



## Visualize SR-MPLS and SRv6 Policies

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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.

For a list of known limitations, important notes, and what networking technologies are supported, see the [Cisco Crosswork Optimization Engine Release Notes](#).

This section contains the following topics:

- [View SR-MPLS and SRv6 Policies on the Topology Map, on page 1](#)
- [View SR-MPLS and SRv6 Policy Details, on page 3](#)
- [Visualize SR-MPLS or SRv6 Policies Example, on page 4](#)
- [Find Multiple Candidate Paths \(MCPs\), on page 11](#)
- [Visualize Underlying Paths Associated with a Defined Binding-Segment ID \(B-SID\) Label, on page 14](#)
- [Visualizing Native SR Paths, on page 16](#)

## 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**.

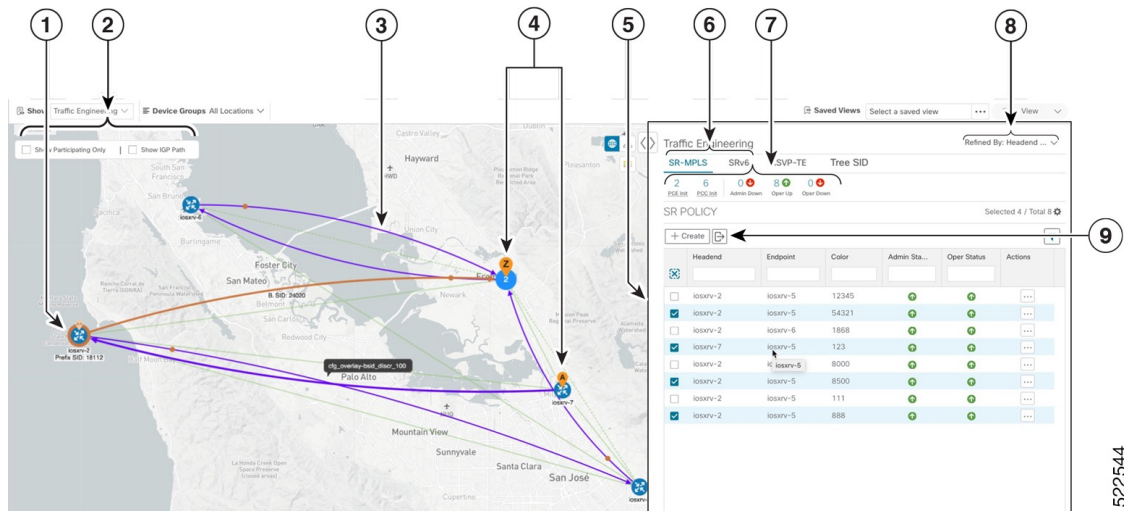




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**Note** Throughout this section, the navigation is documented as **Traffic Engineering > Traffic Engineering**. However, when using Crosswork Optimization Engine within the Crosswork Network Controller solution, the navigation is **Traffic Engineering & Services > Traffic Engineering** and select either the **SR-MPLS** or **SRv6** tabs.

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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: <ul style="list-style-type: none"> <li>• <b>Show IGP Path</b>—Displays the IGP path for the selected SR-TE policy.</li> <li>• <b>Show Participating Only</b>—Displays only links that belong to selected SR-TE policy. All other links and devices disappear.</li> </ul>
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.  An adjacency segment ID (SID) is shown as an orange circle on a link along the path (  ).
4	<b>SR-MPLS and SRv6 Policy Origin and Destination:</b> If both <b>A</b> and <b>Z</b> are displayed in a device cluster, at least one node in the cluster is a source and another is a destination. The <b>A+</b> denotes that there is more than one SR-TE policy that originates from a node. The <b>Z+</b> denotes that the node is a destination for more than one SR policy.
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: <ul style="list-style-type: none"> <li>• <a href="#">Visualize SR-MPLS or SRv6 Policies Example, on page 4</a></li> <li>• <a href="#">Provision SR-MPLS Policies</a></li> <li>• <a href="#">View Device and Link Details</a></li> </ul>

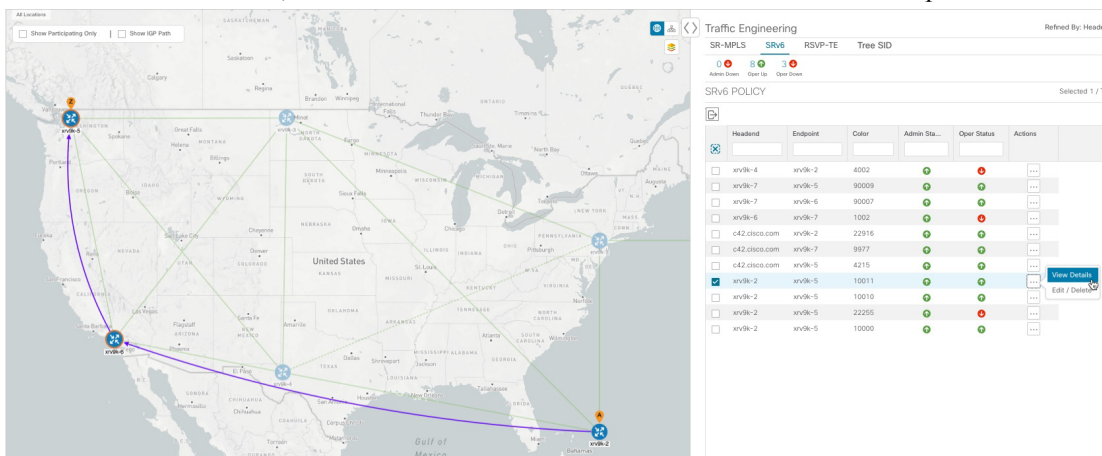
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Callout No.	Description
6	Click on either the <b>SR-MPLS</b> or <b>SRv6</b> tabs to view the respective list of SR-TE policies.
7	The <b>Mini Dashboard</b> provides a summary of the operational SR-MPLS or SRv6 policy status. If filters are applied, the <b>Mini Dashboard</b> is updated to reflect what is displayed in the SR Policy and SRv6 Policy tables. In addition to the policy status, the <b>SR-MPLS Mini Dashboard</b> table displays the number of PCC and PCE initiated tunnels that are <i>currently</i> 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 <b>Headend only</b> 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.  Filter options: <ul style="list-style-type: none"> <li>• <b>Headend or Endpoint</b>—Show policies with either the headend or endpoint device in the selected group.</li> <li>• <b>Headend and Endpoint</b>—Show policies if both the headend and endpoint are in the group.</li> <li>• <b>Headend only</b>—Show policies if the headend device of the policy is in the selected group.</li> <li>• <b>Endpoint only</b>—Show policies if endpoint device of the policy is in the selected group.</li> </ul>
9	Exports <i>all</i> 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.



The screenshot shows a network visualization interface. On the left, a map of the United States displays network paths between various locations. On the right, a table titled 'SRv6 POLICY' lists several policies with columns for Headend, Endpoint, Color, Admin Sta., Oper Status, and Actions. The 'Actions' column for the selected policy (srv6-2) shows a 'View Details' button.

Headend	Endpoint	Color	Admin Sta.	Oper Status	Actions
srv6-4	srv6-2	4502		<span style="color: green;">●</span>	
srv6-7	srv6-5	90009		<span style="color: green;">●</span>	
srv6-7	srv6-5	90007		<span style="color: green;">●</span>	
srv6-6	srv6-7	1002		<span style="color: green;">●</span>	
c42.cisco.com	srv6-2	22516		<span style="color: green;">●</span>	
c42.cisco.com	srv6-7	9977		<span style="color: green;">●</span>	
c42.cisco.com	srv6-5	4215		<span style="color: green;">●</span>	
srv6-2	srv6-5	10011		<span style="color: green;">●</span>	 View Details Edit / Delete
srv6-2	srv6-5	10010		<span style="color: green;">●</span>	
srv6-2	srv6-5	22255		<span style="color: green;">●</span>	
srv6-2	srv6-5	10000		<span style="color: green;">●</span>	

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

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**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.

The screenshot displays a detailed view of a network policy. The 'Summary' section provides key configuration and operational data:

- Admin State:** Up
- Oper State:** Up
- Binding SID:** 24006
- Policy Type:** Regular
- Profile ID:** -
- Description:** -
- Traffic Rate:** 0 Mbps
- Unused:** True
- Delay:** 15 (with an information icon 'i' and a tooltip showing 'Last Updated: 16-May-2022 10:23:15 AM GMT+5:30')
- BWOD Policy Bandwidth:** 0 Mbps
- Accumulated Metric:** 14
- Delegated PCE:** 172.23.209.75
- Non-delegated PCEs:** -
- PCE Computed Time:** 16-May-2022 09:15:28 AM GMT+5:30
- Last Update:** 16-May-2022 09:15:34 AM GMT+5:30

Below the summary, a 'Candidate Path' table is visible:

Path Name	Preference	Path Type	State
cto-test-1-discr-100	100	Unknown	Up

## 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.

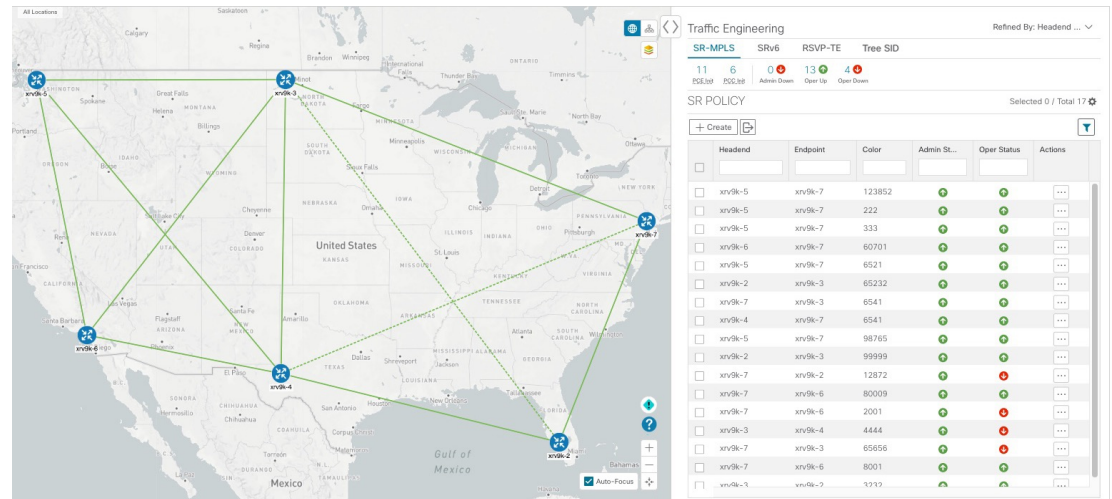
In this example, we assume that devices and SR-MPLS policies have been added and device groups have been created.



**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



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**Step 1**

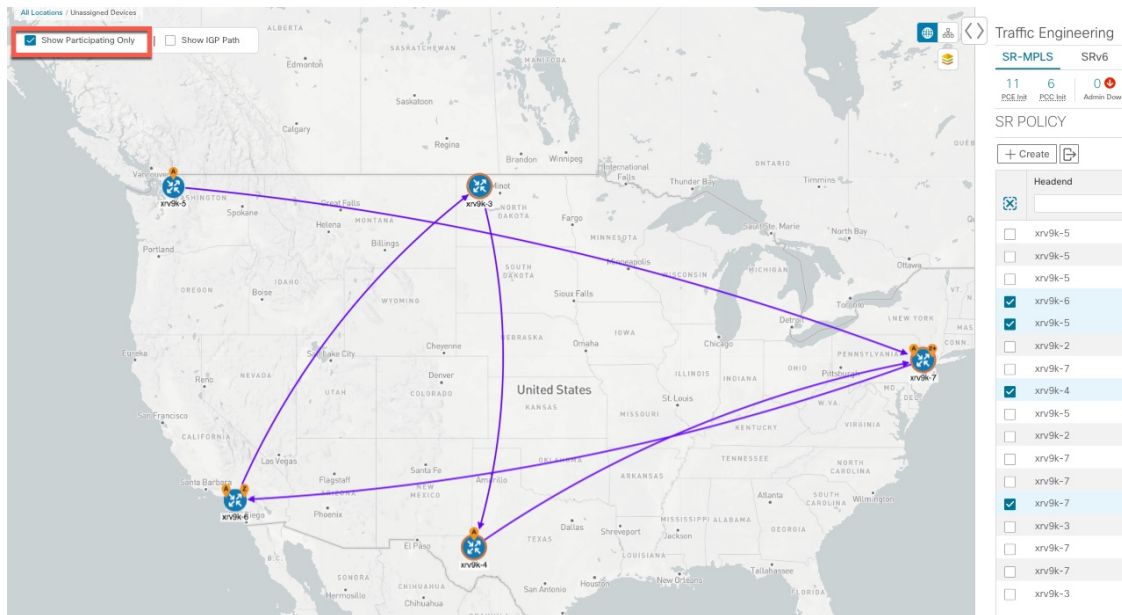
Select SR-MPLS policies for visualization and isolate them on the map.

- From the main menu, choose **Traffic Engineering** > **Traffic Engineering**.
- From the **SR Policy** table, check the check box next to the SR-MPLS policies you are interested in.
- 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.

Visualize SR-MPLS or SRv6 Policies Example

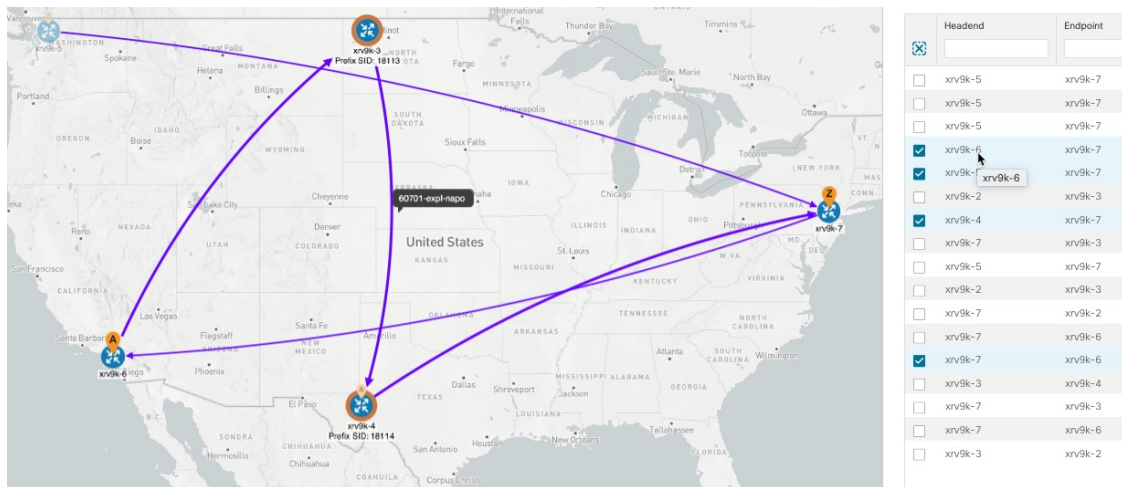


**Step 2** Highlight and view more details for a particular SR-MPLS policy.

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.

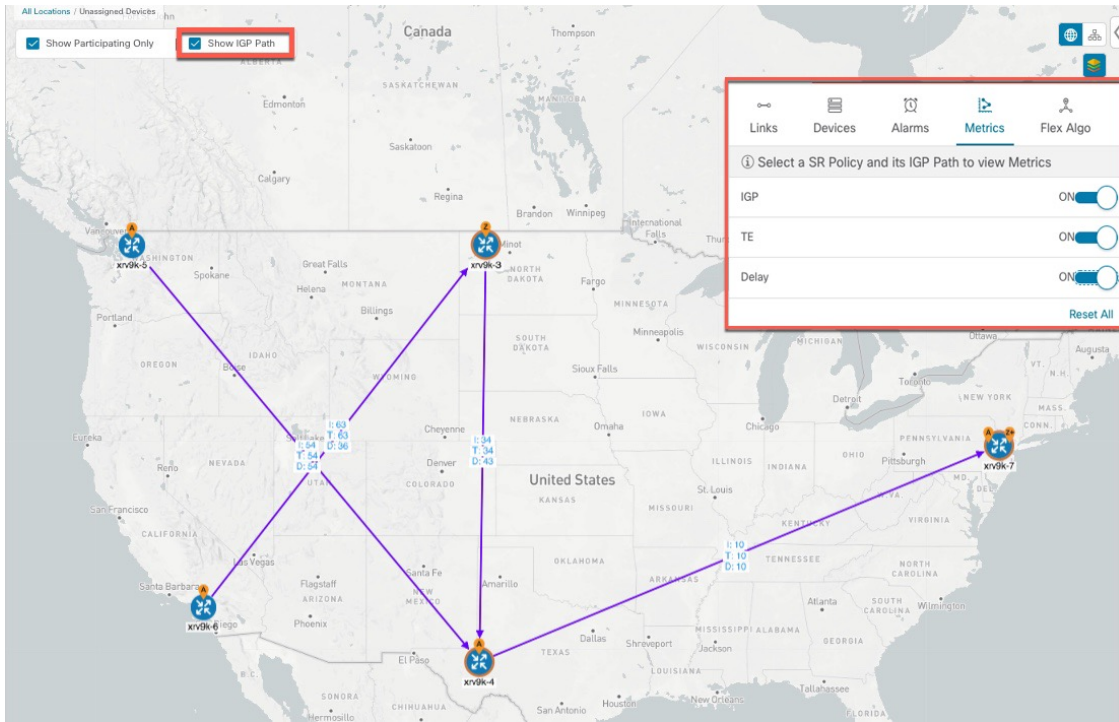
a) Check the **Show IGP Path** check box. The IGP paths for the selected SR-MPLS policies are displayed, with straight lines, instead of the segment hops.

b) Click .

c) Click the **Metrics** tab.

d) Toggle applicable metrics to ON.

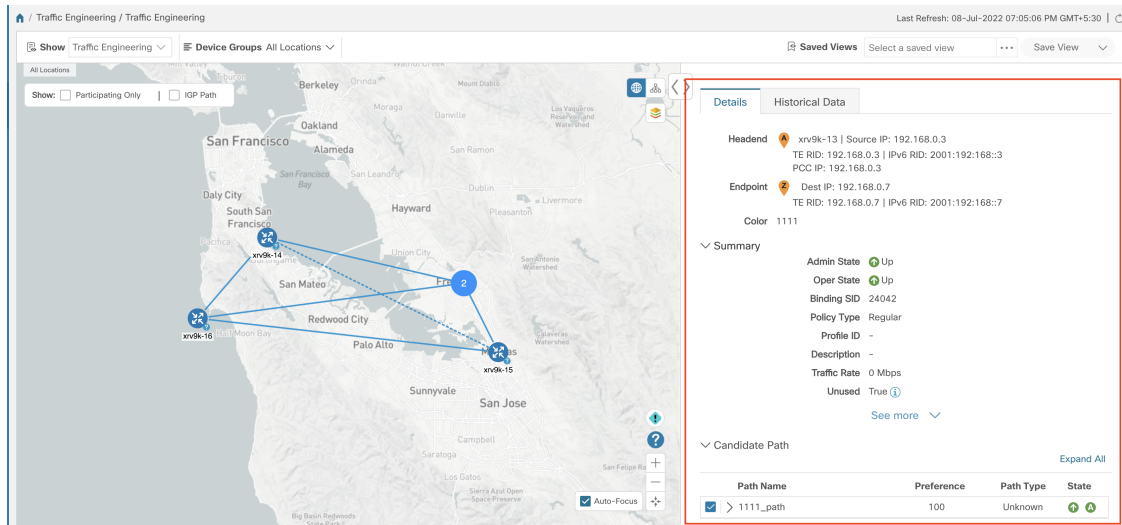
**Note** You must check the **Show IGP Path** check box in order to view metrics.



**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.



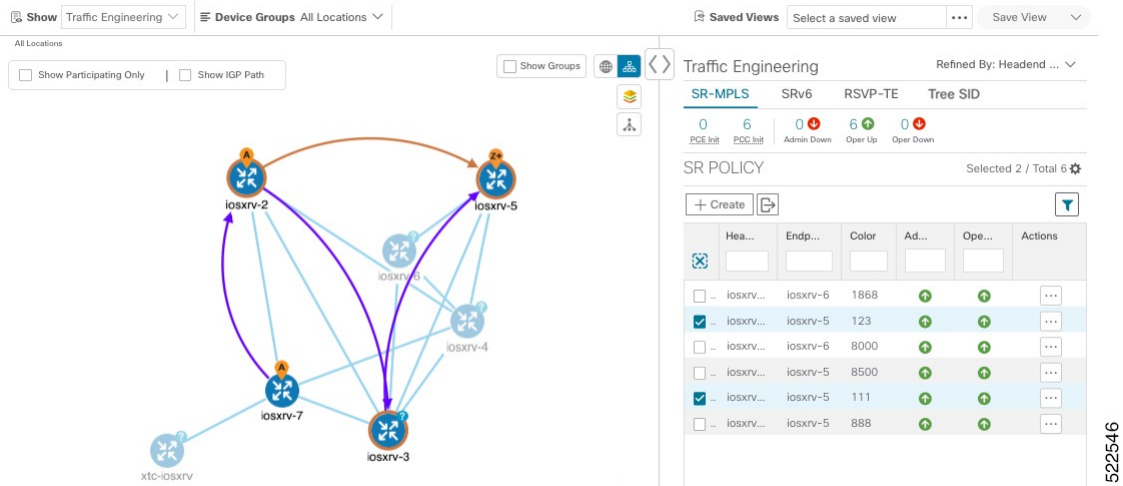
**Step 5**

Customize and save a logical view of the topology.

- Click  to display the logical view of selected SR-MPLS policies.
- Arrange the nodes to your preference.
- 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)**



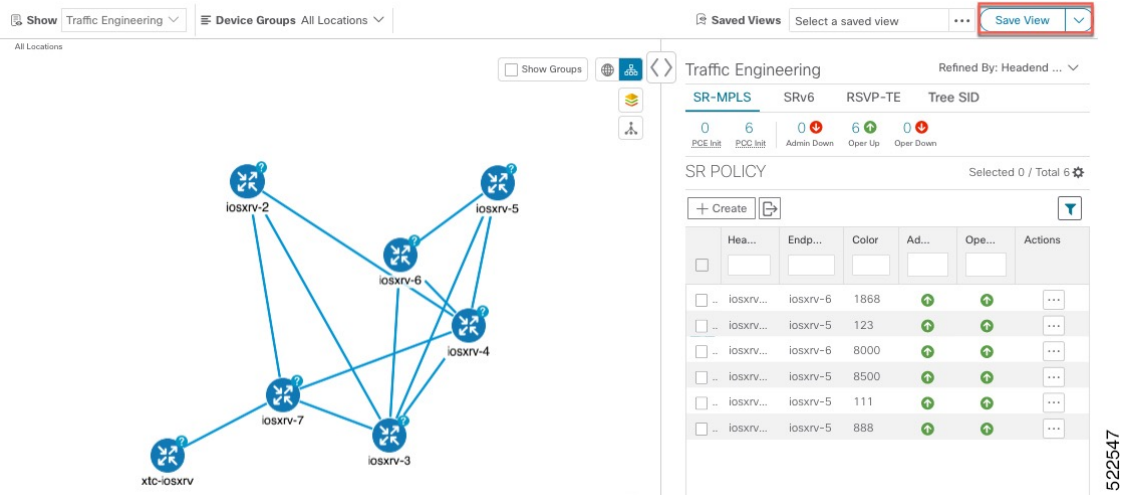
The screenshot shows a network visualization interface. On the left, a logical map displays nodes labeled iosrv-2, iosrv-3, iosrv-4, iosrv-5, iosrv-6, iosrv-7, and xtc-iosrv. Several links connect these nodes, with some highlighted in purple and orange. On the right, the 'Traffic Engineering' panel is visible, showing a table of SR-MPLS policies. Two policies are selected, indicated by checkmarks in the first column.

SR-MPLS	SRv6	RSVP-TE	Tree SID
0	6	0	0
0	6	0	0
Admin Down Oper Up Oper Down			
SR POLICY			
Selected 2 / Total 6			
Hea...	Endp...	Color	Ad...
<input type="checkbox"/>	iosxrv... iosxrv-6	1868	<span style="color: green;">+</span>
<input checked="" type="checkbox"/>	iosxrv... iosxrv-5	123	<span style="color: green;">+</span>
<input type="checkbox"/>	iosxrv... iosxrv-6	8000	<span style="color: green;">+</span>
<input type="checkbox"/>	iosxrv... iosxrv-5	8500	<span style="color: green;">+</span>
<input checked="" type="checkbox"/>	iosxrv... iosxrv-5	111	<span style="color: green;">+</span>
<input type="checkbox"/>	iosxrv... iosxrv-5	888	<span style="color: green;">+</span>

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**Example:**

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



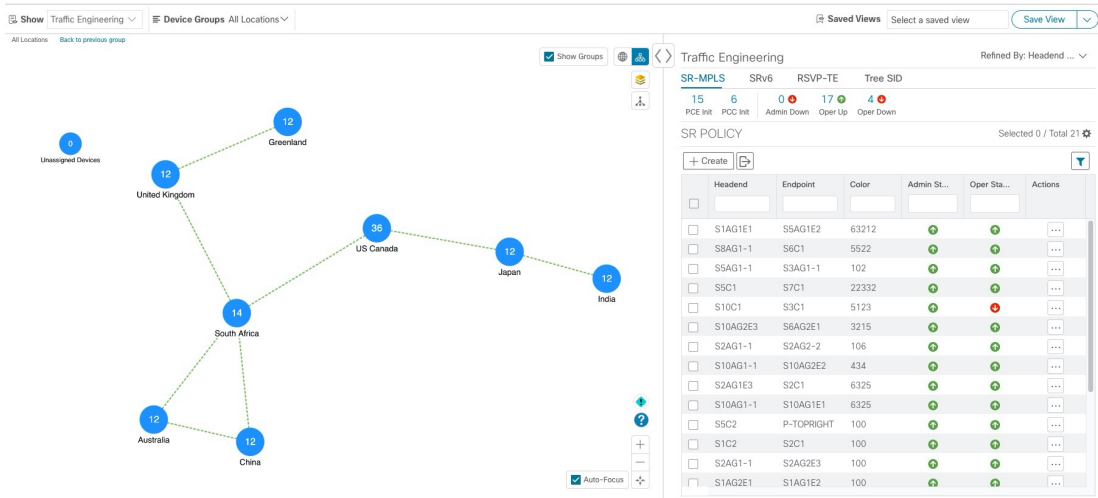
The screenshot shows the same network visualization interface as Figure 3, but with no SR-MPLS policies selected. The 'SR POLICY' table now shows 'Selected 0 / Total 6'. The 'Save View' button in the top right corner of the right-hand panel is highlighted with a red box.

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**Step 6** Close (X) 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**.

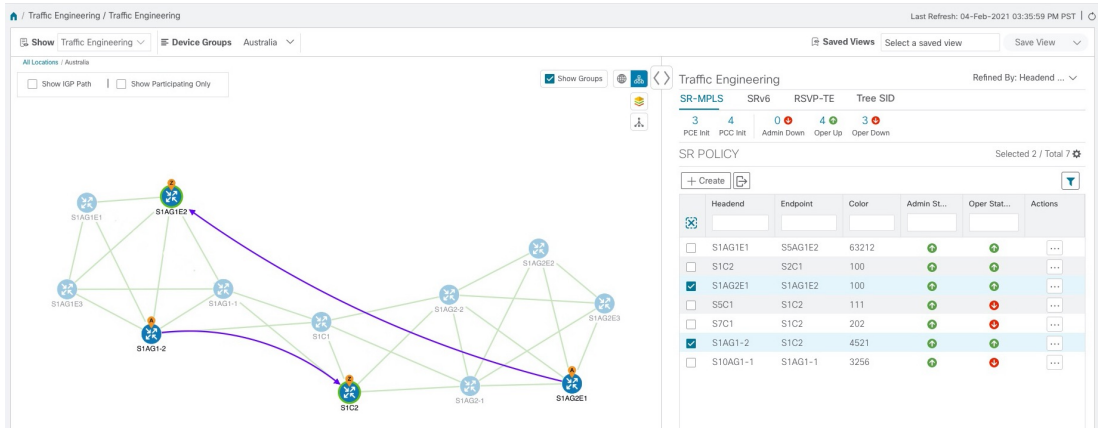




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**Step 8**

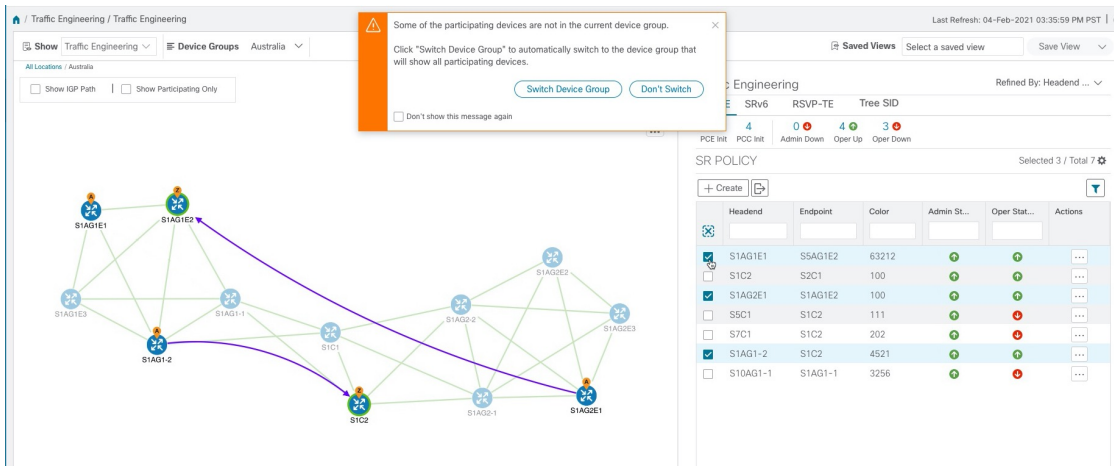
Selecting a specific group from the **Device Groups** drop-down list, will only display that group in the map. In this example, **Australia** is selected and the associated SR-MPLS policy is selected and displayed.



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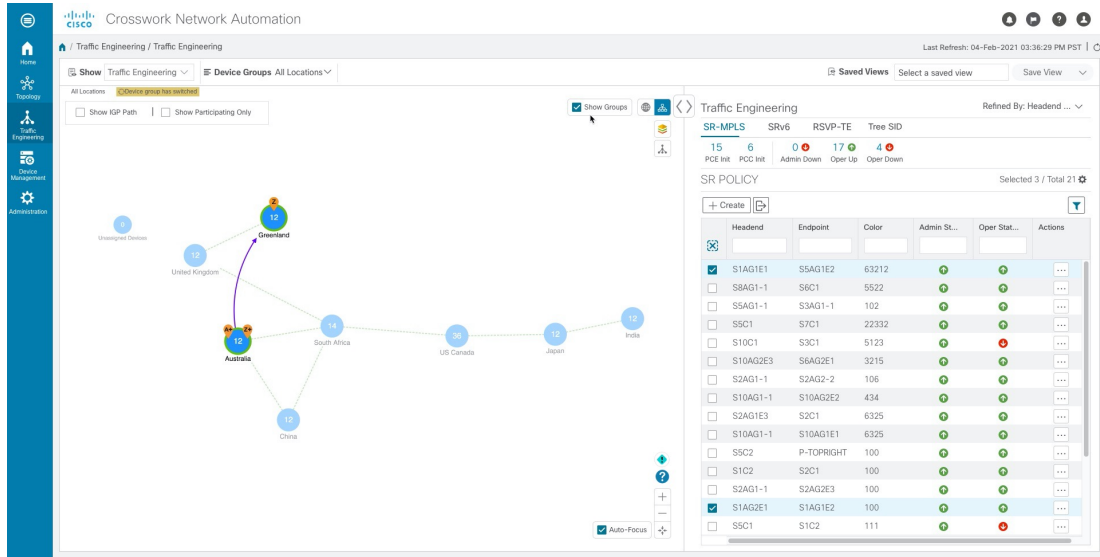
**Step 9**

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**

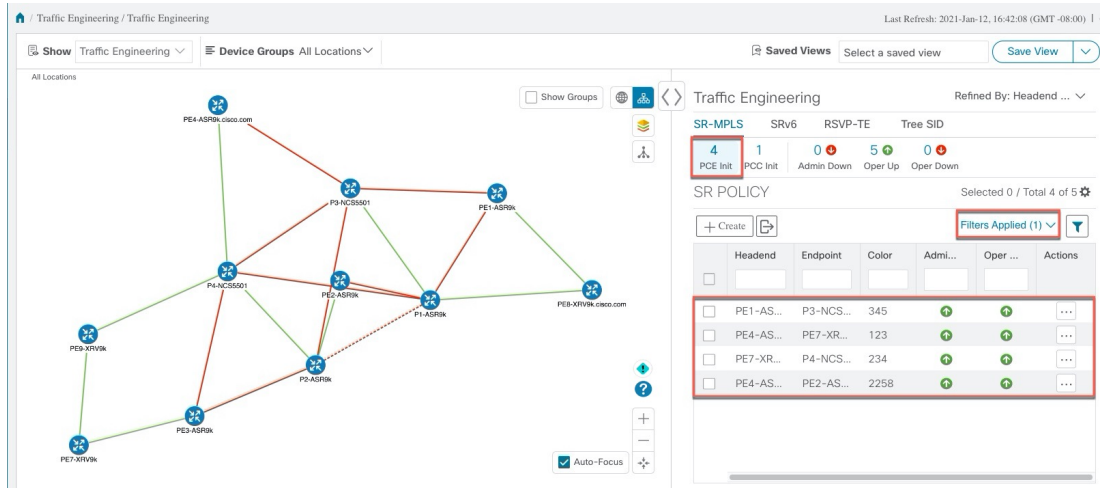
If you select **Switch Device Group**, then the group will change and you will see all participating devices for the SR-MPLS policies you have selected.  
 To go back to the previous group view, click **Back** (this link appears later in the yellow text area indicated in the following figure).



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**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.



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**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

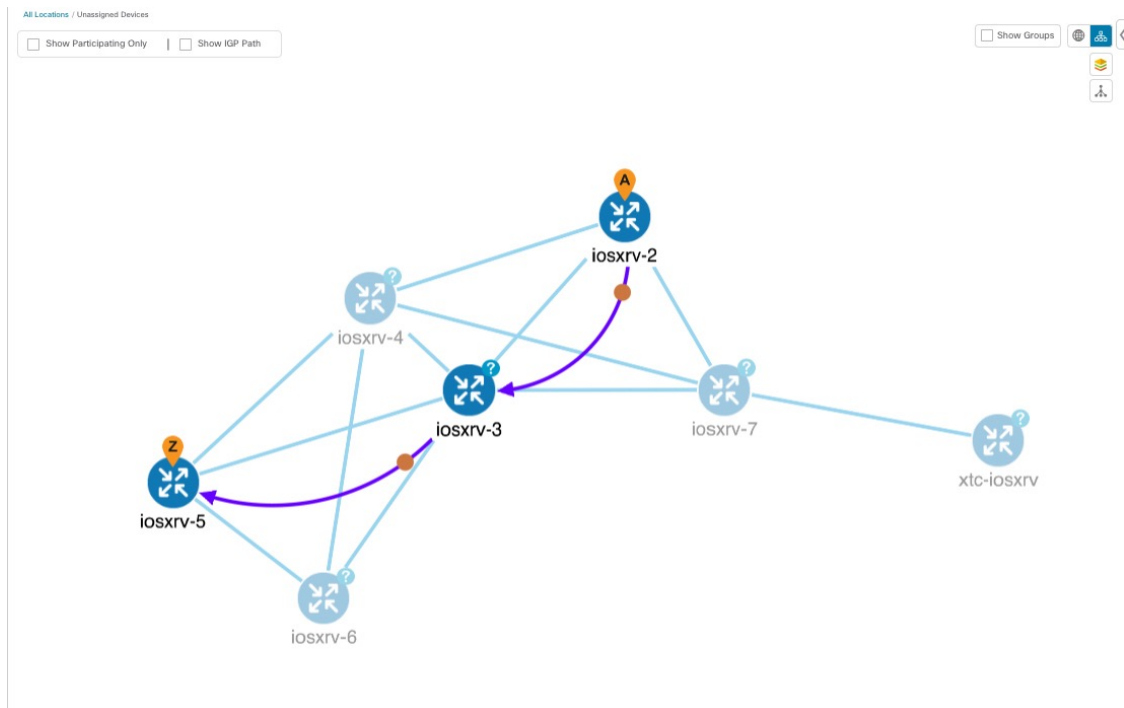
A policy must be configured with MCPs on devices before visualizing them on the Traffic Engineering topology map. This configuration can be done manually or within Crosswork Network Controller.

**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.

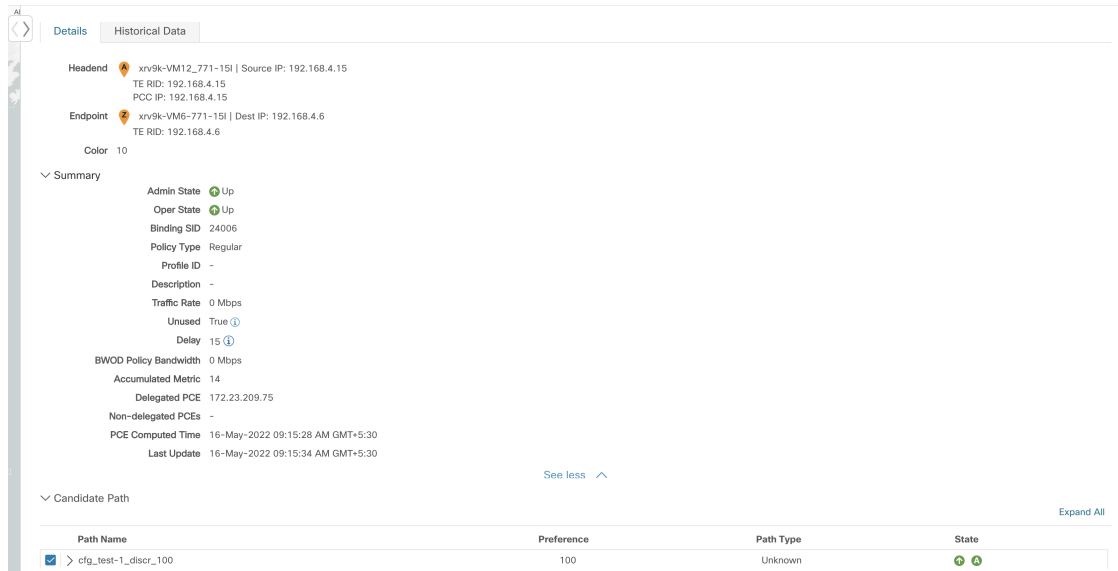
- Check the check box next to the SR-TE policy that has MCPs configured.
- View the SR-TE policy that is highlighted on the topology map.

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 A in the status column indicates the active



The screenshot shows the 'SR Policy Details' window with the following information:

- Headend:** xrv9k-VM12\_771-151 | Source IP: 192.168.4.15  
TE RID: 192.168.4.15  
PCC IP: 192.168.4.15
- Endpoint:** xrv9k-VM6-771-151 | Dest IP: 192.168.4.6  
TE RID: 192.168.4.6
- Color:** 10
- Summary:**
  - Admin State: Up
  - Oper State: Up
  - Binding SID: 24006
  - Policy Type: Regular
  - Profile ID: -
  - Description: -
  - Traffic Rate: 0 Mbps
  - Unused: True
  - Delay: 15
  - BWOD Policy Bandwidth: 0 Mbps
  - Accumulated Metric: 14
  - Delegated PCE: 172.23.209.75
  - Non-delegated PCEs: -
  - PCE Computed Time: 16-May-2022 09:15:28 AM GMT+5:30
  - Last Update: 16-May-2022 09:15:34 AM GMT+5:30
- Candidate Path:**

Path Name	Preference	Path Type	State
<input checked="" type="checkbox"/> > cfg_test-1_discr_100	100	Unknown	Up A

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.

SR Policy Details

PCE Computed Time 26-Aug-2021 03:31:10 PM PDT  
Last Update 26-Aug-2021 03:39:23 PM PDT

Candidate Path Collapse All

Path Name	Preference	Path Type
<input type="checkbox"/> <input checked="" type="checkbox"/> <span style="font-size: small;">▼</span> cfg_test_mcp_diff_paths_discr_10000	10000	Unknown

Segm...	Segment Type	Label	Algo	IP	Node	Interface	Sid T...
0	IGP Adj SID	24002	0	10.0.0.9	iosxrv-2		P
1	IGP Adj SID	24012	0	10.0.0.25	iosxrv-3		P

**Path Name** cfg\_test\_mcp\_diff\_paths\_discr\_10000  
**Policy Type** Unknown  
**Metric Type** TE  
**Disjoint Group** ID:  
 Association Source: -  
 Type: -  
**PCE Initiated** false  
**Affinity** Exclude-Any: -  
 Include-Any: -  
 Include-All: -

Segm...	Segment Type	Label	Algo	IP	Node	Interface	Sid T...
0	Node SID	18115	0	192.168.0.5	iosxrv-5		

**Path Name** cfg\_test\_mcp\_diff\_paths\_discr\_5000  
**Policy Type** Unknown  
**Metric Type** IGP  
**Disjoint Group** ID:  
 Association Source: -  
 Type: -  
**PCE Initiated** false  
**Affinity** Exclude-Any: -  
 Include-Any: -  
 Include-All: -

- 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

The screenshot displays a network topology and the details of an SR Policy. The topology map on the left shows several nodes (iosrv-2, iosrv-3, iosrv-4, iosrv-5, iosrv-6, iosrv-7, xtc-iosrv) connected by links. A path is highlighted in orange, labeled 'Candidate Path', with a callout box indicating 'cfg\_test\_mcp\_diff\_paths\_discr\_5000'. The SR Policy Details panel on the right shows a table of candidate paths. The selected path is 'cfg\_test\_mcp\_diff\_paths\_discr\_5000' with a preference of 5000 and an unknown path type. The table below shows the segments of this path:

Seg...	Segment ...	Label	Algo	IP	Node
0	IGP Adj ...	24002	0	10.0.0.9	iosxr...
1	IGP Adj ...	24012	0	10.0.0.25	iosxr...

Below this, the path details are shown for 'cfg\_test\_mcp\_diff\_paths\_discr\_5000':

Seg...	Segment ...	Label	Algo	IP	Node
0	Node SID	18115	0	192.168...	iosxr...

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

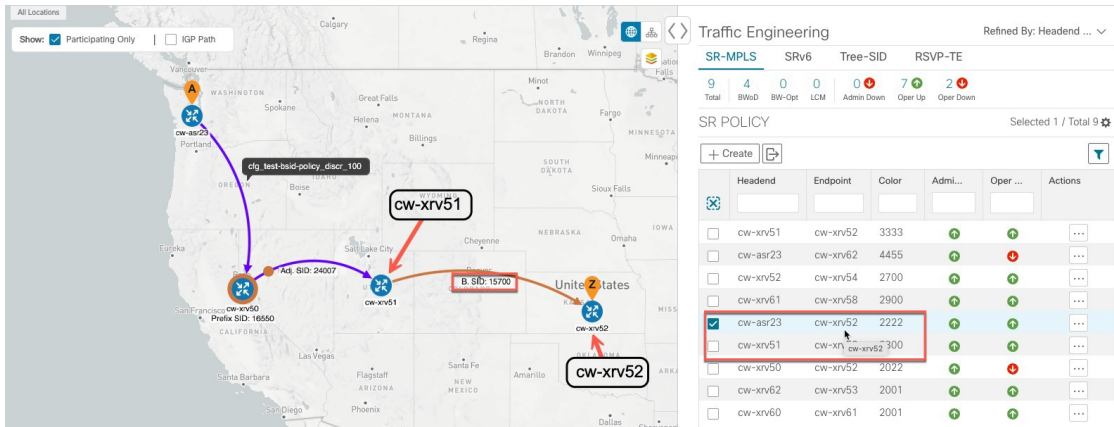
Crosswork Optimization Engine allows you to visualize the underlying path of a B-SID hop that you have manually configured on a device or configured using Crosswork Network Controller. In this example, we have assigned **15700** as a B-SID label on an SR-MPLS policy hop.

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 B-SID path is going from **cw-xrv51** to **cw-xrv52**.

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



**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**. In this example, the B-SID label is **15700**.

SR Policy Details

Details | Historical Data

**Headend** cw-asr23 | Source IP: 3.3.3.100  
TE RID: 3.3.3.100 | IPv6 RID: fb00:3:3::100  
PCC IP: 3.3.3.100

**Endpoint** cw-xrv52 | Dest IP: 3.3.3.52  
TE RID: 3.3.3.52 | IPv6 RID: fb00:3:3::52

**Color** 2222

Summary

- Admin State Up
- Oper State Up
- Binding SID 24011
- Policy Type Regular
- Profile ID -
- Description -
- Traffic Rate 0 Mbps
- Unused True

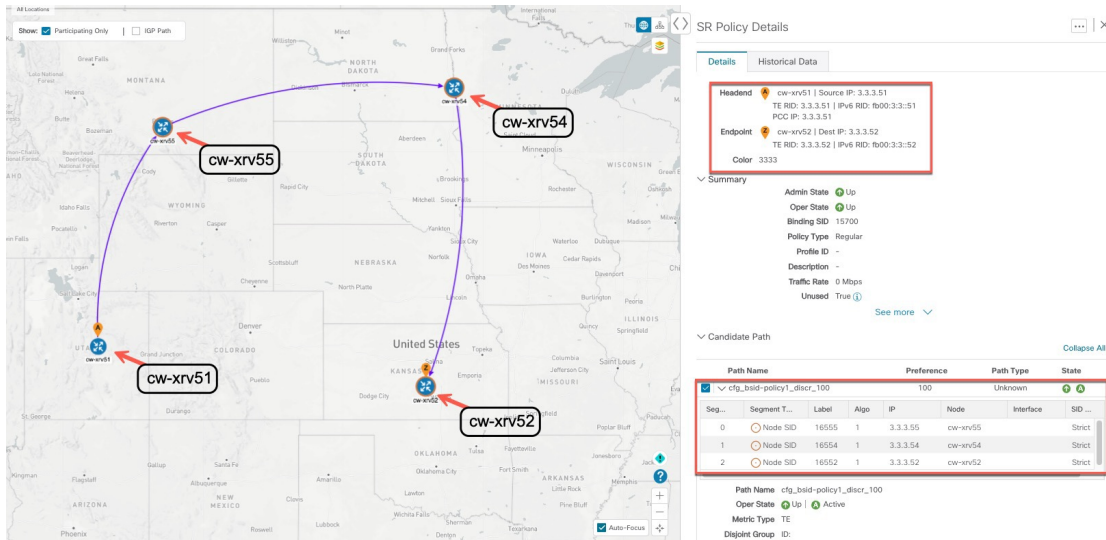
See more

Candidate Path Collapse All

Path Name	Preference	Path Type	State
<input checked="" type="checkbox"/> <span>▼</span> cfg_test-bsid-policy_discr_100	100	Unknown	<span>Up</span> <span>Active</span>
S...	Segme...	L...	Algo
0	Nod...	16...	1
1	IGP ...	24...	0
2	B-Sid	15700	

Path Name: cfg\_test-bsid-policy\_discr\_100  
Oper State: Up | Active  
Metric Type: TE

**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 **cw-xrv51** > **cw-xrv55** > **cw-xrv54** > **cw-xrv52**.



The screenshot shows a map of the United States with four nodes marked: cw-xrv51 (yellow), cw-xrv55 (blue), cw-xrv54 (blue), and cw-xrv52 (blue). A purple path connects them in the order: cw-xrv51 to cw-xrv55, cw-xrv55 to cw-xrv54, and cw-xrv54 to cw-xrv52. To the right, the 'SR Policy Details' window is open, showing the 'Candidate Path' table with the following data:

Path Name	Preference	Path Type	State				
cfq_bsid-policy1_discr_100	100	Unknown	Up				
Seg_	Segment T...	Label	Algo	IP	Node	Interface	SID ...
0	Node SID	16555	1	3.3.3.55	cw-xrv55	Strict	
1	Node SID	16554	1	3.3.3.54	cw-xrv54	Strict	
2	Node SID	16552	1	3.3.3.52	cw-xrv52	Strict	

## Visualizing Native SR Paths

Crosswork Optimization Engine allows you to visualize the Native SR paths. Since this 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 18](#).

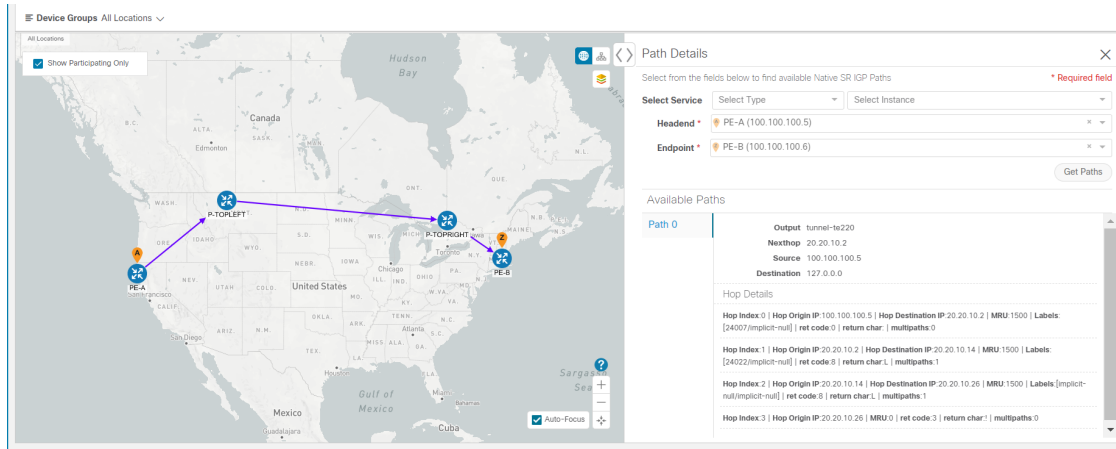
- Step 1** From the main menu, choose **Traffic Engineering** > **Path Query**.
- Step 2** On the Query Path Dashboard, click **New Query**.
- Step 3** Under the New Path Query, select the required values and click **Get Paths**.
- Step 4** Click **View Result** to view the query result.
- Step 5** (Optional) 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



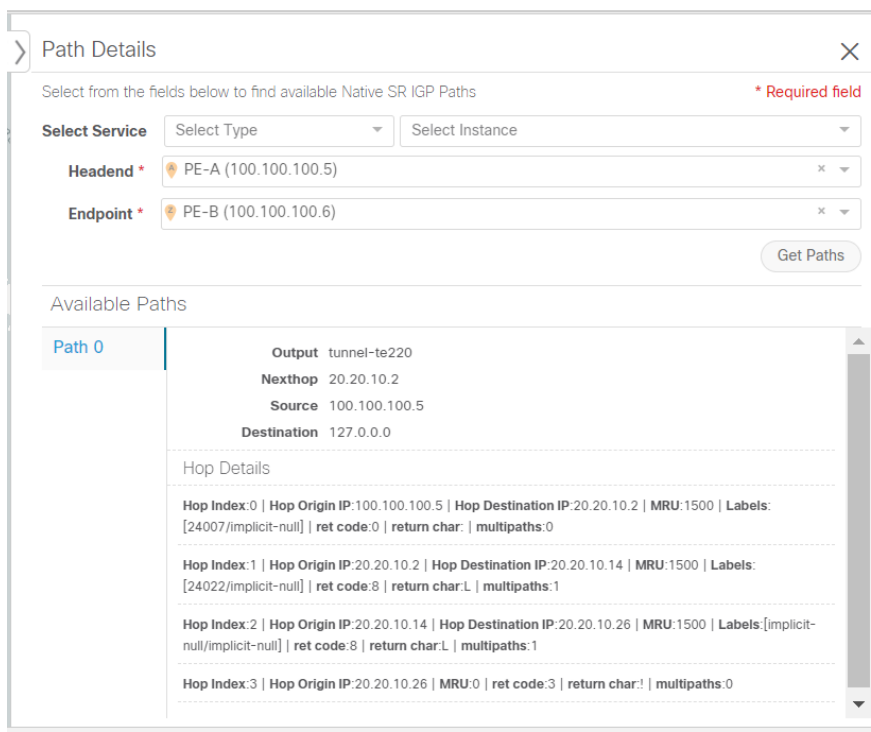
**Step 6** From the **Actions** column, click **View Details**.

If you have not provided the longitude and latitude information for your devices, the path is visualized in the logical view.

**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 device.

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.

#### Connectivity Details

Protocol *	IP Address / Subnet Mask *	Port *	Timeout	Encoding Type	
TELNET	172.29.105.236 / 24	23	30		
SNMP	172.29.105.236 / 24	161	30		
SSH	172.29.105.236 / 24	22	30		
GNMI	172.29.105.236 / 24	57400	30	JSON	

[+ Add Another](#)

#### Capability \*

YANG MDT
  TL1
  YANG CLI
  YANG EPNM
  SNMP
  GNMI



---

**Note** Based on the type of devices, the following device encoding type are available:

- JSON
  - BYTES
  - PROTO
  - ASCII
  - JSON IETF
- 

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
```

