



## SR Circuit Style Manager (CSM)

The SR Circuit Style Manager (CSM) feature pack provides a bandwidth-aware Path Computation Element (PCE) to compute Circuit Style SR-TE policy paths that you can visualize in your network. Circuit Style enables segment routed transport tailored for circuit-oriented services over a packet based network through the use of bi-directional, co-routed, path protected SR-TE policies. Circuit Style SR-TE policies are typically used for high priority services, such as crucial monetary transactions or important live video feed, which *require committed bandwidth with fast and fail-safe connections*. The CSM feature pack ensures dynamic Circuit Style SR-TE policies are provisioned along paths that meet strict bandwidth requirements while at the same time respecting any additional user configured constraints such as latency minimization and disjointness.

Centralized bandwidth accounting in the CSM feature pack allows the user to monitor resource reservation levels and quickly identify hot spots where available bandwidth in the circuit style bandwidth pool is low. The ability to visualize Circuit Style SR-TE policies in your network topology enables easy verification of Circuit Style SR-TE policy configurations, details, and path states. With a few clicks you can view Active and Protect paths, operational status, reserved bandwidth pool size and monitor path failover behavior for individual Circuit Style SR-TE policies.



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**Note** Functionality described within this section is only available with certain licensing options.

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This section contains the following topics:

- [Circuit Style SR-TE Important Notes, on page 2](#)
- [Workflow for Setting Up CS SR-TE Policy Visualization, on page 7](#)
- [Enable SR Circuit Style Manager, on page 8](#)
- [Configure Circuit Style SR Policies, on page 9](#)
- [Review Circuit Style SR-TE Policy Bandwidth Utilization , on page 11](#)
- [View Circuit Style SR-TE Policies, on page 12](#)
- [Trigger CSM to Recalculate a Circuit Style SR-TE Policy, on page 16](#)
- [What Happens When Bandwidth Reservation Settings are Exceeded?, on page 16](#)
- [How Does CSM Handle Path Failures?, on page 20](#)

# Circuit Style SR-TE Important Notes

This topic outlines the scope of Crosswork's support for Circuit Style SR-TE policies, including requirements and constraints on the policy attribute values set in each Circuit Style SR-TE policy, and the processing logic followed during path reversions.




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**Note** Role-based Access Control (RBAC) and task permissions have been introduced in this release. To provision a Circuit Style SR-TE policy you must have write-access to the head-end device based on Device Access Groups and assigned roles. Only Circuit Style SR-TE admin users can modify Circuit Style SR-TE configuration settings. For more information on RBAC and user roles, see the "[Cisco Crosswork Network Controller Administration Guide](#)".

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## Policy Attribute Constraints

You set policy attribute values when you create a Circuit Style SR-TE policy, using either the device's command line interface or Cisco Crosswork Network Controller. You can also change them later.

The table below describes the requirements for each attribute, and how changes affect them. It is important to understand that all the attributes that are described in the table below act as constraints. Each of them corresponds to elements of the configuration that Cisco Crosswork uses to govern how Circuit-Style path hops are computed. Each value is effectively a path computation or optimization constraint, since they either specify a required property of a path or exclude possible choices for that path.

**Table 1: Circuit Style SR-TE Policy Attribute Values and Constraints**

Attribute	Description
Policy Path Protection	The path protection constraint is required for both sides of a Circuit Style SR-TE policy.

Attribute	Description
Bandwidth Constraint	<p>The bandwidth constraint is required and must be the same on both sides of a Circuit Style SR-TE policy. Bandwidth changes can be made to existing policies, with these effects:</p> <ul style="list-style-type: none"> <li>• Once you configure the new bandwidth on both sides, Crosswork will evaluate the path. This <u>will not</u> result in a recomputed path</li> <li>• If the new bandwidth is higher, Crosswork checks the existing path to ensure sufficient resources. If all currently delegated paths can accommodate the new bandwidth, Crosswork returns the same path with the new bandwidth value, indicating to the path computation client (PCC) that it was successful. If any of the current paths cannot accommodate the new bandwidth, it returns the old bandwidth value indicating that it was unsuccessful. This evaluation will not be retried unless the bandwidth is changed again.</li> <li>• If the bandwidth is lower, Crosswork returns the same path with the new bandwidth value to indicate to the PCC that it was successful.</li> </ul> <p>The user interface shows both the requested and reserved bandwidth under each candidate path when you view the policy details. These values can differ if the requested bandwidth is increased but there is insufficient available CS pool bandwidth along one or more of the paths.</p>
Candidate Paths and Roles	<p>The Working path is defined as the highest preference Candidate Path (CP).</p> <p>The Protect path is defined as the CP of the second highest preference.</p> <p>The Restore path is defined as the lowest preference CP. The headend must have <code>backup-ineligible</code> configured.</p> <p>CPs of the same role in each direction must have the same CP preference.</p>
Bi-Directional	<p>All paths must be configured as co-routed.</p> <p>Paths of the same role on both sides must have the same globally unique bi-directional association ID.</p>

Attribute	Description
Disjointness	<p>Working and Protect paths on the same PCC must be configured with a disjointness constraint using the same disjoint association ID and disjointness type.</p> <p>The disjointness association ID for a Working and Protect path pair in one direction must be unique when compared with the corresponding pair in the opposite direction.</p> <p>Only the Node and Link disjoint types are supported. The disjoint type used must be the same in both directions of the same policy.</p> <p>The Restore path must not have a disjointness constraint set.</p> <p>Crosswork follows strict fallback behavior for all Working and Protect path disjointness computations. This means that, if node type disjointness is configured but no path is available, Crosswork makes no automatic attempt to compute a less restrictive link type disjoint path.</p>
Metric Type	<p>Only the TE, IGP, Hop count, and Latency metric types are supported. The metric type used must match across Working, Protect and Restore paths in both directions.</p>
Segment Constraints	<p>All Working, Protect and Restore paths must have the following segment constraints:</p> <ul style="list-style-type: none"> <li>• protection unprotected-only</li> <li>• adjacency-sid-only</li> </ul> <p>To ensure persistency through link failures, configure static adjacency SIDs on all interfaces that might be used by Circuit Style policies.</p>
Unsupported Configurations	<p>The following configurations are not supported:</p> <ul style="list-style-type: none"> <li>• Metric-bounds</li> <li>• SID-Algo constraints</li> <li>• Partial recovery is not supported 7.8.x.</li> <li>• State-sync configuration between PCEs of a high-availability pair. These are not required with Circuit Style SR-TE policies. Use of this feature may result in degraded performance.</li> <li>• Multiple Circuit Style SR-TE policies between the same nodes with the same color but different endpoint IPs.</li> </ul>

Attribute	Description
Supported Policy Changes	<p>The following constraints may be changed for an operationally "up" Circuit Style SR-TE policy that has been previously delegated:</p> <ul style="list-style-type: none"> <li>• Metric type</li> <li>• Disjoint type</li> <li>• MSD</li> <li>• Affinities</li> </ul> <p>Once configuration changes are made in a consistent manner across all CPs and both PCCs (for example: the new metric type is the same for all CPs and both sides), Crosswork will initiate a recompute, which can result in new Working, Protect and Restore paths.</p> <p>During any transitory period in which configurations are not in sync between paths on the same PCC or between PCCs, no path updates are sent to the PCCs.</p>
Unsupported Policy Changes	<p>The following configuration changes to a previously delegated and operationally "up" Circuit Style SR-TE policy are not supported:</p> <ul style="list-style-type: none"> <li>• CP preference</li> <li>• Disjoint Association ID</li> <li>• Bi-directional Association ID</li> </ul> <p>To change these configurations for an existing policy, you must first shut down the policy on both sides, make the change (complying with restrictions as detailed above in terms of consistency) and then "no shut" the policy.</p>
Path Computation	<p>Crosswork computes paths for circuit style policies only after a complete bi-directional, path-protected set of candidate paths has been delegated, including Working and Protect paths on both sides. In cases where there is insufficient bandwidth and a path cannot be found, SR Circuit Style Manager will continue to retry after 30 minutes until a solution is found, or if Circuit Style SR-TE is disabled.</p> <p>Crosswork computes the Restore path only after the Working and Protect paths are down. The SR Circuit Style Manager feature pack configuration interface provides a configurable delay timer to control how long after Restore paths are delegated from both sides to wait before the path is computed. This delay allows topology and SR policy state changes to fully propagate to Crosswork, in cases where these changes triggered the Restore path delegation.</p> <p>Automatic re-optimization is not supported for any paths based on changes in topology, LSP state, or any periodic event. Path computation is supported for Intra/Inter area/level and Intra/Inter IGP Domain (same AS) Not supported path computation Inter-AS.</p>

Attribute	Description
Reversion Behavior	Reversion behavior is controlled by the configuration of the WTR lock timer option under the Protect and Revert paths (it is not relevant for the Working path): <ul style="list-style-type: none"> <li>• No lock configuration: Revert after a default 5-minute lock</li> <li>• Lock with no duration specified: No reversion</li> <li>• Lock duration &lt;value&gt;: Revert after the specified number of seconds</li> </ul>

### Reversion Logic

Path reversion depends on the initial state of the Working, Protect, and Restore paths and the events affecting each path. The scenarios in the following table provide examples of typical reversion behavior.

**Table 2: Path Reversion Scenarios**

Initial State	Events	Behavior
Working path is down, Protect path is up/active	Working path comes back up	<ol style="list-style-type: none"> <li>1. Working path recovers to up/standby state.</li> <li>2. Each PCC moves the Working path to active after the WTR timer expires.</li> <li>3. Protect path moves to up/standby.</li> </ol>
Working path is down, Protect path is down, Restore path is up/active	Working path comes back up, then Protect path comes back up	<ol style="list-style-type: none"> <li>1. Working path recovers and goes to up/active state</li> <li>2. Restore path is removed</li> <li>3. Protect path recovers and goes to up/standby</li> </ol>

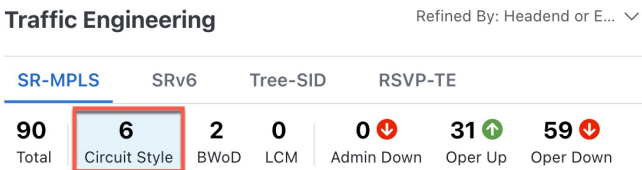
Initial State	Events	Behavior
Working path is down, Protect path is down, Restore path is up/active	Protect path comes back up, then Working path comes back up	<p>On side A: The Working path failure is local (the first Adj SID in the SegList is <b>invalid</b>):</p> <ol style="list-style-type: none"> <li>1. Protect path recovers and goes to up/active.</li> <li>2. Restore path is removed.</li> <li>3. Working path recovers and goes to up/standby.</li> <li>4. Each PCC moves the Working path to active after the WTR timer expires, Protect path goes to up/standby.</li> </ol> <p>On side Z: Working path failure is remote (first Adj SID in SegList is <b>valid</b>):</p> <ol style="list-style-type: none"> <li>1. Protect path recovers but is not brought up, Restore path remains up/active.</li> <li>2. Working path recovers and goes up/active.</li> <li>3. Restore path is removed.</li> <li>4. Protect path goes to up/standby.</li> </ol>

## Workflow for Setting Up CS SR-TE Policy Visualization

The following tasks are necessary to start visualizing Circuit Style SR-TE policies in the topology map:

**Table 3: Tasks to Complete to Start Visualizing Circuit Style SR-TE Policies**

Step	Action
1. Enable the SR Circuit Style Manager (CSM) feature pack.	<p>From the main menu, choose <b>Services &amp; Traffic Engineering &gt; Traffic Engineering &gt; Circuit Style SR-TE &gt; Configuration</b>.</p> <p>Follow the steps in <a href="#">Enable SR Circuit Style Manager, on page 8</a>.</p>
<p>2. Configure CS SR policies on the devices.</p> <p><b>Note</b> If you do this step before enabling the Circuit Style SR-TE feature pack, then the CS SR policies will appear operationally down.</p>	<p>You can configure CS SR policies using one of the following methods:</p> <ul style="list-style-type: none"> <li>• Configure CS SR policies manually on the device using the CLI. For more information, see <a href="#">Configure Circuit Style SR Policies, on page 9</a>.</li> <li>• If you are using Crosswork Optimization Engine within Crosswork Network Controller, you can configure CS SR policies using the UI. For more information, see the <a href="#">Cisco Crosswork Network Controller Solution Workflow Guide</a>.</li> </ul>

Step	Action
3. Verify that the CS SR policies appear in the SR Policy table.	<p>From the main menu, select <b>Traffic Engineering &gt; Traffic Engineering &gt; SR-MPLS &gt; Circuit Style</b>.</p>  <p>The SR Policy table now shows a filtered list containing only CS SR policies.</p>
4. Verify that the reserved bandwidth pool settings you defined in Step 1 are configured properly.	<p>Click on a CS SR node or policy and navigate to the <b>Link Details &gt; Traffic Engineering</b> page (see <a href="#">Review Circuit Style SR-TE Policy Bandwidth Utilization</a>, on page 11). From the <b>Circuit Style</b> section, view the reserved bandwidth pool size. You can also view current Circuit Style SR-TE bandwidth utilization and how much is still available for use.</p>

## Enable SR Circuit Style Manager

In order to manage and visualize Circuit Style SR-TE policies on the topology map, you must first enable SR Circuit Style Manager (CSM) and set bandwidth reservation settings.

When CSM is enabled, it computes the best failover bidirectional paths with the requested bandwidth and other constraints defined in the Circuit Style SR policy configuration between two nodes.

- Step 1** From the main menu, choose **Traffic Engineering > Circuit Style SR-TE > Configuration**.
- Step 2** Toggle the **Enable** switch to **True**.
- Step 3** Enter the required bandwidth pool size and threshold information. The following list describes additional field information. See also [What Happens When Bandwidth Reservation Settings are Exceeded?](#), on page 16.

Field	Description
<b>Basic</b>	
Link CS BW Pool Size	The percentage of each link's bandwidth reservable for Circuit Style SR-TE policies.
Link CS BW Min Threshold	The Link CS BW Pool utilization percentage beyond which a threshold crossing event notification will be generated.
<b>Advanced</b>	
Validation Interval	This is the interval that CSM policy will wait before the bandwidth that is reserved for an undelegated policy is returned to the Circuit Style SR-TE policy bandwidth Pool.
Timeout	The duration until which CSM will wait for the delegation request, to generate a notification.



Field	Description
Restore Delegation Delay	The duration until which CSM will pause before processing a restore path delegation.

- Step 4** Click **Commit Changes** to save the configuration. After enabling CSM, you must create Circuit Style SR policy configurations either manually on the device (see [Configure Circuit Style SR Policies, on page 9](#)) or through Cisco Crosswork Network Controller .

## Configure Circuit Style SR Policies

A Circuit Style SR policy configuration must include the destination endpoint, the amount of requested bandwidth, and the bidirectional attribute (see [Circuit Style SR-TE Important Notes, on page 2](#) for additional requirements or notable constraints). The configuration should also include a Performance Measurement Liveness (PM) profile. A PM profile enables proper detection of candidate path liveness and effective path protection. PCCs do not validate past the first SID, so without PM, the path protection will not occur if the failure in the Circuit Style SR policy candidate path is not the first hop in the segment list. For more information, see [Configuring SR Policy Liveness Monitoring](#).

This section provides *guidance* on how to manually configure a Circuit Style SR policy and a Performance Measurement Liveness (PM) profile on a device.

- Step 1** If applicable, enable the hardware module on the device for PM configuration.

**Example:**

```
hw-module profile offload 4
reload location all
```

- Step 2** Configure the PM profile.

**Example:**

```
performance-measurement
liveness-profile sr-policy name CS-active-path
probe
tx-interval 3300
!
npu-offload enable    !! Required for hardware Offload only
!
!
liveness-profile sr-policy name CS-protect-path
probe
tx-interval 3300
!
!
npu-offload enable    !! Required for hardware Offload only
!
!
!
```

**Step 3** Configure the Circuit Style SR policy with the PM profile. All configurations shown in the example are required in order for CSM to manage the Circuit Style SR-TE policy. Entries that are defined by the user are italicized. See [Circuit Style SR-TE Important Notes, on page 2](#) for additional requirements or notable constraints.

**Example:**


```

segment-routing
 traffic-eng
  policy cs1-cs4

  performance-measurement
    liveness-detection
      liveness-profile backup name CS-protect      !! Name must match liveness profile defined for
Protect path
      liveness-profile name CS-active             !! Name must match liveness profile defined for
Active path
    !
    !
    bandwidth 10000
    color 1000 end-point ipv4 192.168.20.4
    path-protection
    !
    candidate-paths
    preference 10
    dynamic
      pcep
      !
      metric
        type igp
      !
    !
    backup-ineligible
    !

    constraints
      segments
        protection unprotected-only
        adjacency-sid-only
      !
    !
    bidirectional
      co-routed
      association-id 1010
    !
    !
    preference 50
    dynamic
      pcep
      !
      metric
        type igp
      !
    !
    constraints
      segments
        protection unprotected-only
        adjacency-sid-only
      !
      disjoint-path group-id 3 type node
    !
    bidirectional
      co-routed
      association-id 1050
    !
  
```



Link Details 

Summary **Traffic Engineering**

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

	A Side	Z Side
<b>Node</b>	NCS-3	NCS1
<b>IF Name</b>	GigabitEthernet0/0/0/2	GigabitEthernet0/0/0/0
<b>FA Affinities</b>		
<b>FA TE Metric</b>		
<b>FA Delay Metric</b>		
<b>FA Topologies</b>	128, 129, 130, 131, 132	128, 129, 130, 131, 132...

Circuit Style Bandwidth Pool

	A Side	Z Side
<b>Pool Size</b>	800 Mbps	800 Mbps
<b>Used</b>	4 Mbps	4 Mbps
<b>Available</b>	796 Mbps	796 Mbps

## View Circuit Style SR-TE Policies

View Circuit Style SR-TE policy details such as the endpoints, bandwidth constraints, IGP metrics, and candidate (Working and Protect) paths.

**Step 1** From the main menu, choose **Traffic Engineering** > **Traffic Engineering** > **SR-MPLS** and click **Circuit Style**.

**Traffic Engineering** Refined By: Headend or E... ▾

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

<b>90</b>	<b>6</b>	<b>2</b>	<b>0</b>	<b>0</b> ↓	<b>31</b> ↑	<b>59</b> ↓
Total	Circuit Style	BWoD	LCM	Admin Down	Oper Up	Oper Down

The **SR Policy** table lists all Circuit Style SR-TE policies.

**Step 2** From the **Actions** column, click  > **View Details** for one of the Circuit Style SR-TE policies.

**Note** You cannot edit or remove Circuit Style SR-TE policy configurations that have been created directly on the device.

The screenshot shows the SR Circuit Style Manager interface. On the left is a topology map of the San Francisco Bay Area with nodes labeled xrv9k-14 through xrv9k-18. A path is highlighted in purple. On the right is the 'Traffic Engineering' panel. It shows a summary: 90 Total Circuit Styles, 6 Active, 2 Protected, 0 Admin Down, 0 Oper Up, 31 Oper Down, and 59 Oper Down. Below this is a table of SR Policies:

Head...	Endp...	Color	Admin...	Oper St...	Actions	
<input checked="" type="checkbox"/>	xrv9k-16	xrv9k-15	11056	+	+	...
<input type="checkbox"/>	xrv9k-15	xrv9k-16	11056	+	+	View Details
<input type="checkbox"/>	xrv9k-16	xrv9k-15	4294...	+	+	Edit / Delete
<input checked="" type="checkbox"/>	xrv9k-15	xrv9k-16	4294...	+	+	...
<input checked="" type="checkbox"/>	xrv9k-...	xrv9k-12	5600	+	+	...
<input checked="" type="checkbox"/>	xrv9k-12	xrv9k-...	5600	+	+	...

The **Circuit Style Policy Details** window is displayed in the side panel. By default, the Active path is displayed in the topology map and shows the bidirectional paths (Bi-Dir Path checkbox is checked) on the topology map. The Candidate Path list displays the Active (path that currently takes traffic) and Protected paths.

The screenshot shows the SR Circuit Style Manager interface. On the left is a topology map of the San Francisco Bay Area with nodes labeled xrv9k-23 and xrv9k-25. A path is highlighted in purple. On the right is the 'Circuit Style Policy Details' panel. It shows the current path configuration:

- Headend:** xrv9k-25 | TE RID: 192.168.0.0 | PCC IP: 192.168.0.0 | Source IP: 192.168.0.0
- Endpoint:** xrv9k-23 | TE RID: 192.168.0.0 | Dest IP: 192.168.0.0 | Color: 6905

Below this is a table of Candidate Paths:

Path Name	Pref	Role	State
<input checked="" type="checkbox"/> cfg_srte_c_6905_ep_192.16...	100	+	+
<input type="checkbox"/> cfg_srte_c_6905_ep_192.16...	50	+	+

**Note** The Bandwidth Constraint value can differ from the bandwidth you requested if the value was increased and insufficient resources existed to satisfy demand on all Active and Protected candidate paths.

### Step 3 View Candidate path configuration details.

- The **Circuit Style Policy Details** window allows you to drill down to view more information about the candidate paths. You can also copy the URL and share this information with others.

The operational (Oper State Up) candidate path with the highest preference will always be the Active path (see [How Does CSM Handle Path Failures?](#), on page 20). In this example, the Protected path (with preference 50) is currently the Active path and is displayed on the topology map. Notice that it is designated with a green "A" icon under State to clearly indicate it is currently the operational Active path. Click **Expand All** to view more information about both paths.

## View Circuit Style SR-TE Policies

The screenshot displays the SR Circuit Style Manager (CSM) interface. On the left, a map shows three nodes (AVW-25) and three paths connecting them: a purple path (top preference), a blue path (middle preference), and a pink path (bottom preference). On the right, the 'Circuit Style Policy Details' pane shows the configuration for a specific path. The 'Candidate Path' table lists two paths:

Path Name	Pref	Role	State
<input type="checkbox"/> cfg_srte_c_6905_ep_192.168.0.23...	100		Down
<input checked="" type="checkbox"/> cfg_srte_c_6905_ep_192.168.0.23...	90		Up

The path with preference 90 is highlighted with a red box. The details for this path include:

- Path Name: cfg\_srte\_c\_6905\_ep\_192.168.0.23...
- Oper State: Up
- Metric Type: IGP
- Bandwidth: Requested: 9.006 Mbps, Reserved: 0 Mbps
- Bi-Dir Association ID: 5906
- Disjoint Group ID: 453, Association Source: 0.0.0.0, Type: Node-disjoint
- PCE Initiated: false
- Affinity: Exclude-Any: -, Include-Any: -, Include-All: -
- Segment Type: Unprotected
- SID Algorithm: -

- Note**
- First preference paths are shown as purple links.
  - Second preference paths are shown as blue links.
  - Third preference paths are shown as pink links.

If the Circuit Style SR-TE policy configuration was done through Cisco Crosswork Network Controller, you have the option to view the Circuit Style SR-TE policy configuration. To see the configuration, click the link next to **Config ID**. For example:


## Circuit Style Policy Details

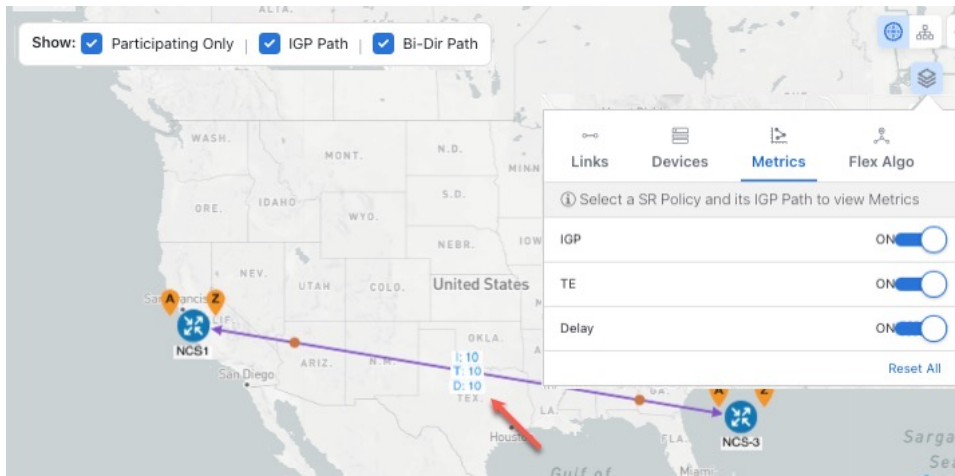
... | X

Current History

Path Name	Pref	Role	State
<input checked="" type="checkbox"/> cfg_srte_c_6905_ep_192.168....	100		<span>↑</span> <span>A</span> ^
<b>Path Name</b>	cfg_srte_c_6905_ep_192.168.0.25_disc		
<b>Oper State</b>	<span>↑</span> Up   <span>A</span> Active		
<b>Metric Type</b>	IGP		
<b>Bandwidth</b>	Requested: 9.006 Mbps Reserved: 0 Mbps		
<b>Bi-Dir Association ID</b>	5906		
<b>Config ID</b>	CS-CS-SR-WP-601-head-end-internal		
<b>Disjoint Group</b>	ID: 567 Association Source: 0.0.0.0 Type: Node-disjoint		
<b>PCE Initiated</b>	false		
<b>Affinity</b>	Exclude-Any: - Include-Any: - Include-All: -		
<b>Segment Type</b>	Unprotected		
<b>SID Algorithm</b>	-		

Here is a sample of a Circuit Style policy configuration. For more information, see [Configure Circuit Style SR Policies](#), on page 9.

- Step 4** To view the physical path and metrics between endpoints of the selected Circuit Style SR-TE policies, click  to turn applicable metrics on and check the **IGP Path** checkbox.





## Trigger CSM to Recalculate a Circuit Style SR-TE Policy

Circuit Style SR-TE policies are static in nature, meaning once the paths are computed, they will not be automatically re-optimized based on topology or operational status changes that may affect their paths. You can manually trigger CSM to recalculate a CS-SR policy after the policy's operational status went from down to up or if bandwidth size and requirement changes have been configured.



**Note** You can only reoptimize an Active and Protect path. It will not work for a Restore path.

- Step 1** From the main menu, choose **Traffic Engineering** > **Traffic Engineering** > **SR-MPLS** and click **Circuit Style**. The **SR Policy** table lists all Circuit Style SR-TE policies.
- Step 2** From the **Actions** column, click  > **View Details** for the Circuit Style SR-TE policies you want CSM to recalculate a path for again.
- Step 3** From the top-right corner, click  > **Reoptimize**.

## What Happens When Bandwidth Reservation Settings are Exceeded?

CSM discovers and updates the available and reservable bandwidth in the network. CSM maintains an accounting of all bandwidth reservations provided for CS SR policies to ensure that the total reserved bandwidth on all interfaces remains at or below the network-wide resource pool (bandwidth pool size).





This topic provides examples of how CSM handles policies that exceed either the bandwidth pool size or bandwidth alarm threshold that were set in the CSM Configuration page.

### Example: Bandwidth Utilization Surpasses Defined Threshold

- Link CS Bandwidth Pool Size: 10%
- Link CS Bandwidth Minimum Threshold: 10%

In this example, the bandwidth pool size for the 10 Gbps ethernet interfaces is 1Gbps and the alarm threshold is set for 100 Mbps (10% of pool size).

1. A Circuit Style SR-TE policy from node 5501-02 to node 5501-01 (r02 - r01) is created with a bandwidth of 100 Mbps.

Link Details  

Summary		
Traffic Engineering		
General	SR-MPLS	SRv6
Tree-SID	RSVP-TE	
	<b>A Side</b>	<b>Z Side</b>
<b>Node</b>	xrv9k-15	xrv9k-16
<b>IF Name</b>	TenGigE0/0/0/0	TenGigE0/0/0/0
<b>FA Affinities</b>		
<b>FA TE Metric</b>		
<b>FA Delay Metric</b>		
<b>FA Topologies</b>	128, 129, 130, 131, 132	128, 129, 130, 131, 132...
<b>Circuit Style Bandwidth Pool</b>		
	<b>A Side</b>	<b>Z Side</b>
<b>Pool Size</b>	100.00 Mbps	100.00 Mbps
<b>Used</b>	0 Mbps	0 Mbps
<b>Available</b>	100.00 Mbps	100.00 Mbps

2. Later, the requested bandwidth configured for the policy is increased to 500 Mbps. CSM determines the additional bandwidth along the existing path is available and reserves it.

Link Details 🗑️ | ✕

Summary **Traffic Engineering**

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

	A Side	Z Side
<b>Node</b>	5501-02	5501-01
<b>IF Name</b>	TenGigE0/0/0/0	TenGigE0/0/0/0
<b>FA Affinities</b>		
<b>FA TE Metric</b>		
<b>FA Delay Metric</b>		
<b>FA Topologies</b>	128, 129, 130, 131, 132	128, 129, 130, 131, 132...

**Circuit Style Bandwidth Pool**

	A Side	Z Side
<b>Pool Size</b>	1000 Mbps	1000 Mbps
<b>Used</b>	500 Mbps	500 Mbps
<b>Available</b>	500 Mbps	500 Mbps

- Since the bandwidth utilization (500 Mbps) with the updated policy is above the configured pool utilization threshold (100 Mbps), an event is triggered.

Optima CSM App	Warning	Bandwidth pool allocation (500.000) exceeds pool threshold (100.00) for frankenrouter-02   TenGigE0/0/0/21
Optima CSM App	Warning	Bandwidth pool allocation (500.000) exceeds pool threshold (100.00) for frankenrouter-02   TenGigE0/0/0/20
Optima CSM App	Warning	Bandwidth pool allocation (500.000) exceeds pool threshold (100.00) for 5501-02   TenGigE0/0/0/2
Optima CSM App	Warning	Bandwidth pool allocation (500.000) exceeds pool threshold (100.00) for 5501-02   TenGigE0/0/0/0
Optima CSM App	Warning	Bandwidth pool allocation (500.000) exceeds pool threshold (100.00) for 5501-01   TenGigE0/0/1/0/1
Optima CSM App	Warning	Bandwidth pool allocation (500.000) exceeds pool threshold (100.00) for 5501-01   TenGigE0/0/0/0

### Example: Bandwidth Pool Size and Utilization Exceeded

- Link CS Bandwidth Pool Size: 10%
- Link CS Bandwidth Minimum Threshold: 90%

In this example, the bandwidth pool size for the 10 Gbps ethernet interfaces is 1Gbps and the alarm threshold is set for 900 Mbps.

- An existing Circuit Style SR-TE policy from node 5501-02 to node 5501-01 (*r02 - r01*) uses a bandwidth of 500 Mbps.
- Later, a new policy requiring a bandwidth of 750 Mbps with a path from node 5501-02 to node 5501-01 to 5501-2 (*r02 - r01 - r2*) is requested. The only paths available between these 2 nodes are the paths computed for the first CS policy.
  - CSM cannot compute a path for the new Circuit Style SR-TE policy *r02 - r01 - r2* and therefore remains operationally down. CSM will try again, every 30 minutes, to find a path that meets the bandwidth requirements.

**Summary** ^

Admin State ↑ Up

Oper State ↓ Down

Binding SID 0

Policy Type Circuit-Style

Profile ID -

Description -

Traffic Rate 0 Mbps

Unused True ?

[See more](#) v

**Candidate Path** ^

[Expand All](#)

Path Name	Pref	Role	State
<input checked="" type="checkbox"/> cfg_r1-r2-2_discr_100	100		<span style="color: green;">↑</span> <span style="color: green;">A</span> <span style="color: blue;">v</span>
<input checked="" type="checkbox"/> cfg_r1-r2-2_discr_50	50		<span style="color: green;">↑</span> <span style="color: blue;">v</span>

- Alerts are triggered.

Source	Severity	Description
Optima CSM App	<span style="color: blue;">⚠</span> Warning	Unable to compute path for 10.10.10.1 <-> 10.255.255.2   color 2000 due to CsmUpdateStatus.NO_PATH
SR Policy [10.255.255.2#10.255.255.2]	<span style="color: blue;">⚠</span> Warning	Policy 'srte_c_2000_ep_10.10.10.1' has operational status as DOWN.
SR Policy [10.255.255.1#10.255.255.2]	<span style="color: blue;">⚠</span> Warning	Policy 'srte_c_2000_ep_10.10.10.2' has operational status as DOWN.

- Later, the Circuit Style SR-TE policy *r02 - r01 - r2* is updated and only requires 10 Mbps. The following behaviors occur:

- Since the total bandwidth required for the two policies (10 Mbps + 500 Mbps = 510 Mbps) now requires less than the bandwidth pool size (1Gbps), Circuit Style SR-TE policy *r02 - r01 - r2* receives a path computed by CSM and becomes operationally up.

**Summary** ^

Admin State ↑ Up

Oper State ↓ Down

Binding SID 0

Policy Type Circuit-Style

Profile ID -

Description -

Traffic Rate 0 Mbps

Unused True ?

[See more](#) v

**Candidate Path** ^

[Expand All](#)

Path Name	Pref	Role	State
<input checked="" type="checkbox"/> cfg_r1-r2-2_discr_100	100		<span style="color: green;">↑</span> <span style="color: green;">A</span> <span style="color: blue;">v</span>
<input checked="" type="checkbox"/> cfg_r1-r2-2_discr_50	50		<span style="color: green;">↑</span> <span style="color: blue;">v</span>

- Since the second Circuit Style SR-TE policy with the reduced bandwidth is now provided a path by CSM, alerts are cleared.

Source	Severity	Description
SR Policy [10.1#10.255...	Clear	Policy 'srte_c_2000_ep_10.2' has operational status back to UP
SR Policy [10.2#10.255...	Clear	Policy 'srte_c_2000_ep_10.1' has operational status back to UP

## How Does CSM Handle Path Failures?

Cisco Crosswork computes paths for Circuit Style SR-TE policies only after a complete bidirectional, path-protected set of candidate paths has been delegated. There are three types of candidate paths that are used during path failures:

- **Working**—This is the path with the highest preference candidate path.
- **Protect**—This path is defined as the second highest preference candidate path. If the Working path goes down, the Protected path (with the lower preference value) is activated. After the Working path recovers, the Protected path remains active until the default lock duration expires.
- **Restore**—This path is defined as the lowest preference candidate path. Crosswork computes the Restore path only after the Working and Protect paths are down. You can control how long after Restore paths are delegated from both sides to wait before the path is computed (see [Enable SR Circuit Style Manager, on page 8](#)). This delay allows topology and policy state changes to fully propagate to Crosswork, in cases where these changes triggered the Restore path delegation.

To address path failures effectively and switchover from working path to protect path, you can configure Performance Measurement (PM). For more information, see [Configure Circuit Style SR Policies, on page 9](#).

### Examples



**Note** Illustrations are for demonstration purposes only and may not always reflect the exact UI or data described within the workflow content. If you are viewing the HTML version of this guide, click the images to view them in full-size.

The following image shows that the Working and Protected paths of the Circuit Style SR-TE policy are operational. The *active* path is indicated by the "A" icon.

Path Name	Pref	RoleState
> cfg_r1-r2_discr_100	100	⬆️ ⬆️
> cfg_r1-r2_discr_50	50	⬆️

When the Active path goes down, the Protected path immediately becomes "active". When the Active path goes back up, then the Protected path takes the role of "protected" again and the Active path (with preference 100) becomes active.

Path Name	Pref	RoleState
> cfg_r1-r2_discr_50	50	⬆️ ⬆️
> cfg_r1-r2_discr_100	100	⬆️

In the case where both Working and Protected paths go down, CSM calculates a Restore path and it becomes the active path. Note that the Restore path has the lowest preference value of 10. The Restore path only appears in this particular case. If either the Working or Protected paths become operational again, the Restore path disappears from the topology map and from the Candidate Path list.

## How Does CSM Handle Path Failures?

Traffic Engineering / Traffic Engineering Last Refresh: 13-Oct-2022 03:33:54 PM GMT+11

Show Traffic Engineering Device Groups Unassigne... Saved Views Select a saved view Save View

All Locations / Unassigned Devices

Show:  Participating Only  KSP Path  Bi-Dir Path  Show Groups Color: 1000

Summary

- Admin State Up
- Oper State Up
- Binding SID 24007
- Policy Type Circuit-Style
- Profile ID -
- Description -
- Traffic Rate 0 Mbps
- Unused True (i)
- [See more](#)

Candidate Path Expand All

Path Name	Pref	RoleState
<input checked="" type="checkbox"/> > cfg_r1-r2_discr_10	10	<span style="color: green;">+ A</span>
<input type="checkbox"/> > cfg_r1-r2_discr_50	50	<span style="color: red;">+</span>
<input type="checkbox"/> > cfg_r1-r2_discr_100	100	<span style="color: red;">+</span>

Auto-Focus