Cisco Crosswork Optimization Engine 6.0 Release Notes

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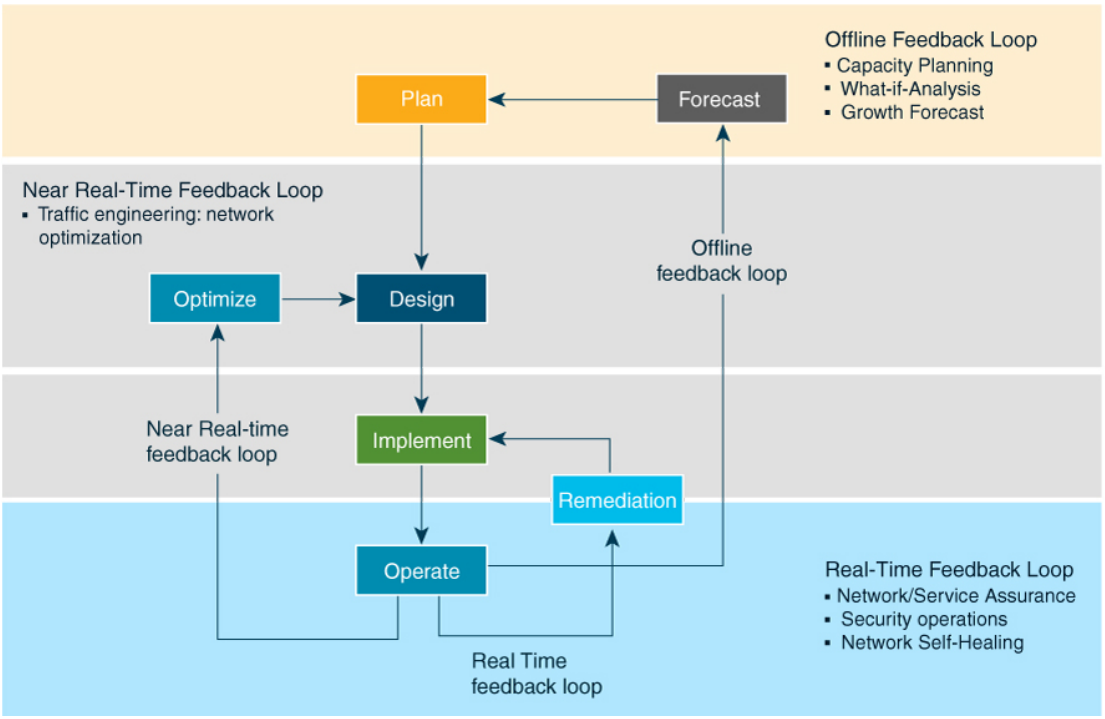
This document provides information about Cisco Crosswork Optimization Engine, including product overview, new features and functionality, compatibility information, and known issues and limitations.

Overview

Network operators are facing challenges to support the exponential growth of network traffic while addressing the pressure to efficiently run network operations. They need a toolset to help automate bandwidth optimization and efficiently steer traffic with little operator intervention. Cisco Crosswork Optimization Engine fulfills this need by providing real-time network optimization capabilities that allow operators to effectively maximize network utility as well as increase service velocity.

Looking at the following figure, Cisco Crosswork Optimization Engine is built to fulfill the need for a closed-loop optimization loop as described under “Near Real-Time Feedback Loop”. Through Cisco Crosswork Optimization Engine, the operator is able to define the optimization intent, implement the intent, and continuously monitor, track, and react to maintain the original intent.

Figure 1: Network Resolution Lifecycle



Real-time Visibility

To run their network effectively, end-to-end visibility is important to any network operator. Cisco Crosswork Optimization Engine not only provides this visibility, but also the ability to visualize the network across different layers and the relationship between each layer. Cisco Crosswork Optimization Engine leverages IETF-standard BGP-LS protocol to discover IP network automatically, including the following features:

- Real-time visibility: Provides the network operator with a true representation of the actual topology
- Hierarchical topology view: Enables operators to define the different levels of granularity in the topology visualization

Simplified SR-TE Policy and RSVP-TE Tunnel Lifecycle Management

Cisco Crosswork Optimization Engine also provides an easy to use UI and API to manage and monitor the TE tunnel lifecycle. The UI and API enables the network operator to perform the following tasks:

- Visualize SR-TE (SR-MPLS and SRv6) policies and RSVP-TE tunnels.
- Create, modify, and remove SR-MPLS policies and RSVP-TE tunnels using an intuitive workflow
- Continuously track SR-MPLS policies and RSVP-TE tunnels and use dynamic path computations to maintain SLA objectives
- Preview an SR-MPLS policy or RSVP-TE tunnel before deploying it to the network

Extensibility through Feature Packs

Crosswork Optimization Engine feature packs to help tackle bandwidth management, network congestions, and prevent over capacity utilization. A user defines the bandwidth optimization intent and the tools implement the intent, and continuously monitor, track, and react to maintain the original intent. A user can also define network congestion thresholds and configure whether to have the tool automatically remediate congestion or provide mitigation suggestions the operator can choose to act upon. The following feature packs are available with appropriate licensing. For licensing and ordering information, work with your Cisco Partner or Cisco Sales representative.

Bandwidth on Demand

As the name suggests, Bandwidth on Demand allows an operator/user to provision a Segment Routing Traffic Engineering (SR-TE)–based policy with a requested bandwidth between a specific set of devices. It is a soft bandwidth guarantee and can include a secondary optimization objective such as latency/TE/IGP.

Local Congestion Mitigation

Local Congestion Mitigation resolves congestion issues at the local interface level. This is done by rerouting traffic via tactical SR-TE policies only between devices on either side of the congested link. This way, the mitigation is localized to the congested interface and the end-to-end policy is not rerouted. This feature allows for operators to regain some control of the network by introducing a human in the loop. Upon congestion detection, mitigation recommendations are provided to the user and applied to the network only upon user confirmation. It can also be used as a monitoring tool to understand long-term congestion and failure patterns in the network, which will enable operators to augment capacity or perform maintenance in the identified parts of the network.

SR Circuit Style Manager

Segment Routing Circuit-Style (SR Circuit-Style) is a new way to provide a predictable way to transport circuit-like services (Optical circuits, TDM) over a Segment Routing network. To do so, SR Circuit-Style provides a bandwidth management mechanism that will guarantee that a given service will get the necessary bandwidth along its path (and along its backup path). The SR policy itself is supposed to follow some strict rules when provisioned: explicit path only, co-routed, bi-directional (guaranteed latency), bandwidth guaranteed, fault protected and diversity.

What's New

This section lists new features and changes delivered in Cisco Crosswork Optimization Engine 6.0.

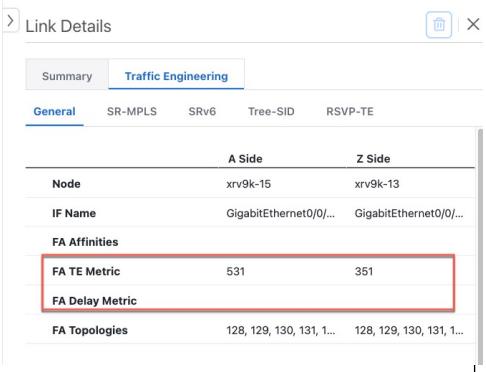
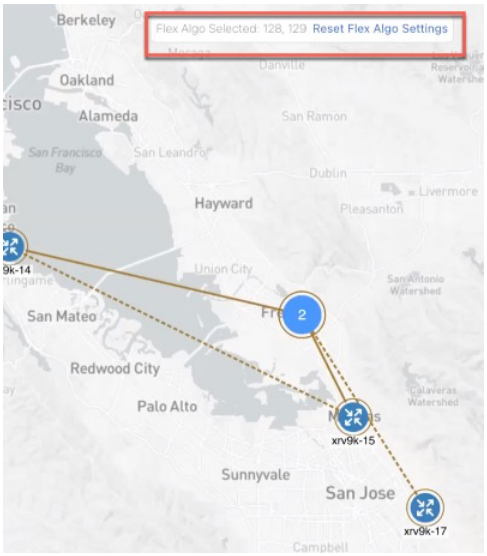
Table 1: New Features and Functionality in Cisco Crosswork Optimization Engine 6.0

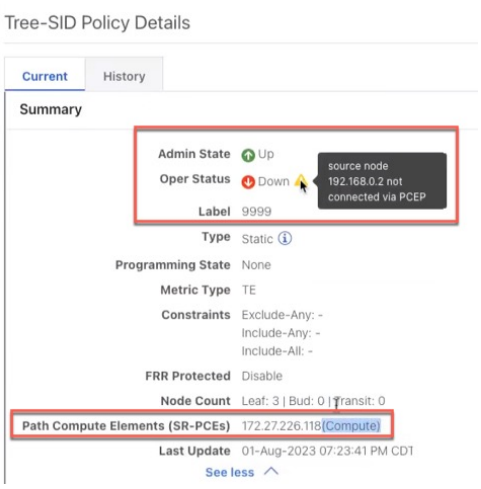
Feature	What's New
Local Congestion Mitigation (LCM) feature pack	• Automated Mode—This option allows LCM to automatically deploy TE tunnel recommendations based on thresholds that you configure. • Manual Mode (default)—This option, like in previous releases, requires a user to view the LCM Operational Dashboard and decide whether to commit TE tunnel recommendations. • Pause Mode—This option can pause LCM operations on a particular interface when LCM is in either Automated or Manual mode. Pausing operations in Automated mode are necessary in cases where deployed solutions do not result in the intended resolution, there is uneven ECMP traffic, there are policies that are not carrying traffic, or when an interface is continuously throttling between different solutions. **Note** Pausing LCM operations removes all existing TE policies that were deployed for that interface. **Note** Automated mode is accessible through Limited Availability. Engage your account team for further details.

Feature	What's New

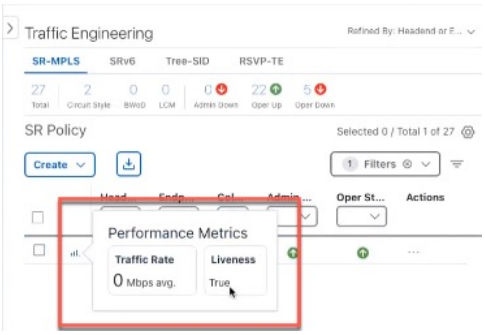
SR Circuit Style Manager (CSM) feature pack	• Hop count may be used as a metric type when computing SR-TE Circuit Style policies.
	• Now attempts to periodically (every 30 minutes) recompute paths for policies that were unable to find a path.
	• In response to feedback from customers, we have changed some events to alarms. For example, an alarm is triggered when policy traffic exceeds the reserved bandwidth pool size or threshold.
	• APIs:
	  • RESTCONF APIs—Manually re-optimize (single or multiple) SR-TE Circuit Style policies. These APIs can be initiated after network topology changes.
	  • CSPolicyPathsOnLinks—Lists Circuit Style SR-TE policies on a specified link and filtered by its operational state (up,down,active, and unknown) of the specified policies.
	  • AllCSPolicyPaths—Lists Circuit Style SR-TE policies filtered by its operational state and if it has hops (segment lists).
	  • CSPolicyPathsonNode—Lists all Circuit Style SR-TE policies on specified nodes filtered by its operational state (up,down,active, and unknown).
	To view API documentation, see Cisco Devnet.

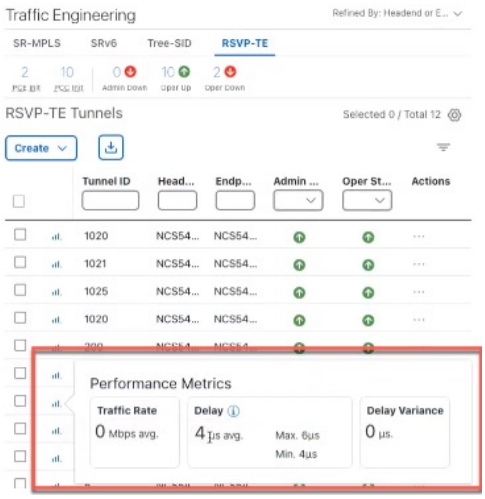
Bandwidth on Demand feature pack	• In previous releases, BWoD required protected adjacency SID constraints. Now user can elect BWoD to prefer to use protected (default option) or unprotected adjacency SIDs. • The Policy Violation now has two options: Strict or Loose. • The process of changing delegation from one PCE to another has been improved to guarantee a clean transfer of PCE roles. • Enhanced batch processing of queued BWoD policy computations. The queue is initially cleared prior to running a list of new pending delegations/undelegations instead of running each delegation one at a time.

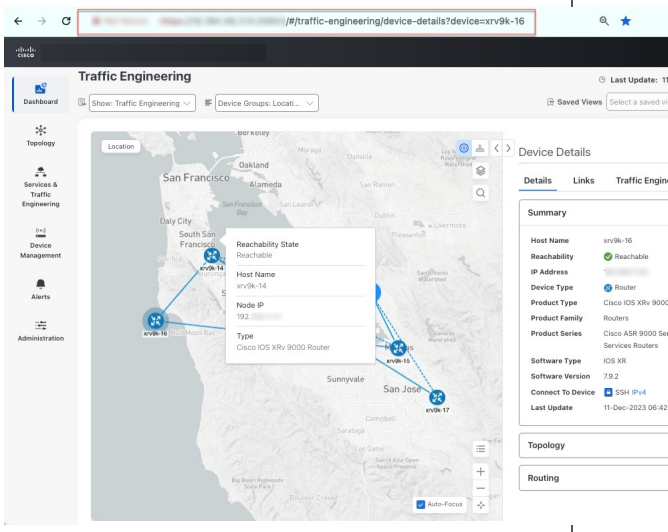
Feature	What's New
Flexible Algorithm	• You can now view Application-Specific Link Attribute ASLA Flexible Algorithm metrics (TE and Delay) in the link details: **Note** ASLA is supported on PCC and core routers that are Cisco IOS XR 7.4.1 or later versions. 1. From the Traffic Engineering topology map, click on a participating Flexible Algorithm link. 2. From the Links page, click ***Link_Type_entry*** > **Traffic Engineering** tab > **General**. For example:  • An overlay on the topology map has been added when Flexible Algorithms are selected. This is to help identify which Flexible Algorithms are selected more easily. For example: 

Feature	What's New
Tree-SID	PCE warnings and path compute elements are displayed in Tree-SID policy details: 

Feature	What's New
Performance Metrics of TE policies	

Feature	What's New
	When Service Health is installed and SR-PM collection is enabled, you can view KPI metrics (Delay, Jitter, and Liveness) from the Traffic Engineering table or from the TE tunnel details. To view the KPI metrics for the policy: 1. Configure SR-PM on the device from the policy provisioning page (**Traffic Engineering** > **Traffic Engineering** > **SR-MPLS** or **RSVP** tab. Locate the policy you are interested in from the policy table and click ⋯ > **performance metrics**). **Note** You can configure Delay or Liveness (not both) manually on the device. See the device platform documentation for information. For example: Segment Routing Configuration Guide for NCS 540 Series Routers. 2. Enable SR-PM collection in **Performance Metrics Settings** (**Administration** > **Settings** > **System Settings** tab > **Performance Metrics**). **SR-MPLS policies** KPI metrics contain Delay, Delay Variance (Jitter) or Liveness (Boolean value) along with traffic utilization. For example: ***Figure 2: SR-MPLS Policy Performance Metrics in the Traffic Engineering Table***  **RSVP-TE Tunnel** KPI metrics include Delay and Delay Variance (Jitter) along with Utilization. For example: ***Figure 3: RSVP TE Tunnel Performance Metrics in the Traffic Engineering Table***

Feature	What's New
	
Asymmetric delay for links	In previous releases, only one side of the link delay value for an interface was considered during computation. When you configure delays on both remote and local nodes, the calculation of each delay on each interface is now taken into consideration when computing a path. **Note** To configure link delay over an interface, refer to the device platform configuration guide. For example, Segment Routing Configuration Guide for Cisco NCS 540 Series Routers.

Feature	What's New
Unique TE tunnel and device detail URLs	TE tunnel or device details are now assigned unique URLs that can be shared. The URL sends the user to the Policy or Device Details page after logging in. • SR-MPLS, SRv6, Tree-SID, and RSVP-TE tunnels —From the Traffic Engineering table, click **Actions > View Details** for a particular row. • Devices—From the Traffic Engineering topology map, click on a device. 
Increased performance and memory footprint	Major improvement in topology discovery time, network model building, and processing cache, bandwidth, metric, and TE tunnel type information.

Note Cisco Crosswork Infrastructure is a microservices-based platform and is the foundation required for running Crosswork Optimization Engine. For a list of new Cisco Crosswork Infrastructure features, see Cisco Crosswork Network Controller 6.0.x Release Notes.

Compatibility Information

The following table details Crosswork Optimization Engine support for IOS Versions, SR-PCE, and Cisco devices. A later table indicates compatibility with Cisco Crosswork applications, NSO Function Packs, and browsers.

Cisco IOS Support

We recommend that the SR-PCE version you use be equal to or higher than the PCC software version. PCC 7.11.1 is recommended and has been validated to work with Crosswork Optimization Engine 6.0 features.

Other listed PCC versions are supported, but may not support all Crosswork Optimization Engine features because of PCC version limitations.

Note Software Maintenance Updates (SMUs) are required for both PCC/Headend and SR-PCE versions indicated in the table. To download the Cisco IOS XR versions and updates, see the IOS XR Software Maintenance Updates (SMUs) document. The correct SMUs to download will have "Optima" or the bug ID appended to the filename. For example: `asr9k-x64-7.3.2.Optima.tar` or `xrv9k-7.3.2.CSCvy63506.tar`.

Table 2: Crosswork Optimization Engine 6.0 Support for SR-PCE 7.11.1 (by Cisco IOS Version and Headend Router Type)

Cisco IOS XR	Cisco ASR 9901 (64-bit)	Cisco XRv 9000[1]	Cisco 8000 series	Cisco NCS 5500 series	Cisco NCS 540 series[2]	Cisco NCS 560 series
7.3.1	✓	✓	✗	✓	✓	✓
7.3.2	✓	✓	✗	✓	✓	✓
7.4.1	✓	✓	✗	✓	✓	✓
7.4.2	✓	✓	✗	✓	✓	✓
7.5.2	✓	✓	✓	✓	✓	✓
7.6.1	✓	✓	✗	✓	✓	✓
7.7.1	✓	✓	✓	✓	✓	✓
7.7.2	✓	✓	✓	✓	✓	✓
7.8.1 + SMU (CSCwc93705)	✓	✓	✓	✓	✓	✓
7.8.2	✓	✓	✓	✓	✓	✓
7.9.1	✓	✓	✓	✓	✓	✓
7.9.2	✓	✓	✓	✓	✓	✓
7.10.2	✓	✓	✓	✓	✓	✓
7.11.1	✓	✓	✓	✓	✓	✓

1 The SR-PCE may be deployed on XRv9000 (VM or appliance).
2 The SMU is available via the Cisco NCS 540-ACC-SYS Router or Cisco NCS 540x-ACC-SYS Router Software Download Center.

Cisco IOS XE Version	Cisco ASR 920	Cisco ASR 903 RSP 3
17.4.1[3]	✓	✗
17.5.1	✓	✓
17.6.3	✓	✗
17.7.1	✓	✓
17.8.1	✓	✓
17.9.1	✓	✓
17.12.1	✓	✓

[3] Supports only PCE- initiated SR-TE policy deployment.

Note

- Segment Routing Traffic Matrix (SRTM) is only available in Cisco ASR 9000 devices.
- SRv6 and Visualizing Native Path (Path Query) features are supported from PCC IOS XR 7.3.2 or later.
- Local Congestion Mitigation is supported from:
  - PCC IOS XR 7.3.2 and above for NCS 5500, NCS 560, and NCS 540
  - PCC IOS XR 7.4.1 (ASR 9000)
  - PCC IOS XR 7.5.2 and 7.7.1 for Cisco 8000
  - PCC IOS XE 17.05.1 or 17.05.1 (ASR 920/903 RSP 3)

Cisco Crosswork Application, NSO Function Pack, and Browser Support

The following table lists software versions that have been tested and are known to be compatible with Cisco Crosswork Optimization Engine. For *complete* installation requirements, see the *Cisco Crosswork Network Controller 6.0 Installation Guide*.

Hardware/Software	Supported Version
Cisco Crosswork Infrastructure	Version 6.0
Cisco Crosswork Data Gateway	Version 6.0
Browsers	• Google Chrome—119 or later • Mozilla Firefox—120 or later

Networking Technology Support

The following is the networking support information for SR-PCE 7.11.1.

- Supported Features
- Unsupported Features

Table 3: Supported Features

Category	Description	Notes / Details
SR	SR-MPLS PCE initiated policies	Policies that are provisioned or discovered by Cisco Crosswork.
SR	PCC initiated policies and ODN policies	Policies that are discovered by Cisco Crosswork.
SR	Explicit path SR-TE policies	Policies that are PCC initiated (SID list with labeled SID list with addresses), PCE reported, PCE initiated. Includes SRv6 TE discovery of PCC initiated policies.
SR	Dynamic path SR-TE policies	PCC computed, PCE reported, PCE delegated
SR	Single consistent Segment Routing Global Block (SRGB) configured on routers throughout domain covered by Cisco Crosswork	—

Category	Description	Notes / Details
SR	Egress Peer Engineering (EPE) PeerAdjacency SIDs, PeerNode SIDs	• EPE must be configured on both ends of the eBGP link to appear in Cisco Crosswork. • EPE PeerAdjacency SIDs and PeerNode SIDs are represented as individual links in the Crosswork UI between the corresponding Autonomous Systems border routers (ASBR). **Note** EPE PeerNode SIDs are identified by the Border Gateway Protocol Router ID (BGP RID) Loopbacks as the A and Z side link interfaces. • Labels for both types of EPE SIDs, are shown as adjacency SIDs in the Cisco Crosswork UI.
SR	Prefix SID	Regular/Strict Node SIDs + FA. Includes SRv6 Locators.
SR	Adjacency SID	B-flag (protected/unprotected), P-flag (Persistent). Includes SRv6 Locators.
SR	SR policy optimization objective min-metric (IGP, TE, and Latency)	PCE initiated provisioning and PCC initiated discovery
SR	SR policy path constraints (affinity and disjointness, protected segments)	• Only 2 SR-MPLS policies per disjoint group or sub-id are supported. Disjoint Types: link, node, srlg, srlg-node. • Only 32-bit affinities supported. EAG (RFC 7308) is not reported by PCE and not visualized by Cisco Crosswork.

Category	Description	Notes / Details
SR	Binding SID for explicit or dynamic policies	Discovered for PCC initiated and PCE initiated policies. It is configurable for PCE initiated policies.
SR	Profile ID (Discovered and configurable for PCE-init)	Parameter used for applying features on PCC to PCE initiated policies.
SR	Flexible Algorithm (Flex Algo) for SR-MPLS and SRv6 policies	• Discover and visualize node Flex Algo participation. • Discover and visualize Flex Algo definitions. • SR policy IGP path respecting Flex Algo associated with prefix SIDs. • Displays pruned topology participating in FlexAlgo. • Preview and provision PCE initiated SRTE policies with a SID-Algo constraint.
SR	Discovery and visualization of multiple candidate paths	—
SR	Binding SIDs as Segment List Hops for SR policies	Discovery and visualization of PCC initiated policies.
SR	Tree-SID	Visualization and provisioning of PCE initiated policies.
SR	SR policies with Loopback IPs (Prefixes) other than TE router ID for headend/endpoint and prefix SIDs in segment list	Prefix (node) SIDs associated with specific IGP domain / area.
SR	Maximum SID Depth (MSD)	• Per-node Base MPLS imposition MSD discovered via IGP/BGP-LS. • Per-node MSD discovered via PCEP session info. • Per-policy MSD.
SR	Global Max Latency	Configured on PCE and applied to all PCE delegated SRTE policies with a latency metric.

Category	Description	Notes / Details
SR	Inter-domain SRTE policies (inter-IGP domain, inter-AS)	PCE delegated and Bandwidth on Demand policies.
SR	Node SID reuse across different IGP domains	Recommended to not reuse node SIDs in adjacent IP domains. Inter domain explicit path policies with a label-only hop that is a node SID used in adjacent domains may be unresolvable if hop after ABR hop.
SR-IGP	Application-Specific Link Attribute (ASLA) Delay / TE metric	Crosswork collects and uses ASLA delay and TE metric in Flex Algo topology computations and SRTE policy IGP paths.
SR-IGP	Visualizing native SR-IGP path	Path Query OAM feature to use traceroute on device to report actual SR-IGP multi-paths to destination node ***(SR-MPLS only)***
SR	Dynamic Circuit Style	Path computation and bandwidth reservation through the Circuit Style feature pack.
RSVP	PCE initiated tunnels (provisioned by or discovered by Cisco Crosswork), PCC initiated tunnels discovered by Cisco Crosswork	—
RSVP	ERO strict hops, ERO loose hops (PCC initiated only)	—
RSVP	FRR protection on Cisco Crosswork provisioned tunnels	—
RSVP	Path optimization objective min-metric (IGP|TE|Latency)	—
RSVP	Path constraints (affinity, disjointness)	Only 2 RSVP tunnels per disjoint group or sub-id
RSVP	Binding Label (explicit | dynamic)	—
RSVP	Signaled Bandwidth	—
RSVP	Setup and Hold Priority	—

Category	Description	Notes / Details
RSVP	Path Protection (partial support)	Paths discovered as independent tunnels if multiple paths are up. Cisco XR only reports active path. Other vendors may report all active paths.
PCEP	PCEP Session discovery	Each PCEP session a PCC has with a PCE along with its details is displayed as part of node details
IPv4/IPv6	Dual Stack IPv4 or IPv6	Nodes can be IPv4, IPv6 or IPv4/IPv6 capable
IPv4	Unnumbered Interfaces (partial)	Topology discovery, SR policies with unnumbered IF hops discovery/provisioning, LCM policy support
IPv6	IPv6 Link Local Interfaces	Discovery of IPv6 link local interfaces as part of topology and as a hop in an SRv6 TE policy
IPv6	IPv6 Router ID	Nodes with IPv6 and IPv6 Router ID only with support for SRv6 only

Table 4: Unsupported Features and Limitations

Category	Description	Notes / Details
SR	Provisioning multiple candidate paths via Cisco Crosswork	—
SR	Per-Flow Policies (PFP)	PFP (ODN or manually configured) not supported in PCEP. This PFP is the mapping of forward class to PDP with matching color and EP. Underlying PDP is reported as normal.

Category	Description	Notes / Details
SR	Multiple segment lists per candidate path	This configuration is not supported in Crosswork. These segment lists will not be discovered if configured on a PCC. High level requirements: • Discover multiple segment lists (with weights) per policy (TopoSvc, PCE, PCC) • Provision multiple segment lists (with weights) per policy (UI, PCED, PCE, PCC) • Visualize including showing IGP paths (UI, OE) • Compute paths of policies with multiple segment lists for LCM (OE, LCM)
SR	Anycast SIDs	—
SR	SR policy provisioned (SR-PCE initiated) with IPv6 endpoints or hops	—
SR	SR-MPLS policy optimization objective min-metric with margin	Not supported for policies provisioned by Cisco Crosswork. Margin is not discovered for PCC initiated policies.
SR	SR-MPLS policy constraints (resource exclusion or metric bound)	Not supported for policies provisioned by Cisco Crosswork. Constraints are not discovered for PCC initiated policies.
SR	Heterogeneous SRGBs	Different SRGBs configured on nodes are not supported. SRGB must be configured to ensure proper discovery and visualization of SR policy paths.
SR	Egress Peer Engineering (EPE) Peer Set SIDs	No discovery
SR	Routers that are not SR-capable	All nodes assumed SR capable when computing SR policy IGP paths. LCM and BWoD SR policy path computation will not exclude non-SR capable nodes in IGP path.

Category	Description	Notes / Details
SRv6	PCE initiated provisioning of SRv6 policies is not supported.	—
SRv6	Traffic collection on SRv6 policies is not currently supported.	Requires telemetry (gNMI) for policy counters (no SNMP support)
IGP	ISIS Overload bit	Affects IGP paths for all policies and PCE path computation (BWoD, LCM). PCE reports but does not process.
IGP	OSPF MADJ Interfaces	No support for discovering OSPF Multi-area adjacencies
IGP	Multiple IGP instances on same interface	Single interface that participates in multiple IGP instances are not supported.
IGP	Cisco Crosswork supports L1 or L2 adjacencies on links but not both on the same link.	—
RSVP	Configuring loose hop Explicit Route Object (ERO) in Crosswork	Only strict hops can be configured. If strict hops are not configured for every hop along the path and those hops are not remote interface IPs or loopbacks, unexpected behavior may occur
RSVP	Named tunnels configured on PCCs	Required for Juniper RSVP HEs
RSVP	Tunnels with Loopback IPs other than TE router ID for headend/endpoint and path hops	—
RSVP	Display of active FRR protected path in UI	Cisco Crosswork will discover FRR tunnels which are displayed in UI but will not associate an actively protected tunnel with the FRR tunnel. Path in UI will not include FRR protected path when protection is active.
RSVP	P2MP tunnels	—
RSVP	Path protected RSVP LSPs	No association between paths discovered.

Category	Description	Notes / Details
LDP	Local Congestion Mitigation (LCM) in Mixed SR/LDP networks	LCM will not work in a mixed SR/LDP network with PEs that are LDP only. LDP traffic destined to the LDP-only egress PE attempted to be steered into Autoroute LCM tactical polices will be blackholed
IPv4	IPv4 Unnumbered Interfaces	BWoD, Circuit Style Support, and RSVP
IPv4/IPv6	Secondary IP addresses for interfaces	Not supported. Unpredictable behavior if discovered.
IPv4/IPv6	Overlapping IP addresses in different IGP domains	IP addresses for IGP interfaces and nodes (router-ids) are assumed to be unique across all domains
IPv6	IPv6 Router ID	SR and RSVP not supported (SRv6 only)

Installation Notes

Cisco Crosswork Infrastructure (Cisco Crosswork) is a microservices-based platform that must be installed prior to installing Crosswork Optimization Engine. For complete installation steps, see the Cisco Crosswork Network Controller 6.0 Installation Guide.



Note Download the Crosswork Optimization Engine Application tar.gz file to a directory on your machine. After Cisco Crosswork and Cisco Crosswork Data Gateway are installed, install Crosswork Optimization Engine using the Cisco Crosswork UI (**Administration > Crosswork Manager > Application Management > Applications** tab > **Add File**). For more information, see **Step 2** in Install Crosswork Applications).

Upgrade Crosswork Optimization Engine Feature Packs

If you have enabled feature packs (CSM, LCM, or BWoD) in Crosswork Optimization Engine 5.0 and want to upgrade to Crosswork Optimization Engine 6.0, you must perform the following tasks prior to upgrading:

LCM

- From the LCM **Configuration** page:

1. Set the **Delete Tactical SR Policies when Disabled** option to **False**. This task must be done prior to disabling LCM so that tactical polices deployed by LCM remain in the network after the upgrade.
2. Set the **Enable** option to **False**. If LCM remains enabled, there is a chance that tactical policies may be deleted after the upgrade.
3. Note all options (Basic and Advanced) in the LCM **Configuration** page so that you can confirm the same configuration has been migrated after the upgrade.

- Export the current list of interfaces managed by LCM (**Traffic Engineering > Local Congestion Mitigation > Export** icon). Confirm the interfaces are valid by reimporting the CSV file without errors. For more information, see "Add Individual Interface Thresholds".
- After the upgrade, wait until the **Traffic Engineering** page shows all the nodes and links before enabling LCM

Note:

After the system is stable and before enabling domains for LCM, confirm that the migration of previously monitored interfaces has completed and that each domain has the expected configuration options.

1. Navigate to **Administration > Alarms > All > Events** and enter **LCM** to filter the **Source** column.
2. Look for the following event: "Migration complete. All migrated LCM interfaces and policies are mapped to their IGP domains". If this message does not appear wait for the **Congestion Check Interval** period (set in the LCM **Configuration** page), then restart LCM (**Administration > Crosswork Manager > Optimization Engine > optima-lcm > ... > Restart**).
3. Wait until the optima-lcm service changes from Degraded to Healthy state.
4. For each domain, navigate to the **Configuration** page and verify the options have been migrated successfully. If the domain configurations are incorrect, restart LCM (**Administration > Crosswork Manager > Optimization Engine > optima-lcm > ... > Restart**).
5. Check the **Events** page for the event mentioned above and the **Configuration** page to verify the options.



Note

- If the confirmation message does not appear or domain configuration options are incorrect, then contact Cisco Technical support and provide them with showtech information and the exported Link Management CSV file.
- You can also manually add missing interfaces that were previously monitored or update domain configuration options *after* the system is stable.

CSM

- Set the **Enable** option to **False**.
- Note all options (Basic and Advanced) in the CSM **Configuration** page so that you can confirm the same configuration has been migrated after the upgrade.
- After the upgrade, wait until the **Traffic Engineering** page shows all the nodes and links before enabling CSM.
- Circuit Style SR-TE policies will go to operation down (Oper Down) state if CSM is not enabled within 8 hours after disabling.

BWoD

- Set the **Enable** option to **False**. If BWoD remains enabled, there is a chance that tactical policies may be deleted after the upgrade

- Note all options (Basic and Advanced) in the BWoD **Configuration** page so that you can confirm the same configuration has been migrated after the upgrade.
- After the upgrade, wait until the **Traffic Engineering** page shows all the nodes and links before enabling BWoD.

Product Documentation

The following table lists the guides that Cisco provides for Cisco Crosswork Optimization Engine.

Visit the Cisco Crosswork Network Controller Information Center to find direct links to topics within functional areas. You also can access all Cisco Crosswork Optimization Engine end user documentation at https://www.cisco.com/c/en/us/support/cloud-systems-management/crosswork-optimization-engine/model.html.

Note We sometimes update the documentation after original publication. Therefore, you should always review the documentation on Cisco.com for any updates.

Table 5:

Documentation Title	What is Included
Cisco Crosswork Optimization Engine 6.0 Release Notes	This document
Cisco Crosswork Network Controller 6.0 Installation Guide	Shared installation guide for all the Cisco Crosswork applications and their common infrastructure. Covers: • System requirements • Installation prerequisites • Installation instructions • Upgrade instructions

Documentation Title	What is Included
Cisco Crosswork Network Controller 6.0 Administration Guide	Shared administration guide for all the Cisco Crosswork applications and their common infrastructure. Covers: • Managing clusters and data gateway • Data collection • High availability • Backup and restore • Onboard and manage devices • Zero touch provisioning • Set up maps • Managing users, access and security • Maintain system health
Cisco Crosswork Optimization Engine 6.0 User Guide	• Getting started • Setting up and monitoring the network • Monitoring SR-TE (SRv6 and SR-MPLS) policies and RSVP-TE tunnels • Provisioning SR-MPLS policies and RSVP-TE tunnels • Mitigating network congestion • Defining and maintaining intent-based bandwidth requirements
Open Source Software Used in Cisco Crosswork Optimization Engine	Lists of licenses and notices for open source software used in Cisco Crosswork Optimization Engine.
API Documentation	Advanced users can extend the Cisco Crosswork functionality using the APIs. API documentation is available on Cisco Devnet.

Related Product Documentation

You can access documentation for all Cisco Crosswork products at https://www.cisco.com/c/en/us/support/cloud-systems-management/crosswork-network-automation/tsd-products-support-series-home.html

Known Issues and Limitations

The following section details the known issues and limitations for Cisco Crosswork Optimization.

TE Dashboard

- Traffic Utilization is not supported on Tree-SID and SRv6 policies.
- You cannot view the IGP path on the historical data when an event is selected.
- The metric type for BWoD policies are not visible on the TE Dashboard.
- Hop count metric and BWoD type are not shown in the TE Dashboard under metric/policy type.
- State and Path change events are not visible in the Historic tab of a policy until you zoom in by 5 to 6 clicks.

IPv4 Unnumbered Interfaces

- Bandwidth on Demand and SR Circuit Style Manager feature packs will not factor in IPv4 unnumbered interfaces.
- Tree-SID policies are not supported.
- RSVP-TE PCE-initiated tunnels are not supported.

Tree-SID

- Only static Tree-SID policies can be created via the UI. Also, you can only update and delete static Tree-SID policies that have been created via the UI.
- Tree-SID policies are only supported on devices running Cisco IOS XR software.
- PCE HA is not supported if the static Tree-SID policy was configured manually on the device (not via the UI).
- Tree-SID policies are not deleted from the UI when the SR-PCE in HA mode is down.
- IPv4 Unnumbered interfaces are not supported.
- Tree-SID policies are not supported in Label Switch Multicast (LSM) routing. In cases where LSM is enabled, IGP updates and traffic utilization data are not supported.
- LCM will not operate in portions of the network carrying Tree-SID LSPs.
- On Cisco 8000 Series Routers, only static Tree-SID policies with leaf role are supported.
- The RestConf API is not supported.
- Tree-SID policy details do not show IPv6 router ID or SRv6 core information.

SR-MPLS

- In the SR-MPLS provisioning screen and while previewing an SR-MPLS policy with an IPv6 address, a parsing error is displayed instead of correct error message: "Request Failed. Endpoint address is IPv6, IPv6 provisioning is not supported yet."
- Updating the SID constraint on an existing policy is not allowed by the SR-PCE. The modification screen gives a successful update message, instead of a warning message that it is not allowed.

APIs

- The Topology API cannot discover and report IPv6 Link-Local style links.
- The Dashboard Export API cannot export CSV files to an external location. It can only export to /mnt/cw_glusterfs/bricks/rscoean/export.

BWoD

- BWoD gets disabled when SR Policy Traffic field has 'Measured' selected and Policy Violation field has 'Strict' selected.

PCE Initiated SR-TE Policy and RSVP-TE Tunnel Behavior After an High Availability Switchover

After a switchover in a High Availability setup, PCE initiated SR-TE policies and RSVP-TE tunnels created after the last cluster data synchronization will not be manageable and are considered orphan TE policies. Crosswork will display an alarm when it finds orphan TE policies (**Administration > Alarms**). You can use APIs to help clear these orphan policies so that they are manageable. For more information, see API documentation on Devnet.

Bugs

If you encounter problems while working with Cisco Crosswork, please check this list of open bugs (.xlsx file). Each bug ID in the list links to a more detailed description and workaround. You can use the Cisco Bug Search Tool to search for bugs.

1. Go to the Cisco Bug Search Tool.
2. Enter your registered Cisco.com username and password, and click **Log In**.

   The Bug Search page opens.

Note If you do not have a Cisco.com username and password, you can register here.

3. To search for all Cisco Crosswork bugs, from the Product list select **Cloud and Systems Management** > **Routing and Switching Management** > **Cisco Crosswork Network Automation** and enter additional criteria (such as bug ID, problem description, a feature, or a product name) in the Search For field. Examples: "Optimization Engine" or "CSCwc62479".
4. When the search results are displayed, use the filter tools to narrow the results. You can filter the bugs by status, severity, and so on.

Tip To export the results to a spreadsheet, click **Export Results to Excel**.

Security

Cisco takes great strides to ensure that all our products conform to the latest industry recommendations. We firmly believe that security is an end-to-end commitment and are here to help secure your entire environment. Please work with your Cisco account team to review the security profile of your network.

For details on how we validate our products, see Cisco Secure Products and Solutions and Cisco Security Advisories.

If you have questions or concerns regarding the security of any Cisco products, please open a case with the Cisco Customer Experience team and include details about the tool being used and any vulnerabilities it reports.

Accessibility Features

For a list of accessibility features in Cisco Crosswork Optimization Engine, visit https://www.cisco.com/c/en/us/about/accessibility/voluntary-product-accessibility-templates.html (VPAT) website, or contact accessibility@cisco.com.

All product documents except for some images, graphics, and charts are accessible. If you would like to receive the product documentation in audio format, braille, or large print, contact accessibility@cisco.com.

Obtain Additional Information and Submit a Service Request

Information about Cisco products, services, technologies, and networking solutions is available from various online sources.

- Sign up for Cisco email newsletters and other communications at:

  https://www.cisco.com/offer/subscribe

- Visit the Cisco Customer Experience website for the latest technical, advanced, and remote services to increase the operational reliability of your network. Go to:

  https://www.cisco.com/c/m/en_us/customer-experience

- Obtain general networking, training, and certification titles from Cisco Press publishers at:

  http://www.ciscopress.com

- To submit a service request, visit Cisco Support.

Support and Downloads

The Cisco Support and Downloads website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies.

Access to most tools on the Cisco Support and Downloads website requires a Cisco.com user ID and password.

For more information:

https://www.cisco.com/c/en/us/support/index.html

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