



Provision, Visualize, and Analyze Tree Segment Identifier Policies in Multipath Networks

This section explains the following topics:

- [Overview, on page 1](#)
- [Scenario 12 – Provisioning, Visualizing, and Analyzing Tree Segment Identifier Policies in a Point-to-Multipoint L3VPN Service, on page 2](#)

Overview

Allow users to provision and visualize Tree Segment Identifier (Tree-SID) Segment Routing policies easily and quickly before associating the policies with an L3VPN service model.

Objective

To provision, visualize, and update static Tree-SID policies within your network using Crosswork Network Controller and associate the (mVPN) policies with an L3VPN service model. By provisioning the Tree-SID policies using the Crosswork Network Controller UI and both visualizing and analyzing the multicast paths, root and leaf nodes, transit nodes, and view information about each link among the nodes, provides a holistic view of creating, visualizing, updating, and maintaining point-to-multipoint (P2MP) network configurations. These static Tree-SID policies can now be associated with an L3VPN service model and visualized and edited, as needed, using the Crosswork Network Controller UI.

Challenge

Keeping track of SR PCE and PE paths within networks is a challenge for video broadcasting and streaming service providers, who must use multipath protocols to replicate traffic and send it to different points in the network. Ensuring a high level of service quality forces providers to use difficult manual approaches to visualize, update and maintain their point-to-multipoint (P2MP) network configurations. This slows response to network problems and increases costs.

Solution

Tree-SID is a method of implementing tree-like multicast flows over a segmented routing network. Using Tree-SID, an SDN controller (a device running SR-PCE using PCEP), calculates the tree. Each node (device) in the tree has a specific role in routing the multicast data through the tree. These roles include Ingress for the root or headend node, Transit or Bud for midpoint nodes that are not leaf nodes, and Egress for destination leaf nodes. The tree itself is assigned a single SID label, which represents all of the tree segments and devices

in it. The SDN controller is highly flexible, as it understands the segmentation and can construct routing paths using any kind of constraints that network architects can specify.

The most interesting use case for constraint-based Tree-SID use is where routers are configured to deliver two P2MP streams with the same content over different paths. Here, the multicast flow is forwarded twice through the network, each copy following a unique path. The two copies never use the same node or link to reach the destination, reducing packet loss due to network failures on any one of the paths.

By using Crosswork Network Controller, you can now create Static Tree-SID policies using the UI, associate Static mVPN Tree-SID policies with a provisioned L3VPN service, visualize, analyze, and edit or delete your Tree-SID policies to actively manage your multicast network.



Note Static and Dynamic mVPN Tree-SID policies can be associated with a L3VPN service model. In this workflow tutorial, only a Static mVPN Tree-SID policy will be associated with a L3VPN service model, visualized, and analyzed.

How Does it Work?

- Create a Static Tree-SID policy using the Crosswork Network Controller UI
- Visualize and validate the new Static Tree-SID policy
- Associate your Static mVPN Tree-SID policy with an L3VPN service model (or import an existing static or dynamic Tree-SID policy)
- Visualize and analyze the performance details of your Static mVPN Tree-SID paths and nodes within the L3VPN service model
- Edit your existing Static mVPN Tree-SID policy to enhance performance or correct issues with your Tree-SID L3VPN service model

Scenario 12 – Provisioning, Visualizing, and Analyzing Tree Segment Identifier Policies in a Point-to-Multipoint L3VPN Service

Scenario Context

Without Crosswork Network Controller, provisioning and visualizing Tree-SID point-to-multipoint traffic flows is available only using manual tasks from different sources. Restriction to manual tasks means that the creation of Tree-SID policies, associating a policy with an L3VPN service model, visualization, and editing of the policy and/or service is significantly hampered. By using Crosswork Network Controller, you can sidestep the time loss between manual setup and the visualization of the traffic flow paths and avoid data that is often out of date with manual configurations. Crosswork Network Controller supports both creation and discovery of the Tree-SID segmentation directly from network configurations and displays the data flow map immediately. This facilitates rapid troubleshooting for issues with Tree-SID traffic flows.

Crosswork Network Controller's topology services uses PCE topology and LSP data to discover and visualize pre-configured Tree-SID policies in your network. The PCE controller manages the layer 3 topology, LSP and Tree-SID data using BGP link state, and supports initial discovery and notifications for the Tree-SID

trees. Static Tree-SID policies can also be configured and later associated with newly created, or previously configured, L3VPN services directly in the Crosswork Network Controller's UI. Likewise, based on the health of the service and policies, editing capabilities are also performed using the UI to troubleshoot and optimize models operations.

Assumptions and Prerequisites

If your network has PCE and Tree-SID policies already configured on your devices, this workflow assumes, at a minimum, the following basic configuration options:

1. On all nodes involved in the Tree-SID path, irrespective of role:
 - a. Enable Path Computation Element Protocol (PCEP)
 - b. Enable Computation Client (PCC)
2. Under SR-PCE, on end points: Configure a P2MP SR static or dynamic Policy.
3. On all root and leaf nodes:
 - Enable multicast routing
 - Configure `interface vrf <vrf-number>`
 - Configure `router bgp` on topo nodes and PCE. On corresponding neighbors between PCE and PCC nodes, mention the configured `interface vrf <vrf-number>`.
 - Configure `route-policy <vrf-number>` and `PASS_ALL`
 - Under segment routing traffic engineering: Configure `ODN color <same as vrf-number>`
4. On all leaf nodes only: Configure `router PIM`, `route-policy TREESID_CORE`.

Step 1 Create a Static Tree-SID Policy

If you are using preconfigured Static or Dynamic Tree-SID policies already configured on your devices, skip to Step 2 in the workflow. If you are configuring Tree-SID policies using the Crosswork Network Controller's UI, this task first creates a Static Tree-SID policy, each representing a leaf or root node, before you have the option to associate the policies with a L3VPN service model that can be visualized and edited as necessary:

Step 1 Go to **Services & Traffic Engineering > Traffic Engineering**.

The logical map opens and the Traffic Engineering panel is displayed to the right of the map.

Step 2 In the Traffic Engineering panel, select the **Tree-SID** tab.

The Traffic Engineering Tree-SID Policy screen appears.

Step 1 Create a Static Tree-SID Policy

Traffic Engineering Refined By ▾

SR-MPLS SRv6 **Tree-SID** RSVP-TE

2 0 2 0 ↓ 2 ↑ 0 ↓
 Total Dynamic Static Admin Down Oper Up Oper Down

Tree-SID Policy Selected 0 / Total 2 ⚙

[+ Create](#) [↗](#) [⏴](#)

	Root Name	Root IP	Name	Tree ID	Label	Admin...	Oper ...	Actions
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	xrv9k-26	192.1...	Disney	-	152001	↑	↑	⋮
<input type="checkbox"/>	xrv9k-27	192.1...	MY_F...	-	15200	↑	↑	⋮

Step 3 Click + Create.

The New Tree-SID Policy (Static) screen appears.

New Tree-SID Policy (Static) * Required Field

Name *

Tree-SID Label * ?

Root * ?
 Selected - None

Leaf (s) *
 Selected - None

[+ Add another](#)

Optimization Objective *

LFA FRR ?
 Enable Disable

Constraints

Affinity

[+ Add another](#)

Step 4 To enter or select the required Static Tree-SID policy values, do the following:

- a) After providing a name for your new Static Tree-SID policy, in the Tree-SID Label field, assign the MPLS label associated with the Tree-SID policy (for example: **152001**).

The Tree-SID Label must be in the range from 16 to 1048575.

- b) In the Root field, enter the host name (for example: **xrv9k-26**) or select a node on the map or an existing device in the list. As you type or select the Root information, a Root label for the selected node appears on the map. Only PCC nodes with PCEP session to PCE can be added as a Root node.
- c) In the Leaf field, enter the host name (for example: **xrv9k-24**) or select a node on the map. As you type, or select, the Leaf information, Leaf label(s) for the selected nodes appear on the map.

Click + **Add another** to add additional constraints (for example: **xrv9k-27**).

- d) For Optimization Objective, select one of the following constraints: Interior Gateway Protocol (IGP) Metric; Traffic Engineering (TE) Metric; Latency (for example: **IGP**).
- e) For LFA FRR, either select **Enable** or **Disable** (for example: **Enable**).

By selecting Enable, the Loop Free Alternate Fast Reroute (LFA FRR) is enable on all of the nodes in the distribution tree.

- f) For additional Constraints, select one of the following Affinity options: **Exclude-Any**, **Include-Any**, **Include-All**.

In addition, from the Select or Create Mapping drop-down list, click **Manage Mapping**. The Affinity Mapping dialog box opens. For more information on Affinities, see the Configure Link Affinities section in the Crosswork Optimization Engine guide.

Name	Bit Position (0-31)	Actions
There are no TE link Affinities here, may be you should create new one.		

- g) For Affinity Mapping, type a Name (color) of the mapping and enter the Bit Position (**0 – 31**). Enter the same bit position that is used on the device interface. Click **Done**.

To create additional constraints, click + **Create**.

Step 2 Visualize and Validate the new Static Tree-SID policy

New Tree-SID Policy (Static) * Required Field

Name *

Tree-SID Label * ?

Root * ?

Selected - xrv9k-26 [192.168.0.26] [2001:192:168::26] [Edit](#)

Leaf (s) *

Selected - xrv9k-24 [192.168.0.24] [2001:192:168::24] [Info](#) [Edit](#)

Selected - xrv9k-27 [192.168.0.27] [2001:192:168::27] [Info](#) [Edit](#)

[+ Add another](#)

Optimization Objective *

LFA FRR ?

Enable Disable

Constraints

Affinity

[+ Add another](#)

h) To commit the policy, click **Provision** to activate the policy on the network.

The newly provisioned Tree-SID policy may take some time to appear in the Tree-SID table depending on the network size and performance. The Tree-SID table is auto refreshed every 30 seconds. Once the request is successful, either select **View Tree-SID Policy List** or **Create New** to add additional policies. If you select **View Tree-SID Policy List**, the Tree-SID Policy screen appears showing the newly created policy in the table.

Step 2 Visualize and Validate the new Static Tree-SID policy

Step 1 Select the root Tree-SID policy check box from the list. In this example, select **xrv9k-26**.

Tree-SID Policy Selected 1 / Total 2 ⚙️

	Root Name	Root IP	Name	Tree ID	Label	Admin St...	Oper Status	Actions
<input checked="" type="checkbox"/>	xrv9k-26	192.168....	Disney	-	152001	⬆️	⬆️	⋮
<input type="checkbox"/>	xrv9k-27	192.168....	MY_FIRST_TRR...	-	15200	⬆️	⬆️	⋮

If there is a large number of policies in the table, filter by Root IP, Name, Label, or other parameter, to help locate the policy you want to visualize.

In the map, you will see the selected Tree-SID policy as an overlay on the topology. It shows a representation of the Tree-SID policy routes, with icon flags indicating the root **R** node (**xrv9k-26**, also known as the ingress device) and the two leaf **L** nodes (**xrv9k-24** and **xrv9k-27**, also known as egress devices), with intermediary transit nodes between them. Administrative and operational status for each node is shown in the table.

Note Use the buttons at the top right of the logical map to toggle between the Logical Map and the Geo Map



views.

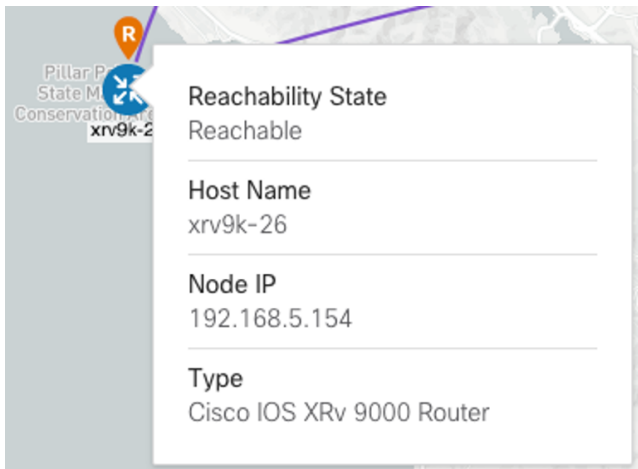
Step 2

Select the **Geo Map** button to view the selected Tree-SID service topology overlaid on a world map.

Step 3

In the map, select the **Show: Participating Only** check box to hide underlay devices that are not participating in the selected Tree-SID policy. Then use your mouse to hover over the **xrv9k-26** root device to view its corresponding Reachability State, Host Name, Node IP, and device Type.

Check any participating Tree-SID device in the same fashion to view their corresponding details.



Step 4

In the map, click **xrv9k-24**.

The Device Details screen opens showing **xrv9k-24** information organized by Summary and Routing in the Details tab, and PCEP Sessions in the Traffic Engineering tab.

Step 2 Visualize and Validate the new Static Tree-SID policy

Device Details

Details Links Traffic Engineering

Summary

- Host Name** xrv9k-24
- Reachability** ✔ Reachable
- IP Address** 192.168.5.152
- Geo Location** Latitude 37.621300, Longitude -122.379000
- Device Type** 🌐 Router
- Device Group** Location > All Locations > Unassigned Devices
- Product Type** Cisco IOS XRv 9000 Router
- Connect To Device** 🔒 SSH IPv4
- Last Update** 22-Mar-2023 09:43:19 AM PDT

Routing

- TE Router ID** 192.168.0.24
- IPv6 Router ID** 2001:192:168::24
- ISIS System ID** 0000.0000.0004 Level-2
- ASN** 65000

Device Details

Details Links Traffic Engineering

General SR-MPLS SRv6 Tree-SID RSVP-TE Flex Algo

> IGP: Domain ID: 1000, ISIS System ID: 0000.0000.0004, Level: 2

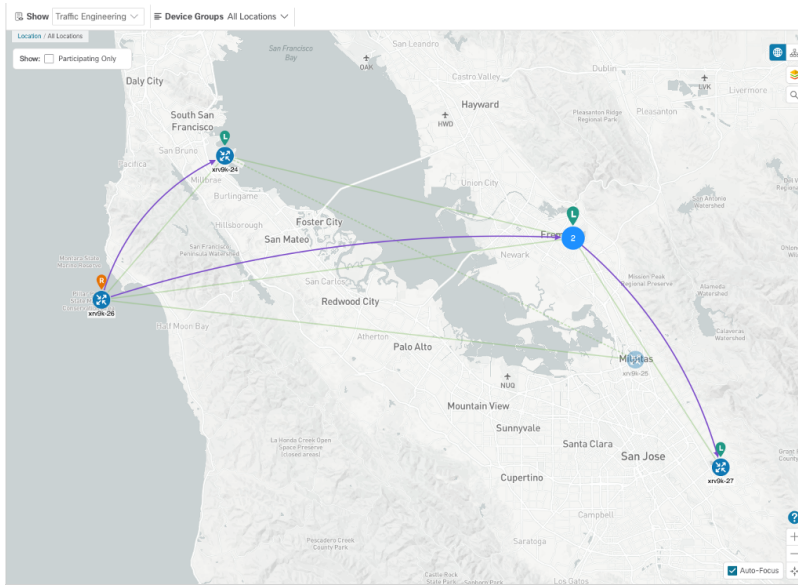
PCEP Sessions

Summary


- Stateful** true
- Source Address** 192.168.0.24
- Capability Instantiate** true
- Capability SR** true
- PCE Address** 172.27.226.126
- Capability Update** true
- MSD** 10

Step 5



Click **X** in the top-right corner to return to the Tree-SID Policy table to close the Device Details screen and then again select the **Tree-SID** tab.




Step 6

In the Tree-SID Policy list for the selected **xrv9k-26** device, click  in the **Actions** column and select **View Details** to drill down to a current and detailed view of the Tree-SID policy.


The Tree-SID Policy Details screen appears.

Tree-SID Policy Details  




Current **History**


Root  xrv9k-26 | Root IP: 192.168.0.26
TE RID: 192.168.0.26 | IPv6 RID: 2001:192:168::26

Name Disney

Tree ID - 

∨ **Summary**

- Admin State**  Up
- Oper Status**  Up
- Label** 152001
- Type** Static 
- Programming State** None
- Metric Type** TE
- Constraints** Exclude-Any: -
Include-Any: -
Include-All: -
- SR-PCE Address** 172.27.226.126

[See more](#) 

∨ **Tree-SID path**

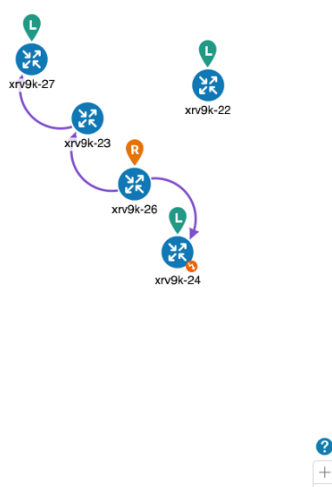
	Leaf Node Name	Leaf Node IP	Expand All
<input checked="" type="checkbox"/>	> xrv9k-22	192.168.0.22	
<input checked="" type="checkbox"/>	> xrv9k-24	192.168.0.24	
<input checked="" type="checkbox"/>	> xrv9k-27	192.168.0.27	

Note To view all of the Tree-SID Policy Details, click **See more**.

Step 2 Visualize and Validate the new Static Tree-SID policy

Step 7 In the Tree-SID path section, click **Expand All** to view Tree-SID path names and IPs for the **xrv9k-24** and **xrv9k-27** leaf nodes. The list also shows details for the corresponding Root node, all Transit nodes, the two Leaf nodes, and their Egress Link's Local IP and Remote IP information.

Step 8 Deselect the **xrv9k-22** check box to see Tree-SID path details for **xrv9k-24** and **xrv9k-27** devices only. The topology updates to show only the selected **xrv9k-24** and **xrv9k-27** Tree-SID routes.

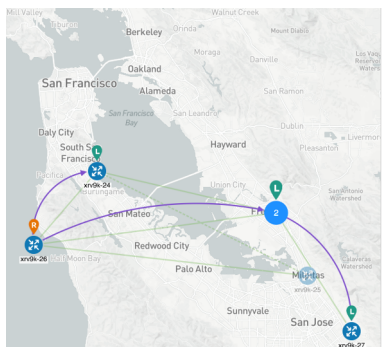


Tree-SID path details:

Leaf Node Name		Leaf Node IP	Collapse All	
<input type="checkbox"/>	xrv9k-22	192.168.0.22		
Node		Egress Link		
Role	Name	IP	Local IP	Remote IP
R...	xrv9k-26	192.168.0.26	10.0.0.30	10.0.0.29
T...	xrv9k-23	192.168.0.23	10.0.0.10	10.0.0.9
L...	xrv9k-22	192.168.0.22	-	-
<input checked="" type="checkbox"/>	xrv9k-24	192.168.0.24		
Node		Egress Link		
Role	Name	IP	Local IP	Remote IP
R...	xrv9k-26	192.168.0.26	10.0.0.81	10.0.0.82
L...	xrv9k-24	192.168.0.24	-	-
<input checked="" type="checkbox"/>	xrv9k-27	192.168.0.27		
Node		Egress Link		
Role	Name	IP	Local IP	Remote IP
R...	xrv9k-26	192.168.0.26	10.0.0.30	10.0.0.29
T...	xrv9k-23	192.168.0.23	10.0.0.41	10.0.0.42
L...	xrv9k-27	192.168.0.27	-	-

Step 9 Click **X** in the top-right corner to return to the Tree-SID Policy table.

Step 10 Select the Root IP Tree-SID policy **xrv9k-26** check box from the list. Make sure the geographical map option is selected. The geographical map updates to show the policy and its disjunct routes. You can click on individual links and get details on the Tree-SID policies in which each link participates.



Tree-SID Policy table:

Root ...	Roo...	Name	Tre...	Label	Admin ...	Oper S...	Actions
<input checked="" type="checkbox"/>	xrv9k-26	192...	Disney	-	1520...		
<input type="checkbox"/>	xrv9k-27	192...	MY...	-	15200		
<input type="checkbox"/>	xrv9k-23	192...	Tree...	-	7500		

Summary and Conclusion

As we observed, you can use the Tree-SID tab and its associated map to visualize Tree-SID defined routes, identify disjunct policy routes, and identify problems with transit nodes, interfaces and links that may affect traffic from the Root to the Leaf nodes.

Step 3 Associate the Static Tree-SID Policy with the newly created L3VPN service model


Step 1 Go to **Services & Traffic Engineering > Provisioning (NSO)**.

The Provisioning screen appears showing available Services/Policies.


Step 2 Select **L3VPN > L3vpn-Service**.

The L3VPN > L3vpn-Service table appears.

Vpn Id	Provisioning State	Date Created	Actions
MVPN-TREE-SID-119	Success	17-Mar-2023 01:36:58 PM PDT	⋮
NSS-uit1_22_27_shared-internal	Success	22-Mar-2023 07:54:46 AM PDT	⋮
test1234	Success	17-Mar-2023 12:07:05 AM PDT	⋮
testst	Success	16-Mar-2023 09:58:46 PM PDT	⋮

Step 3 To create a new L3vpn-Service, click the  symbol.

The Create L3VPN > L3vpn-Service screen appears.

Note You may also click the  symbol to import an existing L3vpn-Service.

Step 4 In the Vpn-id field, type the unique ID for the service (for example: **MVPN-TREE-SID-119**) and click **Continue**.


Note This identifier has a local meaning (such as within a service provider network).

Step 5 In the Vpn-service-topology drop-down list, select **custom** to define the service topology.

Note Point-to-point VPN service topology is not supported.

Step 3 Associate the Static Tree-SID Policy with the newly created L3VPN service model

The screenshot shows the Cisco Crosswork Network Controller interface. The breadcrumb navigation is: / Provisioning / L3VPN > L3vpn-Service. The page title is "Edit L3VPN > L3vpn-Service". The service name is "L3vpn-Service {MVPN-TREE-SID-119}". The "Vpn-Id" field is set to "MVPN-TREE-SID-119". The "Vpn-service-topology" dropdown is set to "custom". Below this, there is a "custom-template" section with a table header "name" and a list of expandable sections: "vpn-instance-profiles", "vpn-nodes", "service-assurance", and "multicast". At the bottom, there are three buttons: "Commit changes", "Dry Run", and "Cancel".

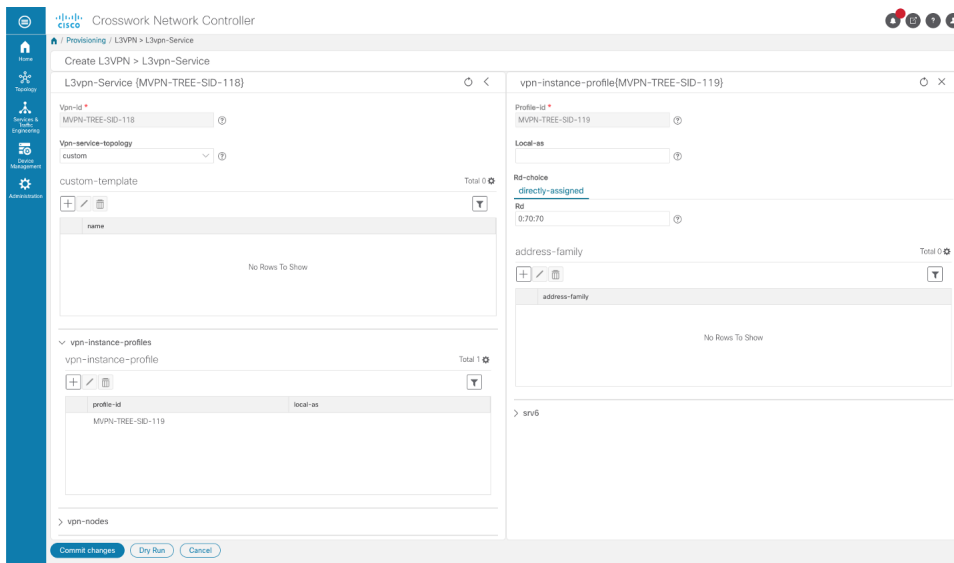
Step 6 Expand the vpn-instance-profile section and click the  symbol to add the profile ID.

The vpn-instance-profile panel appears.

Step 7 In the Profile-id field, type the VPN instance profile identifier (for example: **MVPN-TREE-SID-119**) and click **Continue**.

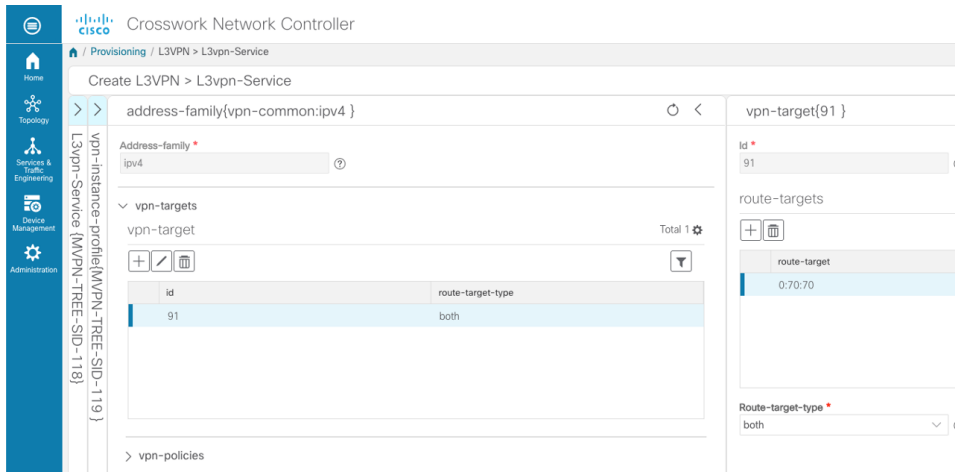
The vpn-instance-profile panel refreshes with additional fields to fill.

Step 8 In the Rd-choice field, enter the directly-assigned Rd that indicates an RD value that is explicitly assigned (for example, **0:70:70**).



- Step 9** For address-family, click the symbol. The address-family panel appears and select **ipv4** from the Address-family drop-down list and click **Continue**.
- The address-family {ipv4} panel updates with vpn-targets section included.
- Step 10** For vpn-target, click the symbol so to signify the VPN target id and route-target-type.
- The vpn-target panel appears.
- Step 11** In the Id field, enter the ID (for example: **91**) and click **Continue**.
- Step 12** In the vpn-target{91} panel, select the Route-target-type drop down list and select **both**.
- The address-family {ipv4} panel updates showing the vpn-target id (as **91**) and route-target-type (as **both**).
- Step 13** In the vpn-target{91} panel for route-targets, click the symbol and type the Route-target (for example, **0:70:70**) and click **Continue**. Click **X** to close the panel.
- The route-target table updates with the new information. Click **X** in the top right to close all of the remaining panels.
- Adding the vpn-instance-profiles is now complete.

Step 3 Associate the Static Tree-SID Policy with the newly created L3VPN service model



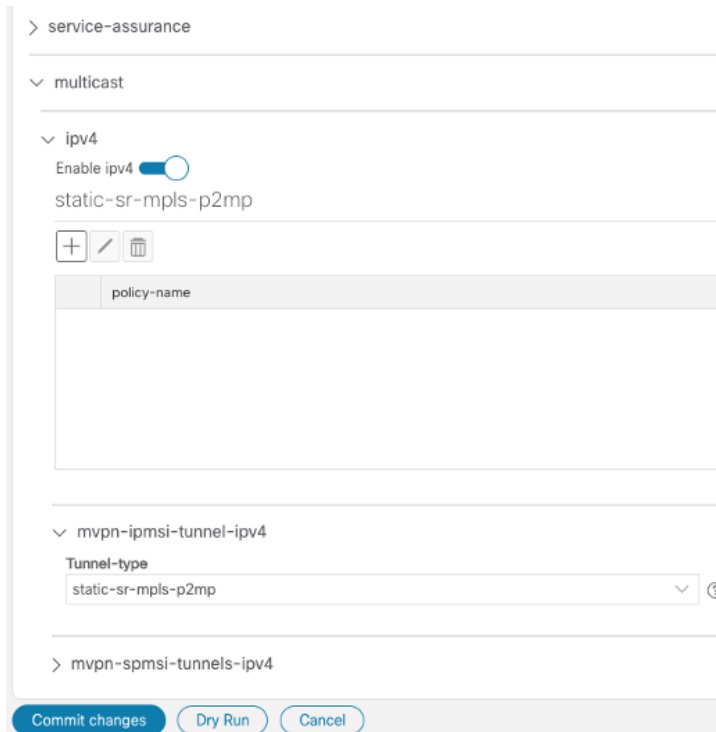
Step 14 Select **multicast** to expand the section.

Subsections, such as `ipv4`, `mvpn-ipmsi-tunnel-ipv4`, and `mvpn-spmsi-tunnels-ipv4` appear.

Step 15 For the `mvpn-ipmsi-tunnel-ipv4` section, from the Tunnel-type drop down list, select **static-sr-mpls-p2mp**.

The Enable `ipv4` toggle is now switched on and the `static-sr-mpls-p2mp` area to define the name of the SR p2mp policy name.

Note The `sr-mpls-p2mp` available in the drop-down list is for a Dynamic Tree-SID policy.



Step 16 Click the **+** symbol.

The `static-sr-mpls-p2mp` panel appears.

Step 17 In the Policy-name field, type the previously created Static Tree-SID policy name (for example: **xrv9k-26**) and click **Continue**.


The static-sr-mpls-p2mp{Static-xrv9k-26} panel updates.

Step 18 In the sr-p2mp-policy area for the group-address, click the  symbol to add the address.

The group-address panel appears.

Step 19 In the Address field, type the IPv4 static multicast group address (for example: **1.1.1.1**) and click **Continue**.

The group-address{1.1.1.1} panel refreshes. Click **X** at the top right to close any remaining panels.

Step 20 Click the  symbol in the multicast > ipv4 subsection to add the other policy name.

The static-sr-mpls-p2mp panel appears.

Step 21 In the Policy-name field, type the other previously created Static Tree-SID policy name (for example: **xrv9k-24**) and click **Continue**.

The static-sr-mpls-p2mp{xrv9k-24} panel updates.

Step 22 In the sr-p2mp-policy area for the group-address, click the  symbol to add the address.

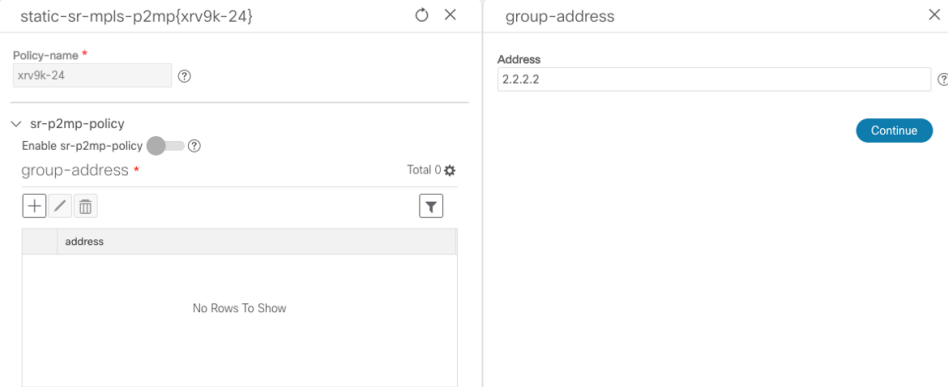
The group-address panel appears.

Step 23 In the Address field, type the IPv4 static multicast group address (for example: **2.2.2.2**) and click **Continue**.

The group-address{2.2.2.2} panel refreshes. Click **X** at the top right to close any remaining panels.


You have now successfully mapped the static Tree-SID policy to the L3VPN multicast service model. Next, you must add the VPN node details.

Note For advanced configurations, you may select mvpn-spmsi-tunnels-ipv4 subsection under the multicast section to define the tunnel-type, switch-wildcard-mode, switch-threshold, per-item-tunnel-limit, group-acl-ipv4 details.



The screenshot displays two overlapping configuration panels. The left panel, titled 'static-sr-mpls-p2mp{xrv9k-24}', shows a 'Policy-name' field with the value 'xrv9k-24'. Below it, the 'sr-p2mp-policy' section is expanded, showing a toggle for 'Enable sr-p2mp-policy' which is turned on. Underneath, the 'group-address' section is visible, showing a table with the header 'address' and the message 'No Rows To Show'. The right panel, titled 'group-address', shows an 'Address' field with the value '2.2.2.2' and a blue 'Continue' button at the bottom right.

Step 4 Add the VPN nodes

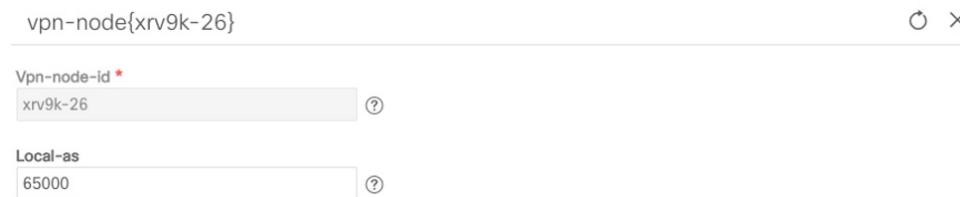
Step 1 In the vpn-nodes section, click the  symbol to add your VPN nodes set up in the Static Tree-SID policy (**xr9k-26**, **xr9k-24**, and **xr9k-27**).


The vpn-node panel appears so to add the VPN node ID.

Step 2 From the Vpn-node-id drop down, select the first of the VPN node (for example: **xr9k-26**) and click **Continue**.

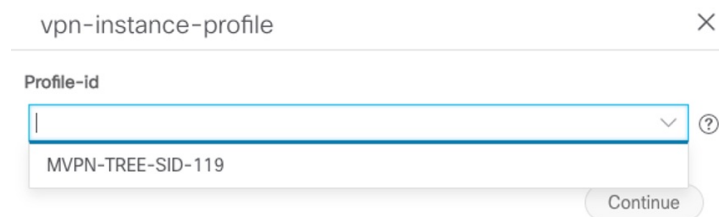
The vpn-node{xr9k-26} panel updates with additional fields.


Step 3 In the Local-as field, type **65000**.



Step 4 In the active-vpn-instance-profiles section, click the  symbol to add the VPN instance profile ID.

Step 5 In the Profile-id drop down list, the previously added profile ID appears. Select it (for example: **MVPN-TREE-SID-119**), click **Continue** and click **X** to close the panel.



Step 6 In the vpn-node{xr9k-26} panel, select the vpn-network-accesses section and click the  symbol to add the vpn-network-access ID. In the Id field, add a number (for example: **1**) and click **Continue**.

The vpn-network-access{1} panel updates with additional fields.

Step 7 In the Interface-id field, type the identifier for the physical or logical interface (for example: **Loopback70**).

The identification of the sub-interface is provided at the connection level and/or the IP connection level.

Step 8 In the ip-connection section, select the ipv4 subsection and in the Local-address field, type the IP address used at the provider's interface (for example: **70.70.10.1**).

Step 9 In the Prefix-length field, type **30**.

The subnet prefix length is expressed in bits. It is applied to both local and customer addresses.

vpn-network-access{1}

Id *
 ?

Interface-id *
 ?

> connection

∨ ip-connection

∨ ipv4


Local-address
 ?

Prefix-length
 ?

> ipv6

> routing-protocols

> service

Step 10 In the routing-protocols section, click the  symbol to add the unique identifier for the routing protocol. In the Id field, type **bgp** and click **Continue**.

The routing-protocol{bgp} panel appears.

Step 11 In the Type drop down list, select **bgp-routing**.

The routing-protocol{bgp} panel refreshes with additional sections.

Step 12 In the bgp section, for the Peer-as field, type **70** to indicate the customer's ASN when the customer requests BGP routing, and in the Address-family drop down list, select **ipv4**. This node contains the address families to be activated.

Note If you select dual-stack, it means that both ipv4 and ipv6 will be activated.

Step 13 In the Multihop field, type **11** to describe the number of IP hops allowed between a given BGP neighbor and the PE.

Step 4 Add the VPN nodes

routing-protocol{bgp}

Id *
bgp

Type *
bgp-routing

bgp

Peer-as *
70

Address-family
ipv4

neighbor Total 0


+ -

neighbor
No Rows To Show

Multihop
11


- Step 14** For neighbor section, click the symbol and in the Neighbor field, type the device address (for example: **70.70.10.2**) and click **Continue**.
- Step 15** For redistribute-connected section, click the symbol and from the Address-family drop down list, select **ipv4** and click **Continue**.
The redistribute-connected{ipv4} panel appears.
- Step 16** In the Enable field, type **true** to enable the redistribution of connected routes.
Close all panels (click X in the top right corner) until the Create L3VPN > L3vpn-Service screen appears.
- Step 17** In the vpn-nodes section, you will see xrv9k-26 listed in the vpn-node table. Select **xrv9k-26** and select the **edit** symbol.
The vpn-node{xrv9k-26} panel appears.
- Step 18** Select the multicast section and click the symbol to add the mapping of the policy for each node.
The static-sr-mpls-p2mp panel appears.
- Step 19** For the Policy-name drop down list, select the policy you want to add to this node (either the source or the receiver). Select **xrv9k-24** as a receiver and click **Continue**.
The static-sr-mpls-p2mp{xrv9k-24} panel updates with additional fields.
- Step 20** For the Role drop down list, select **receiver**.
Close all additional panels (click X in the top right corner) until the Create L3VPN > L3vpn-Service screen appears.
- Step 21** Repeat steps 1 – 20 to add the other two VPN nodes set up in the Static Tree-SID policy: **xr9k-24** and **xr9k-26**.
- Step 22** After all of the VPN nodes have been added, click **Commit changes**.

Step 5 Visualize and Edit the Static mVPN Tree-SID Policy's L3VPN service model

- Step 1** Go to **Services & Traffic Engineering > Provisioning (NSO)**.
The Provisioning screen appears showing available Services/Policies.
- Step 2** Select **L3VPN > L3vpn-Service**.
The L3VPN > L3vpn-Service table appears.
- Step 3** Locate the newly created L3VPN service ID in the table (**MVPN-TREE-SID-119**) and in the Actions column, click  and select **Config View**.
The Configured Data pop-up screen appears.



Step 4 In the Configured Data pop-up screen, review the data configuration and click **Copy To Clipboard** if you want to save a copy, or click **Cancel** to exit.

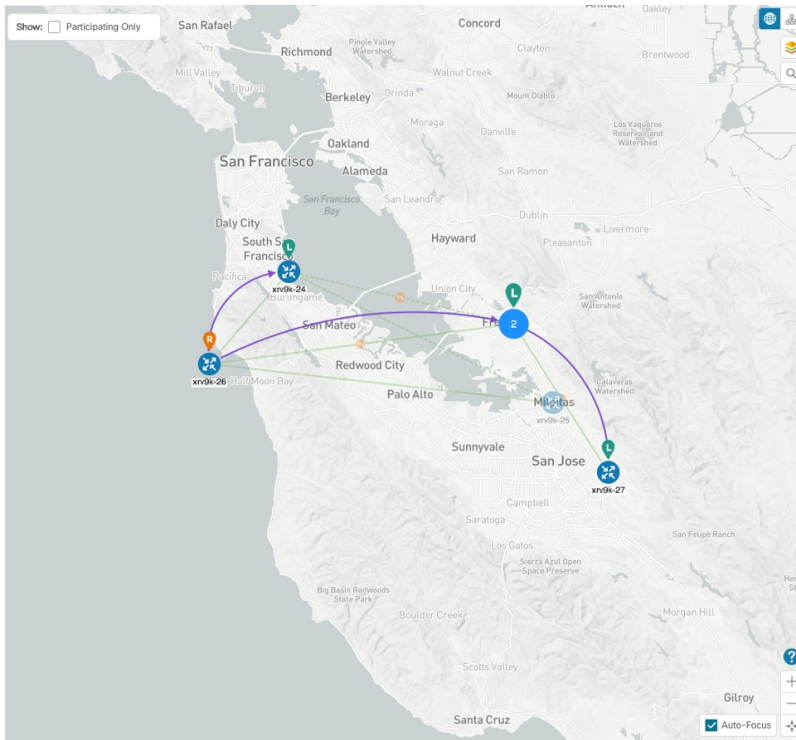
Step 5 To view the new Static mVPN Tree-SID policy associated with the L3VPN service model, click the name of the VPN Id in the table or in the Actions column, click  and select **View**.

The Service Details screen appears with the geographical map showing the newly created L3VPN service and the associated nodes: xrv9k-26, xrv9k-24, xrv9k-27. On the right, the Service Details panel shows the details of the MVPN-TREE-SID-119 service model.

Step 6 In the Service Details panel, select the **Transport** tab to view the Tree-SID Policy information.

Step 7 In the table, select the check box next to xrv9k-26.


In the geographical map, the policy will appear showing the one Root, or source, node (xrv9k-26) and the two Leaf, or receiver, nodes (xrv9k-24 and xrv9k-27).



Step 8 Select the second check box next to xrv9k-24.

The geographical map updates.


Step 9 Use your mouse to hover over the Tree-SID policy names in the table. Depending which policy your mouse hovers over, the geographical map will show the designated path(s) between the nodes to differentiate them from each other.

Step 10 For the first policy in the table, in the Actions column, click  and select **View Details**.


The Tree-SID Policy Details panel appears showing the policy's details such as the Name, a Summary section, and the Tree-SID path information that can be expanded to show additional detail. You may also select the History tab to view historical information for the policy.

Tree-SID Policy Details ✕




Current History


Root  xrv9k-26 | Root IP: 192.168.0.26
TE RID: 192.168.0.26 | IPv6 RID: 2001:192:168::26

Name Disney

Tree ID - 

Summary


- Admin State  Up
- Oper Status  Up
- Label 152001
- Type Static 
- Programming State None
- Metric Type TE
- Constraints Exclude-Any: -
Include-Any: -
Include-All: -
- SR-PCE Address 172.27.226.126
- FRR Protected Disable
- Node Count Leaf: 3 | Bud: 0 | Transit: 1
- Last Update 24-Mar-2023 02:06:57 PM PDT

[See less](#) 

Tree-SID path


Leaf Node Name	Leaf Node IP	Expand All
<input checked="" type="checkbox"/> > xrv9k-27	192.168.0.27	
<input checked="" type="checkbox"/> > xrv9k-24	192.168.0.24	
<input checked="" type="checkbox"/> > xrv9k-22	192.168.0.22	

Step 11 To edit, or add additional policies, go to **Service & Traffic Engineering > Provisioning (NSO)**, and select **L3VPN > L3vpn-Service**.

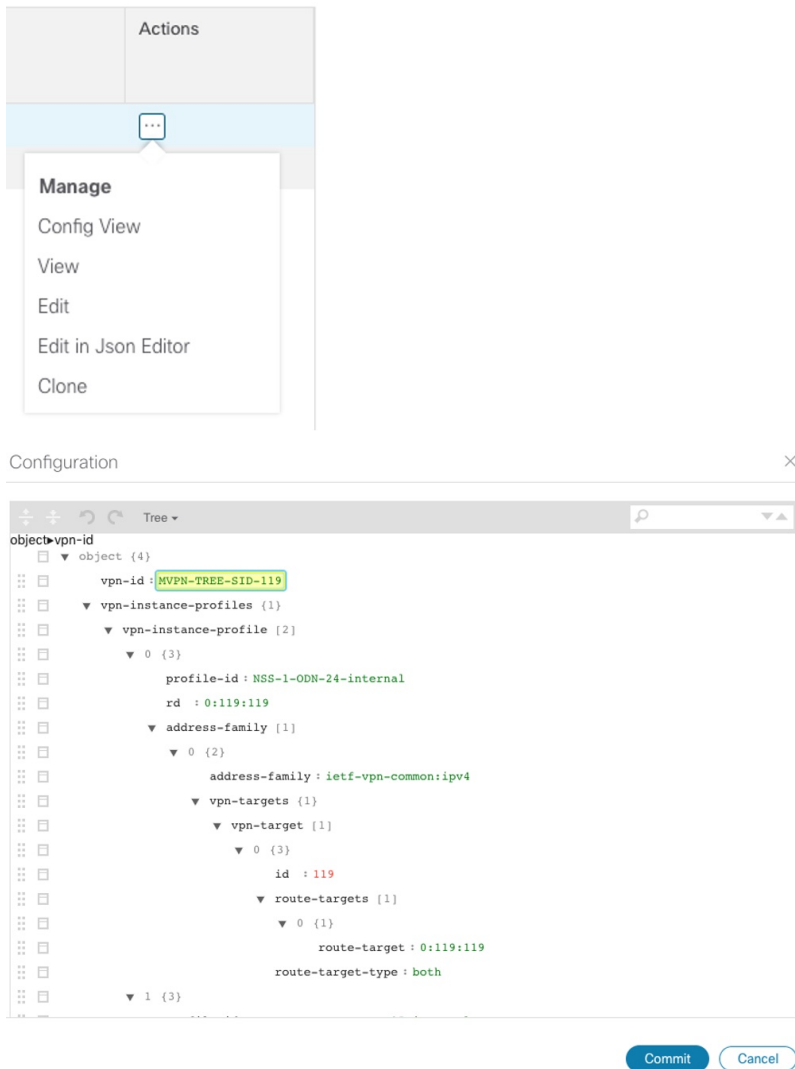
Step 12 For your L3VPN service, in the Actions column, click  and select **Edit**.

The Edit L3VPN > L3vpn-Service screen appears where you can make additional updates (such as adding VPN nodes so to replace a degraded path so to give it a different route) and modifications to existing details that make up the service.

While editing, to show all or hide the multiple fields that make up the service configuration, select the **Show all fields** toggle at the top right. Click on the toggle for Show all fields to be on. Click the toggle again for the Show all fields to be off, showing just a subset of the fields.

Step 13 In addition, from the **L3VPN > L3vpn-Service** screen, click  in the Actions column and select **Edit in Json Editor** for your L3VPN service.

The json Configuration editor appears. Using the json Configuration editor, you can highlight different details that make up the service configuration and edit them directly in the json editor.



Step 14 Once completed, either click **Commit** to initiate the changes and update the service’s configuration or click **Cancel**.

Summary and Conclusion

As we observed, you can provision new Static Tree-SID policies within the Crosswork Network Controller UI. Once provisioned, you can use the Tree-SID tab and its associated map to visualize Tree-SID defined routes, identify disjunct policy routes, and identify problems with transit nodes, interfaces and links that may affect traffic from the Root to the Leaf nodes. In addition, once the Tree-SID policies are associated with an L3VPN service model, similar capabilities are at hand to visualize and analyze Static Tree-SID policies associated with an L3VPN service model and edit in dynamic ways that improve efficiency, accuracy, and ease of use.

