Overview of Cisco Crosswork Optimization Engine

This section mainly describes what Cisco Crosswork Optimization Engine does and how to navigate the main user interface. To quickly get started, you should understand some basic concepts and look over the high-level workflows described in Get Started.

The following topics are addressed in this section:

Audience

This guide is for experienced network administrators who want to use Cisco Crosswork Optimization Engine in their network. This guide assumes that you are experienced and familiar with using the following technologies:

- Networking technologies and protocols (BGP-LS, IGP (OSPF and IS-IS), PCEP, model-driven telemetry, and so on)

- Cisco IOS XR Traffic Controller (XTC) or Segment Routing Path Computation Element (SR-PCE) functionality

- RSVP-TE tunnel provisioning

- Segment routing (SR) policy provisioning

Overview of Cisco Crosswork Optimization Engine

Cisco Crosswork Optimization Engine is part of the Cisco Crosswork Network Automation suite of products. Cisco Crosswork Optimization Engine provides real-time network optimization allowing operators to effectively maximize network utilization as well as increase service velocity.

Crosswork Optimization Engine provides the following:

- A topology map that gives valuable real-time visualization of devices, links, link utilization, and SR policy or RSVP-TE tunnel provisioning in the network.

  To view supported TE tunnel features and limitations, see SR Policy and RSVP-TE Tunnel Support.

- A UI that allows for easy manageability of SR policies and RSVP-TE tunnels. Crosswork Optimization Engine enables the network operator to perform the following tasks:

  - Provision SR policies and RSVP-TE tunnels and modify or remove them using an intuitive workflow

  - Continuously track SR policy dynamic path computations to maintain SLA objectives (with correct licensing)

  - Preview an SR policy or RSVP-TE tunnel before deploying it to the network

- APIs to extend Crosswork Optimization Engine functions. See the Cisco Crosswork Network Automation API Documentation on Cisco DevNet.

- Crosswork Optimization Engine function packs (with correct licensing) that provide closed-loop optimization to define the optimization intent, implement the intent, and continuously monitor, track, and react to maintain the original intent. See the *Cisco Crosswork Optimization Engine Function Packs* document.

Note   To get a quick overview on how to start using Crosswork Optimization Engine, see High-Level Workflows.

Cisco Crosswork Optimization Engine Architecture

In order to provide for better scalability and improved performance the data collection functionality has been separated out into its own VM and software package called Cisco Crosswork Data Gateway. The license to use Cisco Crosswork Data Gateway is included with the Crosswork Optimization Engine license. Cisco Crosswork Data Gateway gathers all the information from the monitored devices and forwards it to Crosswork Optimization Engine for analysis and processing. Crosswork Optimization Engine can then be used by the operator to manage the network or respond to changes in the network.

Apart from Crosswork Optimization Engine, Cisco Crosswork Data Gateway is required for external data collection, such as interface statistics via SNMP and model-driven telemetry sensor paths. Crosswork Optimization Engine can use Cisco Network Services Orchestrator (Cisco NSO) as a provider to manage the devices for any required model-driven telemetry (MDT) sensor paths for data collection. Cisco NSO then supplies the device management and configuration-maintenance services.

If you do not plan to use to use Cisco NSO, you must apply the telemetry configuration on your devices. See Prerequisites for Device Model Driven Telemetry.

This guide explains how to use both Crosswork Optimization Engine and Cisco Crosswork Data Gateway.

For more information on configuring and managing Cisco Crosswork Data Gateway, see Manage Cisco Crosswork Data Gateway.

Note Crosswork Optimization Engine is designed and tested to be used with the Cisco Crosswork Data Gateway 1.1 release.

Crosswork Optimization Engine APIs

Advanced users can extend Crosswork Optimization Engine functions by using product application programming interfaces (APIs).

For more information about the product APIs, see the Cisco Crosswork Network API Documentation on Cisco DevNet.

Disclaimer:

Cisco may be providing you with API software currently at no charge. However, nothing restricts Cisco's right, now or in the future, to monetize the API software. At which point you may be required to pay a license fee in order to use the API software.

Segment Routing Path Computation Element (SR-PCE)

Crosswork Optimization Engine uses the combination of telemetry and Cisco Segment Routing Path Computation Element (SR-PCE) to analyze and compute optimal TE tunnels.

Cisco SR-PCE (formerly Cisco XR Traffic Controller (XTC)) runs on the Cisco IOS XR operating system. SR-PCE provides stateful PCE functionality that helps control and move TE tunnels to optimize the network. PCE describes a set of procedures by which a Path Computation Client (PCC) can report and delegate control of head-end tunnels sourced from the PCC to a PCE peer. The PCC and PCE establish a Path Computation Element Communication Protocol (PCEP) connection that SR-PCE uses to push updates to the network.

Crosswork Optimization Engine discovers all devices that are part of the IGP domain including those that do not establish PCEP peering with SR-PCE. However, PCEP peering is required to deploy TE tunnels to the device.

Log In and Log Out

The Cisco Crosswork Optimization Engine user interface is browser based. See the *Cisco Crosswork Optimization Engine Installation Guide* for supported browser versions.

Step 1 Open a web browser and enter:

```
https://<CrossworkVMManagementIPAddress>:30603/
```

When you access Cisco Crosswork Optimization Engine from your browser for the first time, some browsers display a warning that the site is untrusted. When this happens, follow the prompts to add a security exception and download the self-signed certificate from the server. After you do this, the browser accepts the Cisco Crosswork Optimization Engine server as a trusted site in all subsequent logins.

Step 2 The Cisco Crosswork Optimization Engine browser-based user interface displays the login window. Enter your username and password.
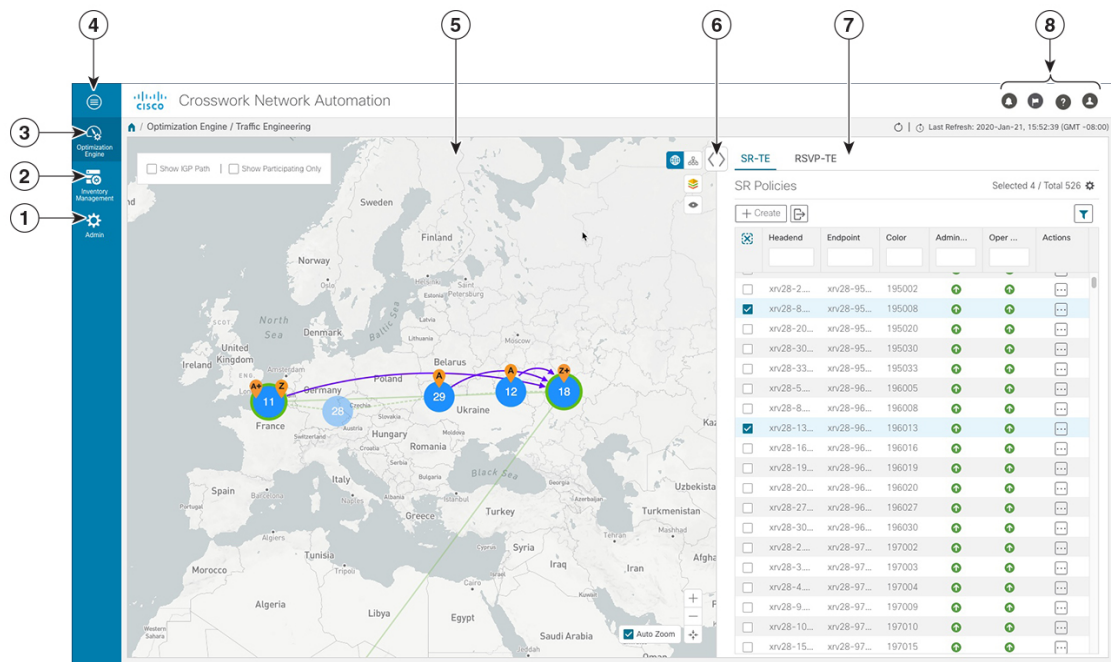
> **Note** The default Cisco Crosswork Optimization Engine administrator user name and password is `admin`. This account is created automatically at installation (see Administrative Users Created During Installation). The initial password for this account must be changed during installation verification. Cisco strongly recommends that you keep the default administrator credential secure, and never use it for routine logins. Instead, create new user accounts with appropriate privileges and their own credentials (as explained in Add Users) and use only those accounts for all subsequent user logins.

Step 3 Click **Log In**.

Step 4 To log out, click 👤 in the top right of the Cisco Crosswork Optimization Engine main window and choose **Log out**.

Crosswork Optimization Engine Home Page

Figure 1: Crosswork Optimization Engine Home Page

Callout No.	Description
1	**More**: Toggles the main menu to compact mode or expanded mode. In compact mode, you must hover over the main menu items to view and select available options. In expanded mode, you must click on the main menu item to display the available options. In this mode, when a main menu item is expanded, it will remain so until you collapse the menu item.
2	**Network Topology Map**: Displays a geographical or logical map view of the devices, links, and SR policies in your network. It also shows the general condition of devices and links. See Visualize the Network. In conjunction with the SR Policies Table and RSVP-TE Tunnels Table, it quickly highlights selected TE tunnels and associated tunnel information such as metrics, adjacency segment IDs, segment hops, source and destination nodes. See Visualize SR Policies and RSVP-TE Tunnels.
3	**Expand/Collapse/Hide Side Panel**: Expand or collapse the contents of the side panel. Close the side panel to get a larger view of the topology map.
4	The content of this panel changes depending if the SR-TE tab (SR Policies Table) or RSVP-TE tab (RSVP-TE Tunnels Table) is selected. Depending on what is selected on the topology map, or whether you are in the process of viewing and managing TE tunnels, you can do the following: • Create and Manage SR Policies • Create and Manage RSVP-TE Tunnels • Get More Information About an SR Policy • Get More Information About an RSVP-TE Tunnel • Get More Information About Devices on the Map • Get More Information About Links
5	Settings icons: 🔔 The **Alerts** icon notifies you of any current error conditions related to the system operations which require attention, and provides a link to detailed information about those conditions. 🚩 The **Events** icon notifies you of new events related to system operation, and also provides access to the history of all system events. ❓ The **About** icon displays the current version of Crosswork Optimization Engine. 👤 The **User Account** icon lets you view your username, change your password, and log out.

Callout No.	Description
6	**Optimization Engine Menu**: You can access the following TE tunnel related options: • **Traffic Engineering**—Returns you to the main window as shown above. • **Affinity Mapping**—Lets you map an affinity to a bit position. See Configure Affinity Mapping. • **Function Packs**—Lets you enable and configure function packs. See the *Cisco Crosswork Optimization Engine Function Packs* document.
7	**Inventory Management Menu**: You can access the following inventory related options: • **Devices**—Lets you add, delete, update and view information about the devices in your network. See Manage Network Devices. • **Providers**—Lets you add, delete, update and manage providers. See Manage Providers. • **Credentials**—Lets you add, delete, update and manage credential profiles that control access to devices and providers. See Manage Credential Profiles. • **Tags**—Lets you add, delete, update and manage the tags you use to sort and group devices. See Manage Tags. • **Job History**—Lets you review device related jobs. See View Device Job History.

Callout No.	Description

8	**Admin Menu**: You can access the following administrative related options:
	
	• **Crosswork Manager**—Lets you do the following tasks:
	
	    • Collect logs and metrics. See Collect and Share Cisco Crosswork Network Automation Logs and Metrics.
	
	    • Monitor the general state of containers. See Monitor Cisco Crosswork Network Automation Functions in Real Time.
	
	    • Control (stop, start, or restart) services. See Control Cisco Crosswork Network Automation Applications and Services.
	
	• **Backup Restore**—Lets you restore or create a backup for the Crosswork Optimization Engine VM.
	
	• **Users**—Lets you add, update and view users and roles. See Manage Users.
	
	• **AAA**—Lets you add, update and view TACACS+ and LDAP to authenticate users. See Manage TACACS+ Servers.
	
	• **Visualization Settings**—Lets you update topology map settings. See Configure Geographical Map Settings and Define Color Thresholds for Link Bandwidth Utilization.
	
	• **Certificate Management**—Lets you view and manage certificates. See Manage Certificates.
	
	• **Collection Jobs**—Lets you view collection job details. See Monitoring Collection Jobs.
	
	• **Data Gateway Management**—Lets you manage Cisco Crosswork Data Gateway instances and view their metrics. See Manage Cisco Crosswork Data Gateway.
	
	• **Data Gateway Global Settings**—Lets you set up data collection for external data destinations and add custom software packages (custom MIB packages, CLI device package, and SNMP device packages). See Configure Cisco Crosswork Data Gateway Settings.
	
	• **Smart Licensing Registration**—Lets you register, view, and manage your Smart Licenses. See Smart Licensing Registration.

Set, Sort and Filter Table Data

Many Cisco Crosswork Optimization Engine windows show database records in tables.

Any window with a table will also provide column selection, sorting, and filter functions that let you control the database records shown in the tables and help you locate particular records quickly.

Click ⚙ to display a list of all the fields in the database for the kind of data record displayed in the table. You can choose which fields you want to display as table columns by checking or unchecking the box next to any field in the list. Your choices are enabled immediately and are permanent.

You can also sort all the records displayed in the table according to the data in any one column by clicking that column's title:

• To sort the records in ascending order, click the column title once.

• To sort the records in descending order, click the column title again.

Sorting takes place immediately. You can only have one active sort at a time. The example **Links** window, below, shows an active sort on the **Link Type** field.

You can also filter the table to show only the records you want, using a quick filter . Many tables have all these features enabled by default. If you cannot see the quick filter features displayed on a window with a table, click ▽.

The quick filter displays only the records that match the value you enter above the column in the **quick filter** field (see item 2, below). Filtering takes place immediately, as you type.

The advanced filter (only available in some tables) narrows the content in the table by applying a filter that includes both a value and a logical operator, such as Equals, Starts with, Contains, and so on. Click ▽ in the column header to access the advanced filter (see items 4 and 5, below).

In addition to these quick and advanced filters, you can also use tags to filter the devices shown in the **Devices** window (see Filter Devices by Tags).

Figure 2: Links Window With Active Sort and Filters

Item	Description
1	**Sort active icon**: This arrow icon indicates that the user has sorted the links by clicking on the column header. The arrow's direction shows that the table is sorted by **Link Type**, in ascending order.
2	**Quick filter field**: Type a text or numeric value in this field to show only the links that match the value you enter. The field shows the values you entered for both quick and advanced filters.
3	**Filter active icon**: This icon shows that a quick or advanced filter is currently applied to the data in this column.

Item	Description
4	**Advanced filter icon**: Click ⛛, shown in each column header, to specify an advanced filter on that column, using logical operators as well as alphanumerical values. **Note** Advanced filtering is not available on all tables.
5	**Filter criteria fields**: These fields appear in a popup next to the column after you click the ⛛ icon. Set the filter criteria by selecting the logical operator from the drop down list in the first field, and then entering the filter value in the second field. Your criteria will be applied immediately. You will then be prompted to enter more operators and values, and to decide if you want to concatenate them using logical AND or OR. The quick filter field shows the values you entered (but not the operators). Logical operators include Equals, Not equal, Starts with, Ends with, Contains, and Not contains. **Note** Some columns will not have all of the logical operators available.