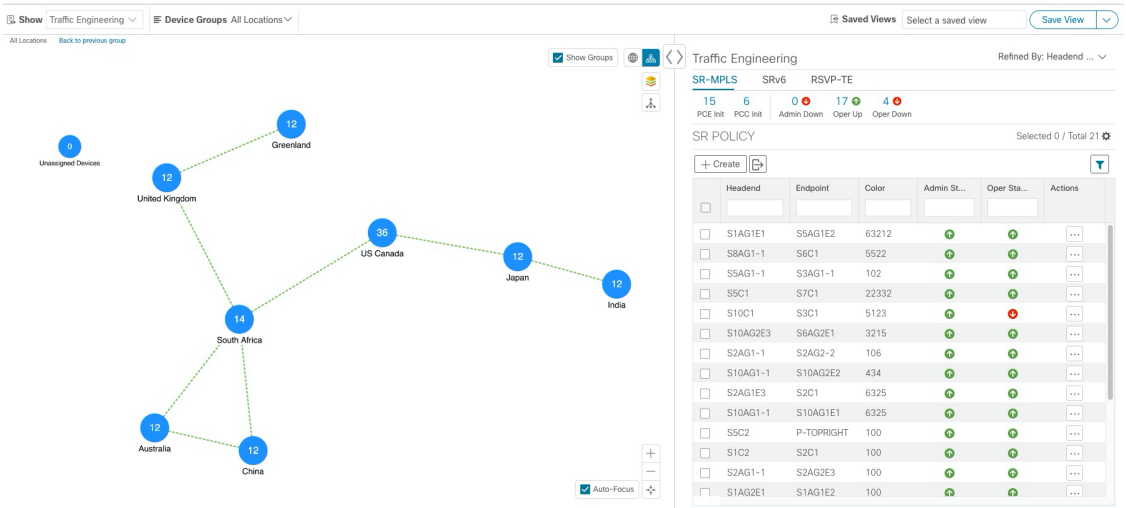

**Example:**

*Figure 4: Logical Map (Save Without SR-MPLS Policies Selected)*



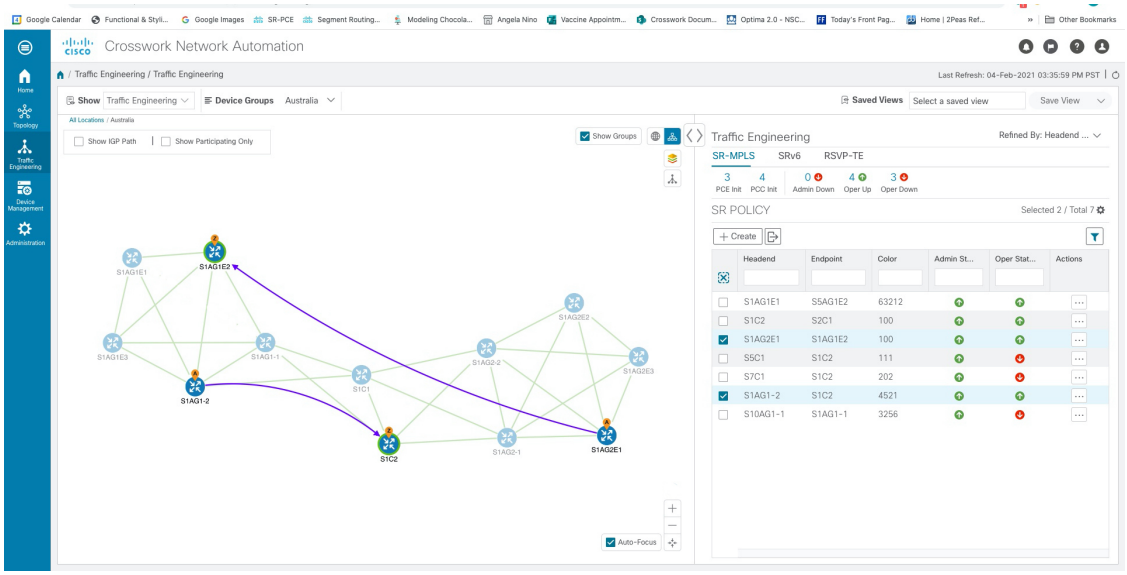

**Step 6** Close (⨯) the current view to return to the **SR Policy** table.

**Step 7** To understand how device groups are displayed with the selection of SR-MPLS policies, uncheck any SR-MPLS policies that might be selected and check **Show**

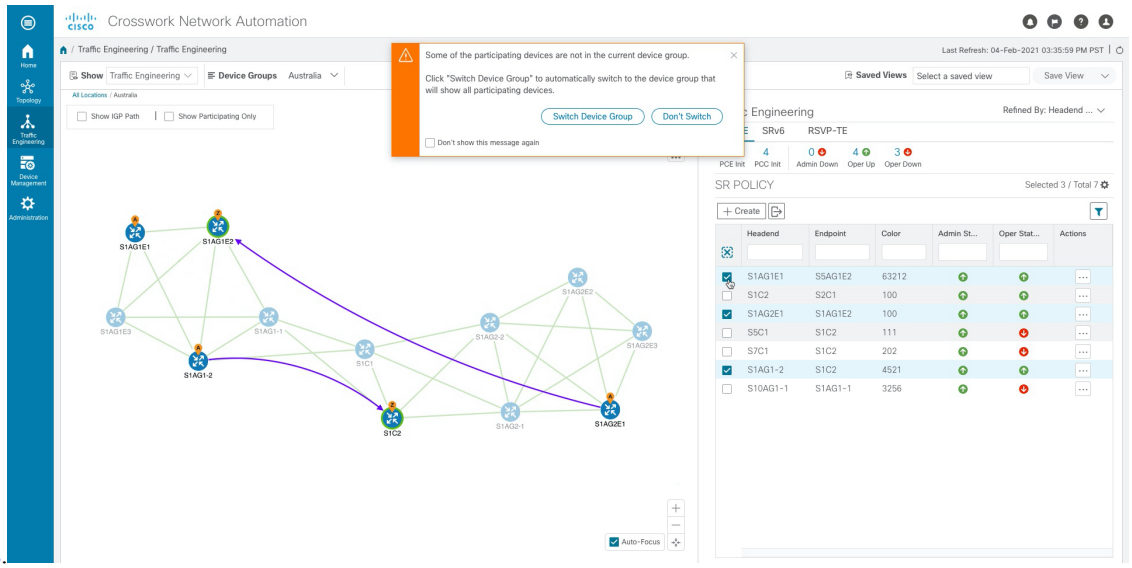



**Groups**.

**Step 8** Selecting a specific group from the **Device Groups** drop-down list, will only display that group in the map and . In this example, **Australia** is selected and the associated SR-MPLS policy is selected and displayed.

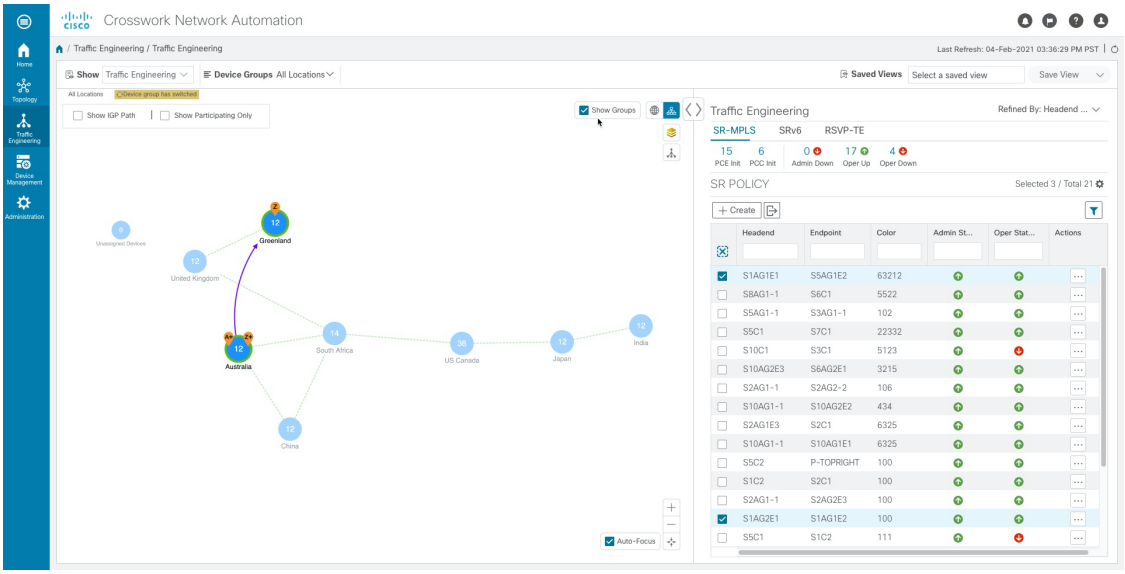



**Step 9** If you select a policy where participating devices are not part of the selected group, then a dialog appears giving you an option to switch the group view. This is the default behavior. If this window does not appear, then the administrator has configured the display to automatically switch view or stay in the current view. For more information, see Set Display Behavior of Device Groups for TE Tunnels.



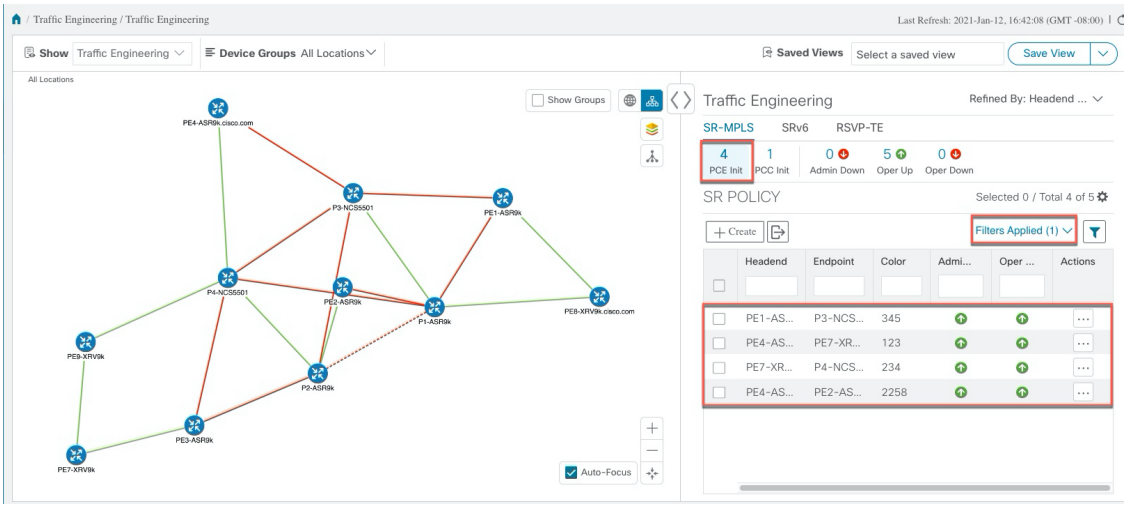

**Step 10** If you select **Switch Device Group**, then the group will change and you will see all participating devices for the SR-MPLS policies you have selected.

To go back to the previous group view, click **Back** (this link appears later in the yellow text area indicated in the following figure).




**Step 11** You can also use the Mini Dashboard to drill down and focus on certain SR-TE policies.

To filter the SR Policy table to show only PCE-initiated policies, click the value for PCE Init from the SR-MPLS Mini Dashboard. Note that the **Filters Applied** text appears.




**Step 12** To remove filter criteria, click **Filters Applied** > **Clear All Filters**. You can also select individual filters if more than one filter has been applied.

# Find Multiple Candidate Paths (MCPs)

Visualizing MCPs gives you insight into which paths might be a better alternative to the currently active one. If you determine to do so, you can then manually configure the device and change which path becomes active.

### Important Notes

- Only PCC-initialized SR-TE policies with MCPs are supported.
- Crosswork Optimization Engine does not distinguish dynamic paths versus explicit paths. The Policy Type field value displays as 'Unknown'.
- You can view active explicit paths, but not inactive candidate explicit paths in the UI.

### Before you begin

A policy must be configured with MCPs on devices before visualizing them on the Traffic Engineering topology map. This configuration can be done manually or within Crosswork Network Controller.

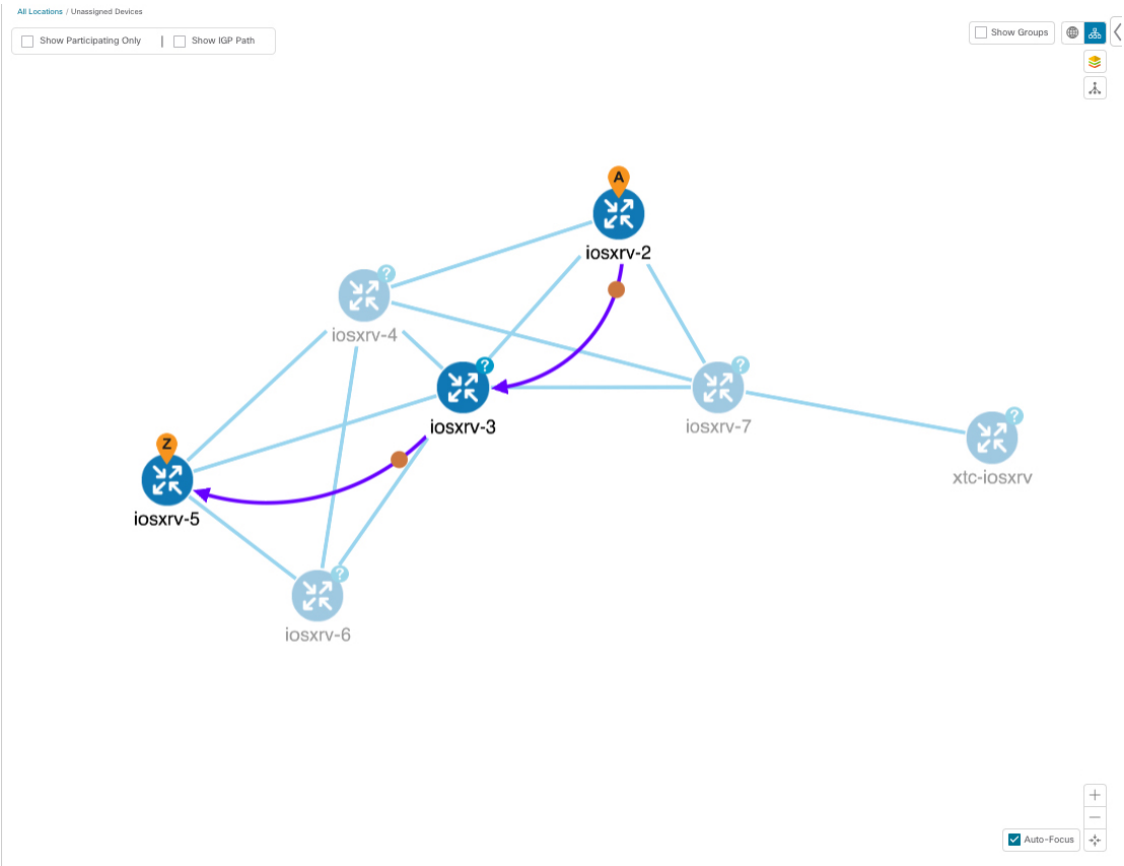
**Step 1** From the main menu, choose **Traffic Engineering** > **Traffic Engineering** > **SR-MPLS** or **SRv6** tab.

**Step 2** Navigate to the active SR-TE policy that has MCPs configured and view it on the topology map.

a) Check the check box next to the SR-TE policy that has MCPs configured.

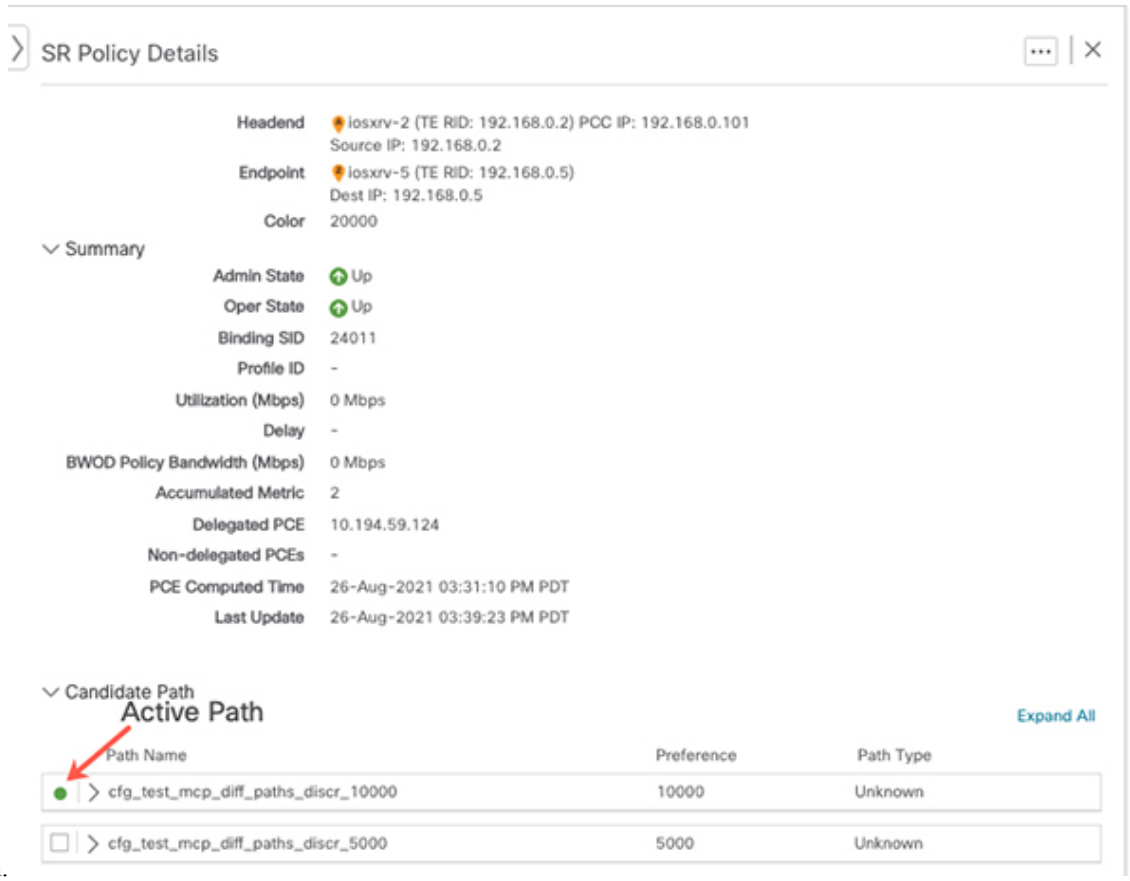
b) View the SR-TE policy that is highlighted on the topology map.

In this example, you see that the active path is going from **iosxrv-2 > iosxrv-3 > iosxrv-5**.




**Step 3** View the list of candidate paths.

a) From the SR-TE Policy table **Actions** column, click ··· > **View Details**. A list of candidate paths appear along with policy details in the **SR Policy Details** window. The green circle indicates the active path.

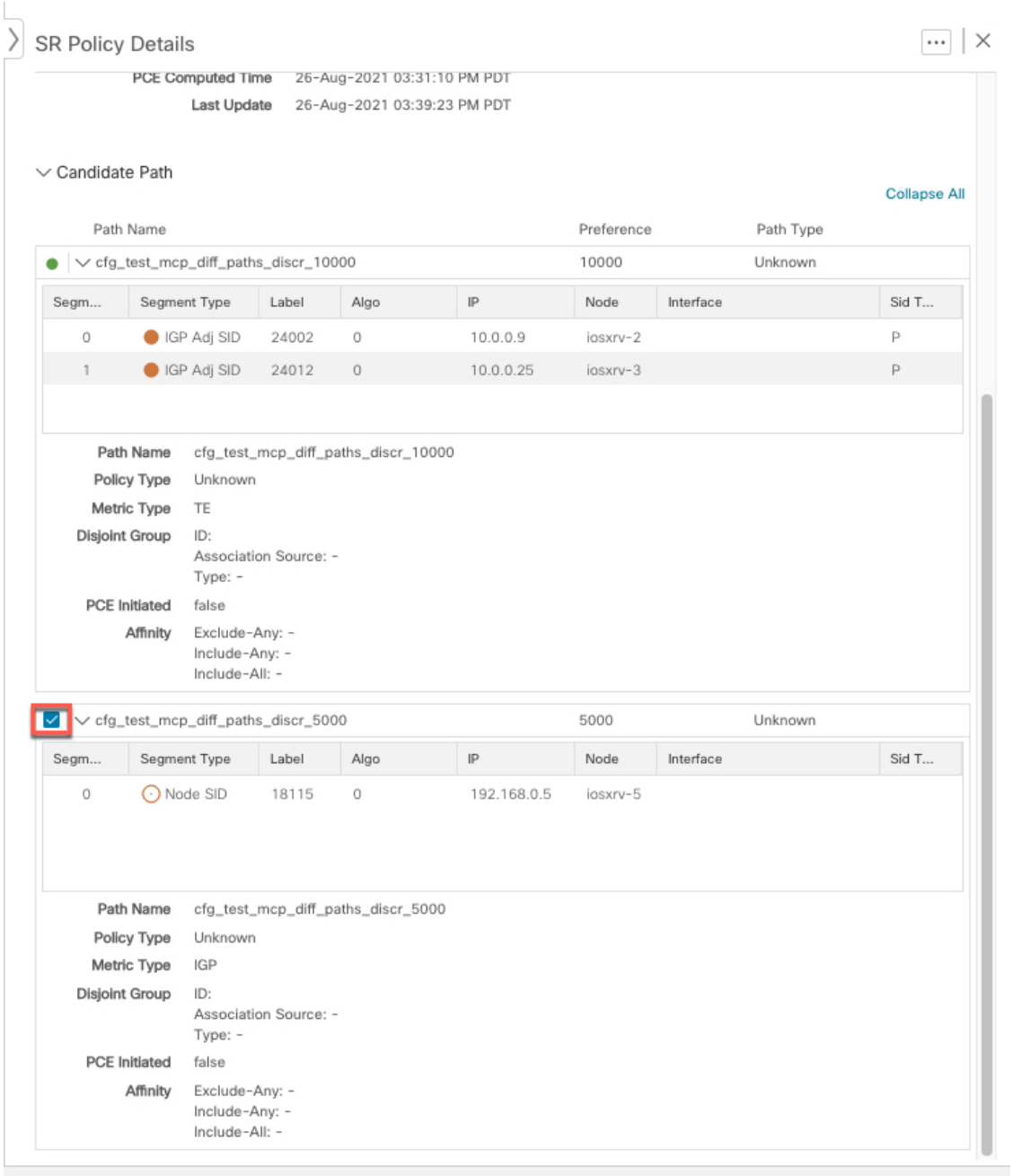



**Step 4** You can expand individual paths or click **Expand All** to view details of each path. As you hover each segment, the segment is highlighted on the map.

**Step 5** Visualize the candidate path on the topology map.

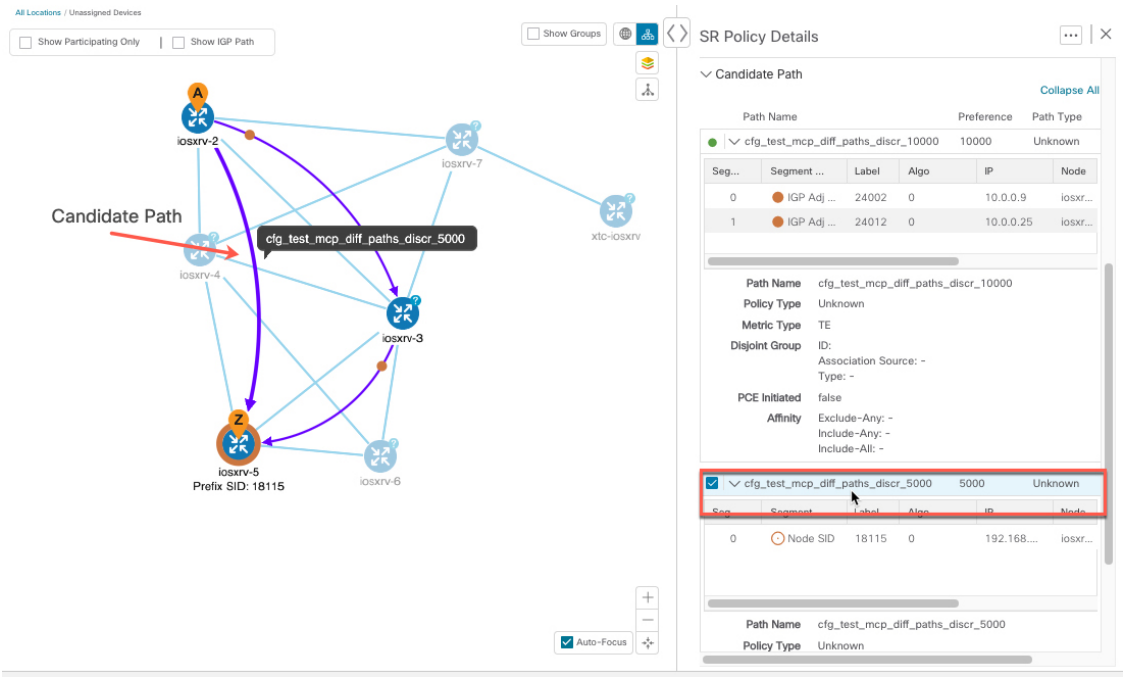
a) Check the check box next to any candidate path.

**Note** You will not be able to select or view explicit candidate paths.




b) From the **Candidate Path** area, hover your mouse over the candidate path name. The candidate path is highlighted on the topology map.

In this example, you see that the alternate path goes directly from **iosxrv-2 > iosxrv-5**.




# Visualize Underlying Paths Associated with a Defined Binding-Segment ID (B-SID) Label

Crosswork Optimization Engine allows you to visualize the underlying path of a B-SID hop that you have manually configured on a device or configured using Crosswork Network Controller. In this example, we have assigned **24020** as a B-SID label on an SR-MPLS policy hop.

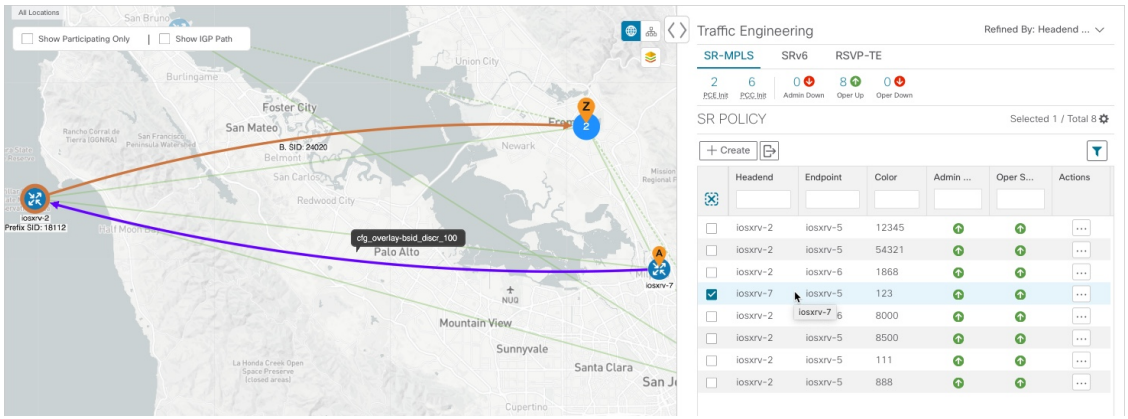
**Note** Click image examples to zoom in for a closer look.

To view the B-SID underlying path for an SR-MPLS or SRv6 policy, do the following:

**Step 1** From the main menu, choose **Traffic Engineering** > **Traffic Engineering** > **SR-MPLS** or **SRv6** tab.

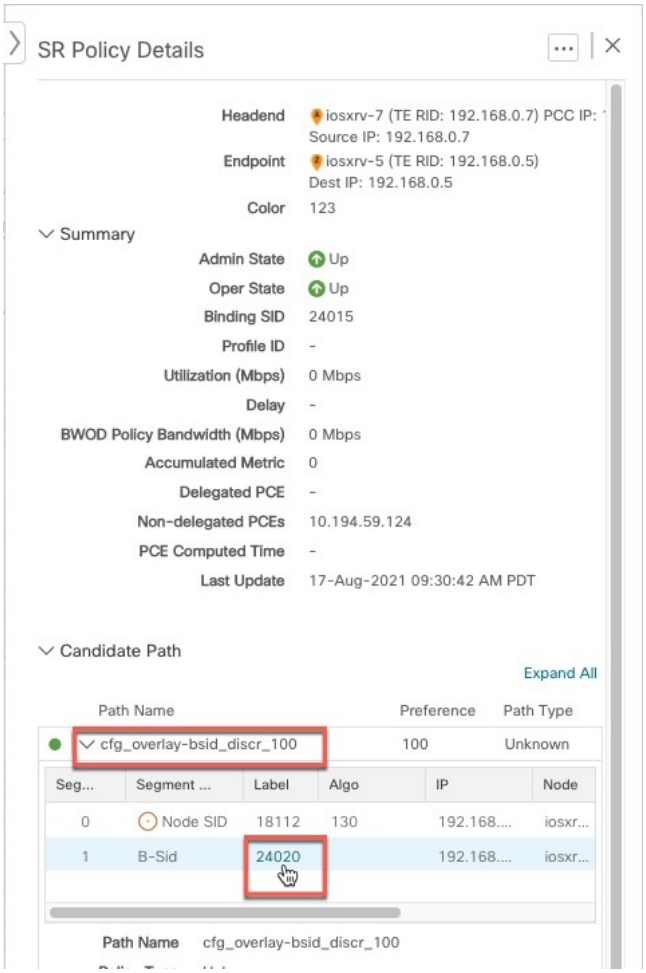
**Step 2** Check the check box next to the SR-MPLS policy that contains a hop assigned with a B-SID label and hover your mouse over any part of the SR-MPLS row to see the B-SID name. The B-SID path is highlighted in orange on the topology map.

In this example, you see that the path is going from **iosxrv-2** to a 2-device cluster.

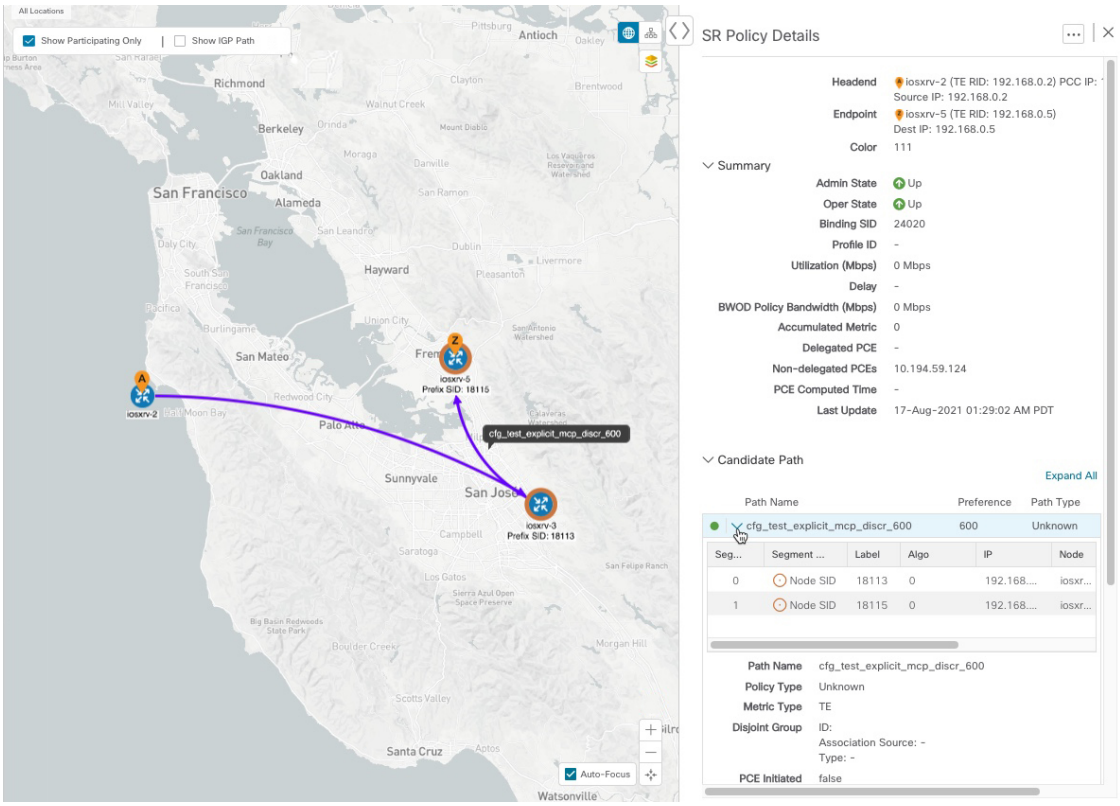



**Step 3** From the **Actions** column, click ⋯ > **View Details**.

**Step 4** From the **SR Policy Details** window, expand the active path name and click the B-SID label.




**Step 5** In the **SR Policy Details** window for the underlying path, expand the active path name to view more details. In this example, you see the underlying path actually goes from **iosxrv-2** > **iosxrv-3** > **iosxrv-5**.




# Visualizing Native SR Paths

Crosswork Optimization Engine The topology of a L3VPN service will show only the logical path and not the actual physical path. Since the feature uses multipaths, all ECMP paths will be shown between the source and destination. Visualizing the native path will help you in OAM (Operations, Administration and Maintenance) activities to monitor label-switched paths (LSPs) and quickly isolate forwarding problems to assist with fault detection and troubleshooting in the network.

**Note** This is applicable only for SR-MPLS policies.

To create a path query, do the following:

### Before you begin

Confirm that device requirements are met. See Visualize Native Path Device Prerequisites, on page 21.

For more information, see the *Cisco Crosswork Infrastructure and Applications Administration Guide* and the *Cisco Crosswork Infrastructure and Applications Installation Guide*.

**Step 1** From the main menu, choose **Traffic Engineering** > **Path Query.**

**Step 2** On the Query Path Dashboard, click **New Query.**

**Step 3** Under the New Path Query, select the required values and click **Get Paths.**

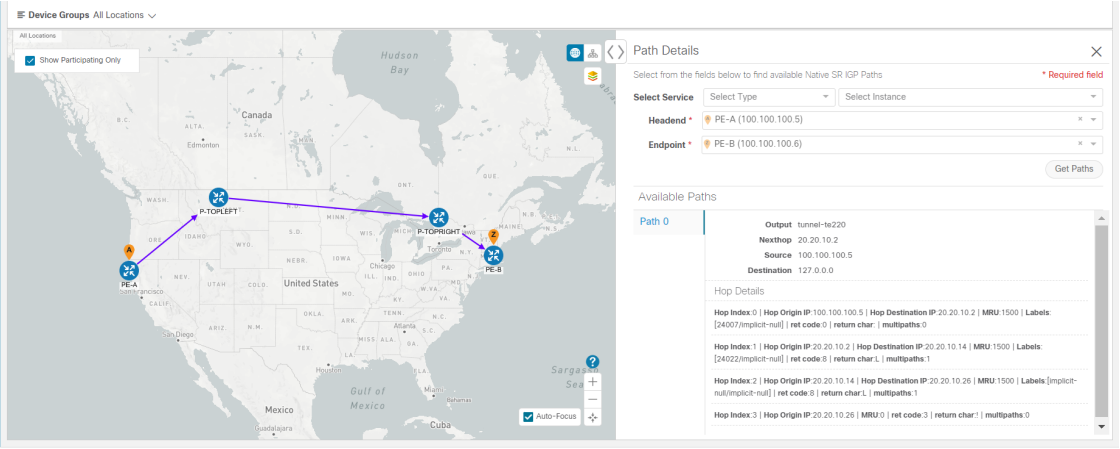
**Step 4** Click **View Result** to view the query result.

**Step 5** (Optional) On the result pop-up click, **View Past Result.** Check the query ID to view the available results.

**Example:**

In the below example, you can view the available paths : **Path 0**

***Figure 5: Path Details***

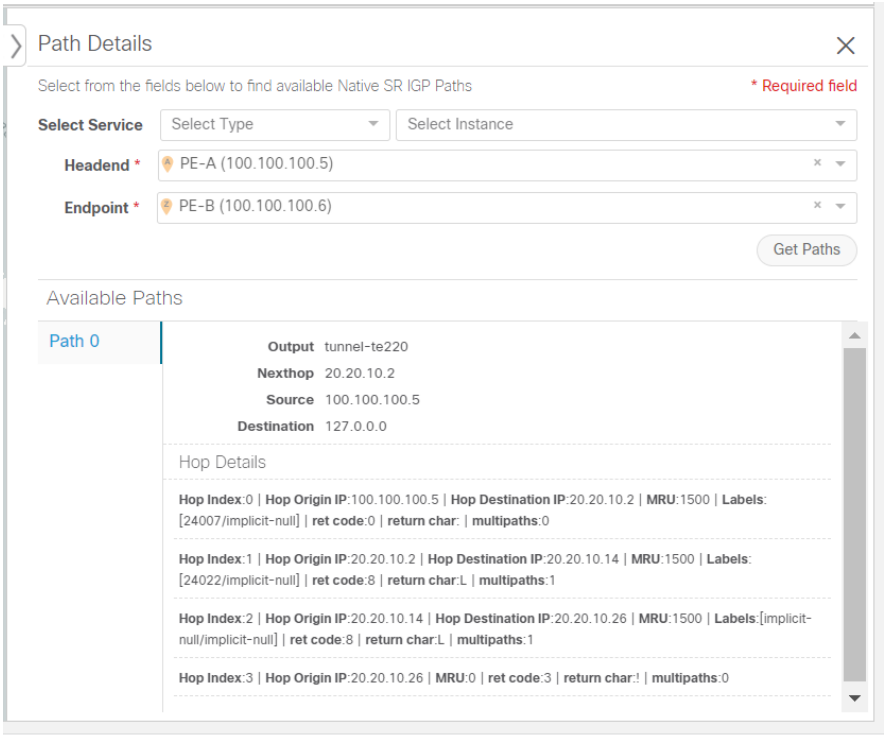



**Step 6** From the **Actions** column, click **View Details**.

**Step 7** From the available paths, click **Path 0** to expand and view the active path.

**Example:**

*Figure 6: Path Details*




# Visualize Native Path Device Prerequisites

Confirm the following device software and configurations are met prior to visualizing native paths.

1. Devices should be running Cisco IOS XR 7.3.2. Run `show version`command to verify it.
2. Devices should have GRPC enabled.
   a. Run `show grpc` to confirm GRPC configuration. You should see something similar to this:

```
grpc
 port 50000
 no-tls
 address-family dual
!
mpls oam
!
```

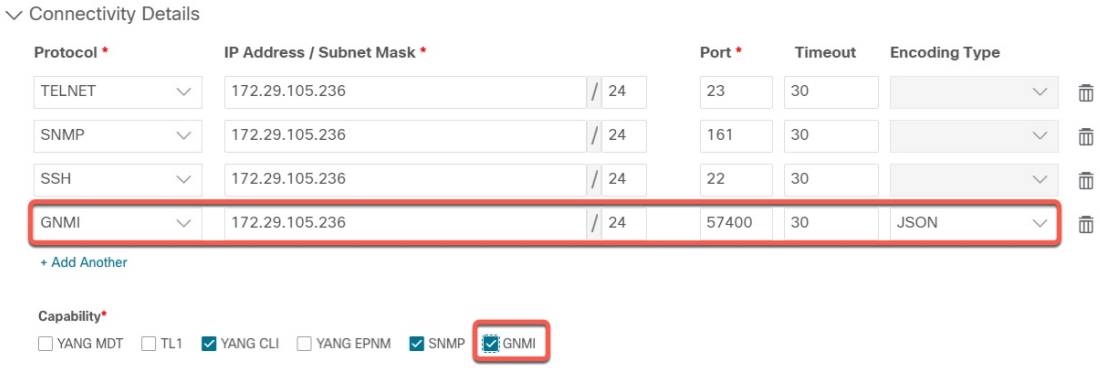
**Note**

- `address-family` is only required in an IPv4 topology.
- To enable GRPC with a secure connection, you must upload security certificates to connect to the d

3. Devices should have GNMI capability enabled and configured.

a. From **Device Management**, click on a device and view device details ( ).

b. Confirm that GNMI capability and connectivity details are configured.




4. Devices should have the CDG router static address. Static route should be added from the device to the southbound CDG IP address. For example:

```
RP/0/RP0/CPU0:xrvr-7.2.1#config

RP/0/RP0/CPU0:xrvr-7.2.1(config)#router static

RP/0/RP0/CPU0:xrvr-7.2.1(config-static)#address-family ipv4 unicast <CDG Southbound
interface IP: eg. 172.24.97.110> <Device Gateway eg: 172.29.105.1>

RP/0/RP0/CPU0:xrvr-7.2.1(config-static)#commit
```