Visualize the Network Topology

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- View Detailed Tables of Alarms, Network Interfaces, Circuits/VCs, and Links from a Network Topology Map, on page 3
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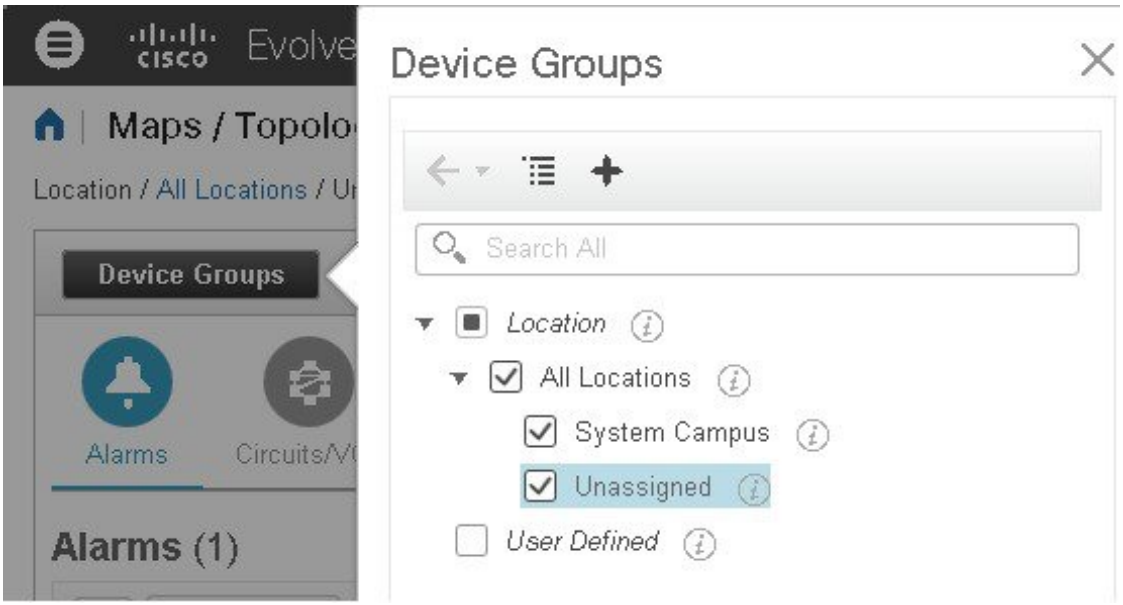
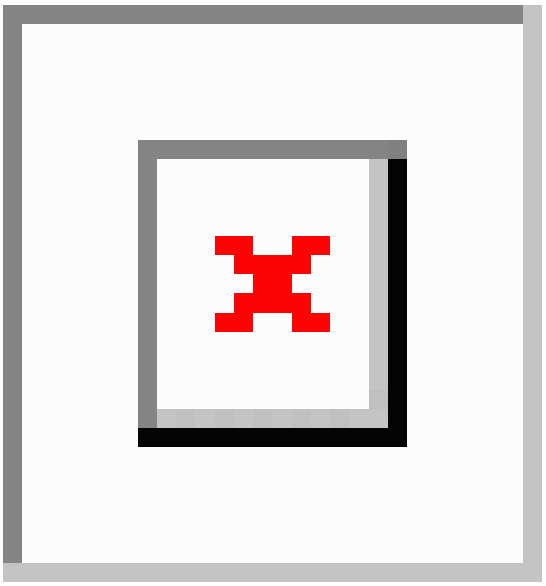
Network Topology Overview

The Network Topology window presents a graphical, topological map view of devices, the links between them, and the active alarms on elements in the map. It also enables you to visualize circuits/VCs within the displayed topology map. In addition, the Network Topology window provides access to map element tools and functions, and allows you to drill-down to get detailed information about map elements.

The Network Topology window is accessed from the left sidebar (**Maps** > **Topology** > **Network Topology**). The content of the Network Topology window is determined by the device group(s) you have selected. To select a device group, click the Device Groups button in the toolbar and select one or more groups in the Device Groups panel. From the Device Groups panel you can access the central device grouping functionality to create new groups, add devices to groups, and so on. See Create Groups of Devices for Easier Management and Configuration for more information.



Each Network Topology map is divided into a left pane that contains alarms/circuits/VCs/links information, and a right pane that displays the map itself. From the left pane, use the toolbar to control the spacing of both panes. For example, if you select 100%, only the map will be shown. If you select 50%, the map and the left pane will share the screen equally. When the left pane is expanded, additional columns might be added to the tables in the tabs.



- Alarms, Circuits/VCs, and Links (left pane)— Provides information relevant to the devices and topology shown in the map.
  - Alarms tab—Shows a table listing the current alarms for the selected group(s) and their severity. You can select alarms and perform basic actions, such as clear, acknowledge, and so on. For full details of the alarms, click the Alarms Table link at the bottom of the Alarms tab.
  - Circuits/VCs tab—Lists the circuits/VCs relevant to the devices in the selected group(s), and indicates the primary state of each circuit/VC. The primary state reflects the most serious current state of the

circuit, as derived from the provisioning, serviceability, discovery, and alarm states. See Circuit or VC States. By default, the circuits/VCs are sorted by primary state, from most to least severe. Note that:

- Selecting a circuit/VC in the list displays a visual representation of the circuit/VC in the topology map.
- Clicking the Circuits/VCs link at the bottom of the tab launches a separate window with a table of circuits/VCs providing more details for each circuit/VC.
- Clicking the Network Interfaces link at the bottom of the tab launches a table listing the interfaces that have been configured for participation in circuits/VCs, such as UNIs and ENNIs.
- Clicking the appropriate toolbar icon allows you to perform actions such as creating a new circuit or running an ITU-T Y.1564 test on the selected circuit.

- Links tab—Lists the links relevant to the selected device group(s) and shows the highest severity alarm on the link. Selecting a link in the table highlights the link in the topology map. Clicking the Links Table link at the bottom of the tab launches a separate window with a table of links.

- Topology map (right pane)—Displays the topology of the selected device group(s) in graphical form. It displays the group's devices and sub-groups (if any) and the links between them (Physical, Ethernet, and technology-specific links). It also displays the active alarms on the devices or links so that you can easily identify problems in the network. You can drill down from the topology map to detailed information about a device or link in order to troubleshoot problems. The topology map can be customized, filtered, and manipulated to show exactly the information you need.

  You can toggle between the network topology map and the geographical map using the toggle buttons in the top right corner of the map.

Note Based on the refresh time intervals for tables settings in **User Preferences** the topology map view on Circuits/VCs and Interfaces will be refreshed. For more information see, Change User Preferences.

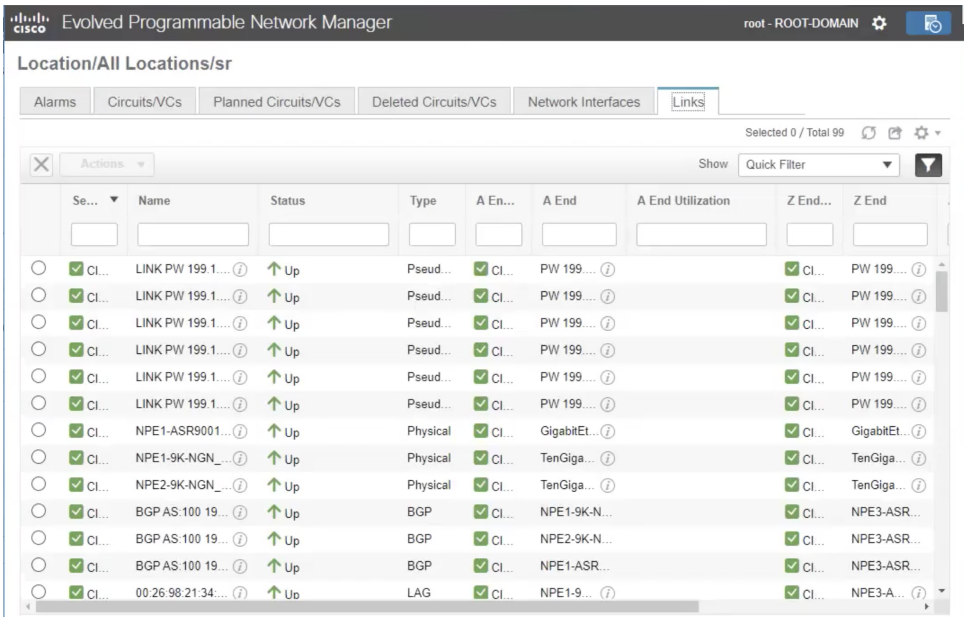
View Detailed Tables of Alarms, Network Interfaces, Circuits/VCs, and Links from a Network Topology Map

From the Network Topology window, you can access extended tables that list and provide more information about the alarms, network interfaces, circuits/VCs and links in the selected device group. These extended tables open in a separate browser window.

The tables accessed from the Network Topology window contain information for the selected device group only. You can access a full list of all alarms/circuits/planned circuits/deleted circuits/network interfaces/links in the system by selecting **Inventory** > **Other** and then selecting the required table (links, network interfaces, and so on).

To open the extended details tables, click the **Detach** icon in the top right corner of the tab or click on the hyperlink at the bottom of a specific tab, for example, click on the Alarms Table link at the bottom of the Alarms tab.

The window displaying the extended tables has these tabs: Alarms, Circuits/VCs, Planned Circuits/VCs, Deleted Circuits/VCs, Network Interfaces, and Links.



Be aware of the following when working with the extended tables:

- When the extended tables window is open, the left pane of the Network Topology window is disabled. When you close the extended tables window, the tabs in the left pane of the Network Topology window become fully functional again.
- There is synchronization between the extended tables and the corresponding tabs in the Network Topology window. For example, if you select a circuit/VC in the extended Circuits/VCs table, that circuit will also be selected in the Circuits/VCs tab in the Network Topology window and the circuit/VC overlay will be shown in the topology map. Conversely, if you select a circuit/VC in the Network Topology window and then open the extended table, the same circuit/VC will be selected in the extended table.
- All the tables are refreshed based on the user preference settings. See Set Up Your Alarm and Event Display Preferences and Customize the Alarm Summary.
- Click the **Export** icon at the top right of the table to export the data from the table to a file.

Note Only CSV format is supported for Circuits/VCs and Network Interface tables. The data from these two tables is exported irrespective of any filters or UI page. For the other tables, **Export** supports both CSV and PDF formats and data is exported based on the applied filters and the current UI page.

- Click the *i* icon next to the **Provisioning** column in the Circuits/VCs and Deleted Circuits/VCs tabs to view the details of configuration, configuration errors, rollback configuration, and rollback configuration errors for each device participating in the circuit/VC. The *i* icon is available for all provisioning states, except None.

You can customize the GUI display settings that control the Network Topolgy page for Circuits/VCs and Interfaces. To do this:

1. Click at the top right of the Cisco EPN Manager window, then choose **My Preferences**.
2. Under Network Topolgy, from the **Refresh Interval for Maps and Tables** drop-down list, choose an option to set the refresh interval. The specified refresh interval will determine the time interval at which the tables in the topology page should be refreshed on Circuits/VCs and Interfaces.

Note The available options are 30 seconds, 1 minute, 2 minute, 5 minute and Do not Refresh. For example, if you set the time interval as 2 minutes, all the topolgy in the inventory will be refreshed every 2 minutes automatically.

Filter Data in the Detailed Tables

You can also filter the data to find specific alarms, circuits/VCs, network interfaces, or links using a *quick filter* or an *advanced filter* from the **Show** drop-down list. The quick filter narrows the content that is displayed in a column according to the text you enter above the column. The advanced filter allows you to narrow down the data in a table by applying a filter using multiple operators such as Does not contain, Does not equal, Ends with, Is empty, and so on. You can also create a *user defined* filter which, if saved, will be added to the **Show** drop-down menu.

To create and save a user defined filter:

Step 1 From the **Show** drop-down list above the extended tables of alarms, circuits/VCs, network interfaces, and links, choose **Advanced Filter**.

Step 2 In the **Advanced Filter** data popup window, enter the advanced filter criteria, and then click **Save As**.

Step 3 In the **Save Filter** dialog box, enter a name for your filter and click **Save**.

To edit or remove a user defined filter, choose **Manage User Defined Filters** from the **Show** drop-down list.

Search for a Device in the Map

You can search for devices in the topology map and in the geo map by the following criteria:

- Device name
- Device family
- IP address
- User defined field value

To search for specific devices in the map:

Step 1 Click the **Search** icon in the toolbar.

Step 2 Type the full or partial device name/IP address/device family/user defined field value in the search text box and press **Enter**. In the topology map, you will see a list of devices that match the search criteria. In the geo map, the Search Results panel lists the devices that match your search and indicates whether they are mapped or unmapped. Click on the i icon to show the Device 360 which contains more information about the device. Click on a device to highlight it in the map.

Determine What is Displayed in the Topology Map

- Choose Which Device Group(s) to Display in the Network Topology Map, on page 6
- View the Contents of a Sub-Group in the Topology Map, on page 7
- Manually Add Links to the Topology Map, on page 8
- Change Which Link and Device Types are Shown in the Network Topology Map, on page 10
- Show/Hide Alarms and Labels in the Topology Map, on page 11
- Isolate Specific Sections of a Large Topology Map, on page 12

Choose Which Device Group(s) to Display in the Network Topology Map

The topology map enables you to visualize the topology of a device group or multiple device groups. The selected group(s) might cover a specific network segment, a customer network, or any other combination of network elements. Device grouping is hierarchical. There are two top-level parent groups containing multiple sub-groups - Location groups and User Defined groups. You can display multiple groups within the same top-level parent group. For example, you can display multiple Location groups but you cannot display one Location group and one User Defined group.

To determine which devices are displayed in the topology map, click on the **Device Groups** button in the left pane and select one or more device groups.

After you have displayed the required group(s) in the topology map, you can access additional information about any device or link. See Get More Information About Devicesand .

The topology map only displays devices for which the logged in user has access privileges, based on the virtual domains to which the user has been assigned.

Note If you encounter topology issues, such as topology components not rendering as expected or component data not being displaying on the map, we recommend that you clear your browser cache and try again.

To display network elements in the topology map:

Step 1 Choose **Maps** > **Topology Maps** > **Network Topology**.

Step 2 Click on the **Device Groups** button in the left pane to open the Device Groups panel.

Step 3 Click on the device group(s) you want to display in the topology map and click **Load**. The device group selections are displayed above the topology map.

Step 4 Customize the topology map as required by showing specific device/link types, adding manual links, and so on. See the following topics for more information:

- Change Which Link and Device Types are Shown in the Network Topology Map, on page 10

• Manually Add Links to the Topology Map, on page 8
• Change the Layout of a Network Topology Map, on page 21

View the Contents of a Sub-Group in the Topology Map

You can expand a sub-group to show its contents within the current context or you can drill down to see the contents of the sub-group independently of the current map context.

Note When expanding sub-groups, be aware that if a device belongs to more than one group, the device will appear in one of the expanded groups only. It will not appear in all of the groups to which it belongs. If your setup has devices that belong to multiple groups, rather view the groups individually in the topology map by selecting them in the Device Groups pane. This will ensure that you will always see all the devices that belong to a specific group.

To view the contents of a sub-group:

Step 1 Click on a sub-group in the topology map.

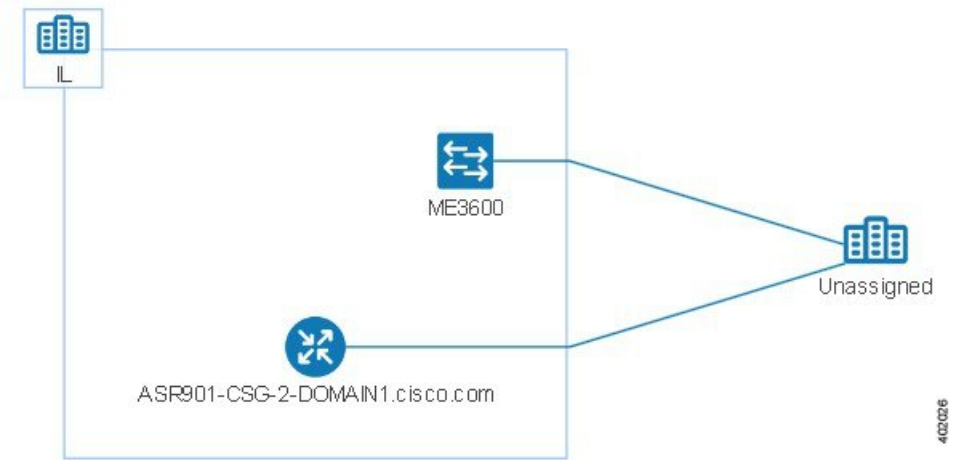
Step 2 In the displayed popup, click one of the following:

- Drill down group—Displays the sub-group on its own in the topology map, meaning that the currently displayed group is replaced with the selected sub-group. Note that the sub-group name is selected in the Device Groups pane.

  Note You can double-click on the sub-group to quickly drill down into the group.

- Expand group—Adds the contents of the sub-group to the current topology map display.

In the figure below, the IL group is expanded.



Manually Add Devices and Networks to the Topology Map

You can display devices and networks that are not managed by the system on the topology map and on the geo map by adding them manually.

Step 1 In the topology toolbar, choose **Create > Create Unmanaged Device** or **Create > Create Unmanaged Network**.

Step 2 Click on the map to add the device/network to the map.

Step 3 Click on the newly-added device/network in the map. From the displayed panel, you can add the device/network to a group, rename the device/network, or delete the device/network.

After you have added a device or network to the topology map, it will also be available in the geo map. The unmanaged device will appear in the list of unmapped devices and you can set its location. See Place Unmapped Devices on the Geo Map, on page 34.

Manually Add Links to the Topology Map

If you know that two devices are connected but Cisco EPN Manager cannot discover the link and show it on the map, you can add the link manually. After you add this link, it will be shown by default whenever the relevant group is shown on the map.

Following are the most common scenarios in which manual links could be used:

- From the optical/DWDM controller of a trunk port on a Cisco NCS device running IOS-XR (NCS 4000, 9000, 5000, 1000) to an add/drop port pair in NCS 2000 devices.
- From the optical/DWDM controller of a client port on a Cisco NCS device running IOS-XR (NCS 4000, 9000, 5000, 1000) to NCS 2000 transponder client ports (representing connections for 10GE/100GE ports).
- From 10GE/100GE controllers of ports on a Cisco NCS device running IOS-XR (NCS 4000, 9000, 5000,1000) to NCS 2000 transponder client ports (representing connections for 10GE/100GE ports).
- Between two trunk ports on Cisco NCS 2000 series devices with 400-G-XP linecards. This link must be created as a managed OTU link.
- From a Cisco NCS 2000 series device with 400-G-XP linecard and a Cisco NCS 4000 series device with 4H-OPW-QC2 linecards. This link must be created as a managed OTU link.

Manual links can be managed or unmanaged :

- Unmanaged links: For visualization purposes only. If you know that two devices are connected but you do not need full management of the link between them, you can add an unmanaged manual link to the map. The link will appear as a grey dashed line.
- Managed links: When you add a managed manual link, it is saved to the database and is included in all links tables. It is shown on the map as a solid line, the same as all other managed links. Cisco EPN Manager retrieves the link status from the managed device interfaces to which it is connected. The discovery status of a manually added managed link will be "Pre-provisioned." This indicates that it was not discovered by the system.

To manually add a link between two devices:

Step 1 In the topology toolbar, choose **Create** > **Create Unmanaged Link** or **Create** > **Create Managed Link**.

Step 2 Click and hold down the mouse on the first device in the topology map and drag it to the second device.

Step 3 In the Interface Details dialog, select the source interface on the first device and the target interface on the second device from the drop-down lists of available interfaces, and click **OK**.

The link between the two selected devices will be displayed on the map.

Delete a Manually Added Link

Links that were added manually to the map can be deleted from the system.

- Manually added managed links are deleted from the Links table, as described in the procedure below.
- Manually added unmanaged links are deleted by clicking on the link in the map and then clicking **Delete** in the Link panel.

To delete a manually added managed link:

Step 1 In the left sidebar, choose **Inventory** > **Other** > **Links**.

Step 2 Filter the Status column of the Links table to show Pre-provisioned links and select the required link.

Step 3 Click the Delete icon to delete the link. The Delete icon is only enabled for manually added links.

Step 4 Alternatively, to delete the manually created links, click the information (I) icon on the link.that you want to delete .
In the **Link Details** window, a single link with **Type** as "Manual" appears.

Step 5 Choose the entry and then click the Delete (X) icon to delete the link.

To delete a manually added unmanaged link:

a. Filter the Status column of the Links table to show Pre-provisioned links and select the required link.

b. To delete the manually created unmanaged links, click the information (I) icon on the link.that you want to delete . In the **Link Details** window, a single link with **Type** as "Manual" appears.

c. Choose the entry and then click the Delete (X) icon to delete the link.

Rename a Link

By default, the link name is generated automatically by the system based on the A- and Z-end interface name. You can rename any link, in which case the new name will represent the link in all link tables, in the Link 360 view, and on the map.

To rename a link:

Step 1 Go to any of the link tables.

Step 2 Select the link you want to rename.

Step 3 Choose **Actions** > **Rename**.

Step 4 Enter a unique name for the link and click **Rename**.

Change Which Link and Device Types are Shown in the Network Topology Map

You can choose to display only certain types of links or devices in the network topology map. Click the **Show** button and select **Links** or **Device Families** to see a full list of link and device types and select the ones you want to display.

Note Link/device type filters are disabled when you select a specific circuit/VC to display on the map.

Step 1 In the left sidebar, choose **Maps** > **Topology Maps** > **Network Topology**.

Step 2 Click on the **Device Groups** button, select the required device group(s), and click **Load**.

Step 3 Click **Show** in the topology toolbar and choose **Links** or **Device Families**.

Step 4 In the Links dialog:

- Select the types of links you want displayed in the topology map, for example, physical layer links, Ethernet layer links, and so on. The Links dialog only shows link types that exist in your network. If a link type exists in your network but not in the selected device group, it will be disabled.
- If you want to differentiate aggregated links from single links, select the Display Aggregated Links as check box.
- You can enable bandwidth utilization visualization on links that support this feature. See Show Bandwidth Utilization for Links on the Map, on page 19 for more information.
- Click **OK**. The topology map will reflect your selections. Only the link types you selected will be displayed.

Step 5 In the Devices dialog:

- Select the device types you want displayed in the topology map, for example, routers, switches and hubs, optical networking, and so on. The Devices dialog only shows device types that exist in your network. If a device type exists in your network but not in the selected device group, it will be disabled.
- Click **OK**. The topology map will reflect your selections. Only the device types you selected will be displayed.

Note If you have selected to display optical networks on the map, by default you will see the devices that serve as optical line amplifiers (if any). Deselect the Display Optical Line Amplifier check box under Device Functions if you do not want these optical line amplifier devices to be displayed on the map. The Display Optical Line Amplifier check box under Device Functions only appears if there are optical devices in setup which support Line Amplifier functionality.

Show/Hide Alarms and Labels in the Topology Map

You can choose to hide the device name labels and you can hide alarms altogether or you can display alarms of specific severities only.

Step 1 In the left sidebar, choose **Maps** > **Topology Maps** > **Network Topology**.

Step 2 Click the **Show** button in the topology toolbar.

Step 3 Select the items you want displayed in the topology map:

- Labels—Labels associated with devices, such as device names.
- Faults—Deselect the check box to hide fault information altogether. Select the check box to show all alarms or use the slider to show only faults of a certain severity or higher. For more information, see Filter Devices and Links by Alarms, on page 11.

Step 4 Close the Show dialog. Your selections are applied to the topology map.

Filter Devices and Links by Alarms

To view only the devices or links containing alarms and suppress the rest of the devices:

Step 1 In the left sidebar, choose **Maps** > **Topology Maps** > **Network Topology**.

Step 2 Click the **Show** in the topology toolbar and select **Alarms**.

Step 3 Select the check box to show all alarms or use the slider to show alarms of a certain severity or higher.

Step 4 Select **Show only elements with the selected alarms** to view only the devices and links containing alarms.

Step 5 To save and close the Show dialog, click **OK**.

Save Global Preferences for the Map Display

The **Show** button in the map toolbar allows you to choose the items that will be shown in your map display, including device names (labels), device types, link types, alarm severity, and so on.

If you are a Super User or Admin user, you can save your choices as global preferences which will be applied automatically for all new users and which can be loaded by any users on demand. You can also delete global preferences.

Note Any user having Network Topology Edit permission, will be able to save and delete the global preference. You also need to have the Network Topology permission to access the topology maps.

The following items are saved as global preferences:

- Labels on/off
- Device families

- Link types
- Alarm severity
- Bandwidth utilization

To save global preferences for map display:

Step 1 In the left sidebar, choose **Maps > Topology Maps > Network Topology**.

Step 2 Click on the **Device Groups** button, select the required device group(s) and click **Load**.

Step 3 Click **Show** in the topology toolbar and select the items you want to show on the map.

Step 4 Choose **Global Preferences > Save**.

Saved global preferences can be deleted if necessary by clicking **Delete**.

Load Global Preferences for the Map Display

The **Show**button in the map toolbar allows you to choose the items that will be shown in your map display, including device names (labels), device types, link types, alarm severity, and so on.

If global preferences have been defined for the map display, you can load them. You can then make your own changes to the map display as required.

The following items are saved as global preferences:

- Labels on/off
- Device families
- Link types
- Fault severity
- Bandwidth utilization

To load global preferences for map display:

Step 1 In the left sidebar, choose **Maps > Topology Maps > Network Topology**.

Step 2 Click on the **Device Groups** button, select the required device group(s) and click **Load**.

Step 3 Choose **Global Preferences > Load**. This option is disabled if no global preferences have been defined.

Isolate Specific Sections of a Large Topology Map

In cases where a topology map is displaying thousands of devices, you might want to focus on specific devices or sets of devices. The Overview pane shows you the entire topology map in miniature and lets you select the area you want to display in the large topology map. It also provides an at-a-glance view of the alarm status of the elements in the topology map.

Step 1 Click the Overview icon in the topology toolbar. The Overview pane appears in the at the bottom right of the topology map and displays the following:

- Dot—indicates any network element. The color of the dot indicates the severity of alarms associated with the network element.
- Line—indicates a link. The color of the line indicates the severity of the associated alarm.
- Blue rectangle—indicates the selection area. The area within the rectangle is displayed in the map pane. Handles on the corners enable you to resize the selection area.
- Pan mode cursor—cursor displayed within the selection area. Use this cursor to move the selection area, and thereby view different elements in the map pane.
- Zoom mode cursor—displayed outside the selection area. Use this cursor to define a new selection area or to zoom in on an existing selection area.

Step 2 Draw a rectangle by dragging the mouse over the area you want to see in the topology map.

Step 3 Click the 'x' in the upper right corner to close the Overview pane.

Get More Information About Devices

From the topology map, you can drill down to get more information about a device.

Step 1 Click on the required device in the topology map. A popup appears showing basic device information and alarm information for the device.

Step 2 Click **View 360** to access the Device 360 view for detailed information about the device.

For more information, see, Get Basic Device Information: Device 360 View.

Get More Information About Links

Cisco EPN Manager provides a variety of ways that you can view links and get more details about them:

To view link information for:	See the procedures in:
A specific link	Get a Quick Look at a Specific Link: Link 360 View, on page 14
A specific link in a topology map	View a Specific Link in the Topology Map, on page 16
A group in a topology map	View a Device Group's Links in a Network Topology Map, on page 16
All of Cisco EPN Manager	View Link Tables , on page 17

Get a Quick Look at a Specific Link: Link 360 View

The Link 360 view gives you a quick look at the configuration and status of a device's links. Each Link 360 view provides information about the A- and Z-sides of the link (type, direction, capacity, and so forth). Depending on the link and device type, it also provides a wide range of metrics, such as power level, span loss, and bit errors.

You can launch the Link 360 view by clicking the "i" next to a link name in any of the link tables. This includes the tables that are opened by clicking **Links Table** in a topology map, or by choosing **Inventory** > **Other** > **Links**.

The Link 360 view provides general link and performance information at the top of the view, and more detailed link information in tabs in the lower part of the view.

Information Provided in Link 360 View	**Description**
General information	The link name, serviceability status, highest severity alarm, type, direction, capacity, and utilization. Definitions of link serviceability states are provided in Link Serviceability States, on page 15. If the link you are viewing is an OTS or OTU link, you can click the **Utilization** field's *i* (**information**) icon to open the **Used Wavelengths** pop-up window, which lists the optical channels configured on the link and the circuits that are currently using those channels. Auto-Refresh—For real-time updates of status and troubleshooting, enable an on-demand refresh by clicking on the Refresh icon. Alternatively, you can also set the auto-refresh interval to 30 seconds, 1 minute, 2 minutes or 5 minutes from the drop-down list. Auto-Refresh is OFF by default. **Note** The Auto-Refresh setting is applicable only for the currently open 360 view popup window. If the view is closed and reopened or another view is opened, by default Auto-Refresh is Off.
Performance data	Graphs or charts reflecting various aspects of link performance.
Alarms	Current alarms for the link, including their severity, status, the time they were generated, the source of the alarm, and the alarm's ID. Also provides a launch point for the Alarm Browser.
Links	(LAGs only) Status, name, and IP address for the A-side and Z-side port in the Link Aggregation Group.
Endpoints	Devices and interfaces that serve as endpoints for the link. Provides a launch point for the Interface 360 view. For optical devices, this tab also displays the latest recorded power values for transmitted and received signals. **Note** Power values are not normally displayed for manual links. However, if you open the Link 360 view for a manual LMP or OTS link between a Cisco NCS 1000 and 2000 device, the view displays the power values for both endpoints.

Circuit/VCs	(For a circuit/VC that traverses the link) Circuit/VC name, type, customer, status, and creation date. Also provides a launch point for the Circuit/VC 360 view.
SRRGs	Lists the Shared Risk Resource Groups (SRRGs) assigned to the link or to the link endpoint devices. For each listed SRRG, you can see whether it is the default SRRG on the link/device or if it has been assigned to the link/device. For more information about SRRGs, see Manage Shared Risk Resource Groups (SRRGs) in the Geo Map.

Link Serviceability States

Serviceability State	Icon	Description
Admin Down		Link was purposefully shut down by the administrator.
Down		Link is down (but it should not be).
Up		Link is up and traffic is passing through the link.
Auto Up		Link is up because it detected a signal (this state is only supported by optical devices).
Unavailable		Link is not discovered yet or its status is unavailable.
Partial		Link has a mismatch between requests, resources, or resource states. Examples: • Link is processing a request to activate some service resources and deactivate others. • Link has some active and some deactivated resources. • Some link resources are up and others are down. • The state for one of the link's resources is not known.

Compare Link Information and Status

From the **Comparison View**, you can perform a side-by-side comparison of multiple links, viewing information such as raised alarms and the status of associated endpoints, circuits, and VCs. To compare links, do the following:

Step 1 For each link you want to compare:

a) Open its **Link 360** view, as described in Get a Quick Look at a Specific Link: Link 360 View.

b) Choose **Actions** > **Add to Compare**.

The link you selected is displayed at the bottom of the page. You can select a maximum of 4 links.

Step 2 Click **Compare**.

The **Comparison View** opens.

Step 3 From the drop-down list at the top of the view, specify whether the view will show all available information or just the information that is unique to each link.

Step 4 Click **Comparison View**, check the check box for the categories you want the view to display, and then click **Save**.

By default, all of the categories are already selected.

Step 5 Scroll down the page to view the information provided for each category you selected.

Note the following:

- The **Comparison View** only displays information for two links at a time. If you selected more than two, you will need to toggle to the links that are not currently displayed.
- To reorder the links you have selected, click **Rearrange**.
- Each link's **Actions** menu is identical to the one provided in its **Link 360** view. If you select an option, the corresponding page opens.
- You can minimize and maximize the categories displayed, as needed.
- The **Comparison View** is also available for circuits and VCs, devices, and interfaces. Whenever you select any of these elements from their respective 360 view for comparison, they are displayed in the corresponding tab. This allows you to switch between element types, as needed.
- When you are done comparing links, click **Back** at the top of the view and then click **Clear All** at bottom of the page. If tabs for other element types are still displayed, you will need to clear them as well.

View a Specific Link in the Topology Map

You can select a specific link from the following pages and view the link in the topology map:

- Launch the Link 360 view, and then choose **Actions** > **Show in Topology**. For information about how to launch the Link 360 view, see Get a Quick Look at a Specific Link: Link 360 View, on page 14.
- From the links table, select a specific link, and then choose **Actions** > **Show in Topology**. You can access the links table by clicking the Links Table hyperlink under the Links tab in the topology map, or by choosing **Inventory** > **Other** > **Links**.

View a Device Group's Links in a Network Topology Map

Cisco EPN Manager uses the following conventions to represent links in the topology map:

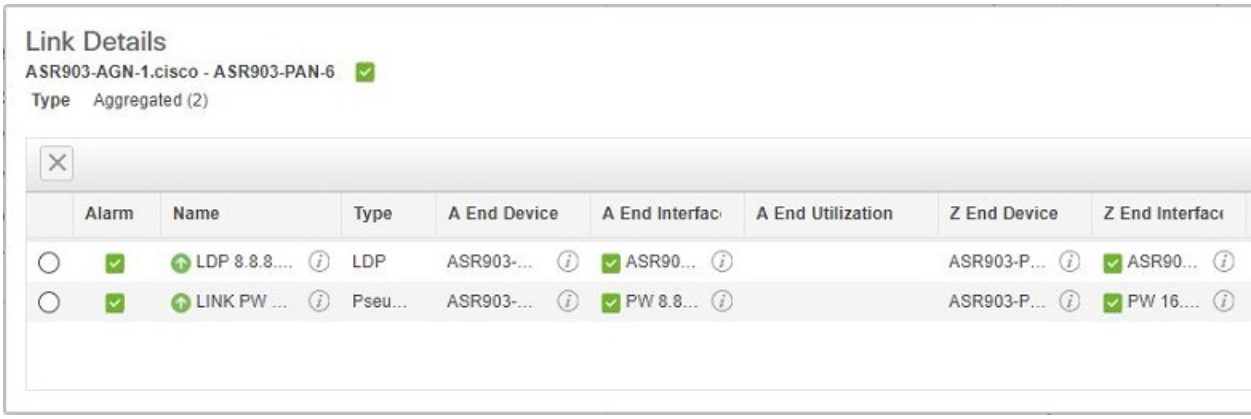
- A solid line represents any type of discovered link between two elements in the topology map.
- A dotted line represents an unmanaged link that was manually drawn in the topology.
- (If enabled in the **Show > Links** menu) A dot-dash line represents an aggregated link.
- If there is a critical alarm on a link, the link will be colored red and the alarm icon will be displayed on the link.
- If an existing link is down and there is no critical alarm on the link, the link will be colored grey and a "?" icon will be displayed on the link. After 6 hours, the link will be removed automatically from the

map but it can be deleted manually from the Links table or from the Link details view before that time if necessary.

If an alarm severity badge is displayed on a link, it represents the most severe alarm that is affecting the link. For aggregated links, it represents the most severe alarm affecting any of the links in the aggregation.

To get more information about links in a topology map:

- Hover over the link with your mouse to display a panel that provides "at-a-glance" useful information about that link, such as the most severe alarms, or bandwidth utilization information for the link, if available. If there are no alarms on the link and there is no bandwidth utilization information, this panel will not be displayed. If there are alarms on the link, you can click the number next to the alarm severity icon to display a table listing only those alarms.
- Click on a link to display a popup window with link information, including link type, the link's A- and Z-side devices and interfaces, and link utilization. For aggregated links, the popup window lists all the underlying links, as in the following example:



View Link Tables

Cisco EPN Manager provides a table that lists all of the links that it is managing. This provides a quick way to locate all links of a specific type or with a name that shares a common string. You can also identify links that have severe alarms, and launch Interface 360 views for view the affected sides.

The table also provides a quick look at link utilization and capacity.

In addition, you can open a table showing links for the current group being displayed in the topology map. This table provides the same information and actions as the table of all links in the system.

Step 1 To display link tables:

- For all links: In the left sidebar, choose **Inventory** > **Other** > **Links**.
- For a selected device group's links: In the left pane of the topology map window, select the Links tab, then click the **Detach** icon in the top right corner or click the Links Table hyperlink at the bottom of the tab. The Links table is displayed in a separate window.

Step 2 From here you can do the following:

- Find specific types of links—for example, Physical, Pseudowire, LAG, ODU, and so forth. Place your mouse cursor in the Type field and select the link type from the drop-down list. You can also find Manual Links in this manner.
- Find links by name by entering text in the Link Name text box. You can also enter a partial string (for example, **3.3.3.3_**).
- Find links with severe alarms by clicking in the Severity text box to display a severity drop-down list, then choosing a severity. You can perform this same procedure from the A-side or Z-side. The table will indicate which side of the link has the more severe alarm, and you can launch an Interface 360 view for both sides.
- See the operational and discovery status of links in the Status column. Links can have an operational status of Up or Down. The discovery status can be one of the following:
  - Pre-provisioned: Managed links that were created manually by a user and were not discovered by the system. These links can be deleted from the system and from the map. Select the link and click the Delete icon.
  - Pre-provisioned-Incomplete: Manually created links that could not be fully discovered.
  - Discovered-Incomplete: Links that could not be fully discovered. These partially discovered links are not shown on the topology map.
  - Unknown: Existing links that are down and therefore can no longer be discovered. These links remain on the topology map for 6 hours but they are colored grey and are identified by an "?" icon on the link. Links with Unknown status can be deleted by selecting the link in the table and clicking the **Delete** button.
- See bandwidth utilization for optical (OTS, OTN, ODU), packet (physical, LAG), and cable (L2TP) links. The Utilization column for each side of the link shows the actual usage data (for example, number of channels for OTS links), the percentage of total capacity used, and the default time period for which utilization is calculated (1 hour). The Capacity column shows the total bandwidth capacity of the link.

  Note To show utilization for packet and cable links, an Interface Health monitoring policy must be created and enabled on the relevant devices. See Set Up Basic Interface Monitoring for more information.

Type	A End ...	A End	A End Utilization	Z End ...	Z End	Z End Utilization	Capacity
Physical	Critical	GigabitEth...	0% (1.2800899e-7 Gbps) 1h	Clea...	GigabitEth...	0% (3.8312794e-7 Gbp	1 Gbps
Physical	Clea...	GigabitEth...	0% (1.574779e-7 Gbps) 1h	Clea...	GigabitEth...	0% (4.6376692e-7 Gbp	1 Gbps
Physical	Clea...	TenGigabi...	0% (0.000044290136 Gbps) 1	Clea...	TenGigabi...	0% (0.00003339692 Gb	10 Gbps
Physical	Clea...	TenGigabi...	0% (0.000071106515 Gbps) 1	Clea...	TenGigabi...	0% (0.00007004112 Gb	10 Gbps
Physical	Clea...	GigabitEth...	0% (3.2127232e-8 Gbps) 1h	Clea...	GigabitEth...	0% (0.0000010210271	1 Gbps
Physical	Clea...	GigabitEth...	0% (6.619419e-8 Gbps) 1h	Clea...	GigabitEth...	0% (1.9693468e-7 Gbp	1 Gbps
Physical	Clea...	TenGigabi...	0.03% (0.002898862 Gbps) 1h	Clea...	TenGigabi...	0.03% (0.0028905713 (	10 Gbps
Physical	Clea...	GigabitEth...	0.05% (0.00047108906 Gbps)	Clea...	GigabitEth...	8.01% (0.08006172 Gbp	1 Gbps
Physical	Clea...	GigabitEth...	0% (8.722009e-8 Gbps) 1h	Clea...	GigabitEth...	0% (6.596751e-8 Gbps)	1 Gbps
Physical	Clea...	GigabitEth...	0% (8.718443e-8 Gbps) 1h	Clea...	GigabitEth...	0% (6.419498e-8 Gbps)	1 Gbps
Physical	Clea...	TenGigabi...	1.25% (0.12529424 Gbps) 1h	Clea...	TenGigabi...	1.09% (0.109484255 Gl	10 Gbps
Physical	Clea...	GigabitEth...	0.03% (0.00029982472 Gbps)	Clea...	GigabitEth...	26.69% (0.2668724 Gbp	1 Gbps
Physical	Clea...	TenGigabi...	0.03% (0.0028978328 Gbps) '	Clea...	TenGigabi...	0.03% (0.0028960628 (	10 Gbps
LAG	Clea...	ASR-9K-...	17.35% (0.34694874 Gbps) 1h	Clea...	ASR920_...	0.04% (0.00077091146	2 Gbps
Physical	Clea...	TenGigabi...	1.1% (0.109563656 Gbps) 1h	Clea...	TenGigabi...	1.24% (0.1243847 Gbps	10 Gbps

- Depending on the link type, perform an action by choosing a link and making a selection from the **Actions** drop-down menu. (For example, for OTS links, you can run an OTDR Scan).

- View a specific link on the topology map by clicking **Actions** > **Network Topology**.

Troubleshoot Link Issues

This section presents suggested solutions for issues you might encounter when working with links.

Link Issue	Possible Cause	Solution
Links that previously existed disappear from the topology map.	The hostname might have been changed on one of the endpoint devices.	1. Delete the device on which the hostname was changed from the system and then add it again. 2. Sync the device and all devices connected to it to make sure that all information is updated.

Show Bandwidth Utilization for Links on the Map

In the topology map and in the geo map, you can enable visualization of how much bandwidth is utilized on optical links (OTS, OTN, and ODU), packet links (physical and LAG), and cable links (L2TP) over which circuits are provisioned. In this way, you can easily identify when a link is over-utilized or approaching over-utilization.

To enable bandwidth utilization, click on the arrow next to the **Bandwidth Utilization** icon in the top right corner of the topology map or the geo map and select the **Utilization** check box. For physical and LAG links, you can select the time frame in which to show the link utilization by clicking the arrow next to the Utilization check box.

When bandwidth utilization is enabled, a thicker link is shown in the map and is colored based on bandwidth utilization thresholds. Click the "?" icon in the Utilization panel at the top right of the map to see the color representations for bandwidth utilization on the supported link types. The thresholds for bandwidth utilization coloring can be set up in Administration > Settings > System Settings > Maps > Bandwidth Utilization. See Define Color Thresholds for Link Bandwidth Utilization, on page 20 .

Bandwidth utilization data is provided in all link-related views, for example, the Link panel that is displayed when you click on a link, Links tables, the Link 360, and so on, even if bandwidth utilization visualization is disabled.

Bandwidth utilization is calculated as follows:

- For OTS links between NCS 2000 devices, link capacity is calculated from the fiber-attributes parameters configurable on the devices. If OTS links are configured to allow SSON circuits (channel number is set to "Nyquist"), capacity is assumed to be 96 channels. Bandwidth utilization is calculated in terms of the number of 50Ghz ITU channels used in relation to the capacity. For SSON circuits the result is approximated because each Carrier NC or Carrier Trail counts as one channel used, regardless of its actual size.

Click on the **i** icon in the Utilization column to display a dialog showing details of exactly which channels are being used and which circuits are using the channels.

Note The dialog shows only50 Ghz ITU wavelengths/frequencies, therefore SSON carrier circuits might not be shown.

- For OTN and ODU links, bandwidth utilization is calculated based on the number of ODU0 timeslots reserved and is represented in gigabits per second.
- For physical and LAG links, bandwidth utilization is calculated from the input and output data rate of the link interfaces. For these link types you can define whether you want to see the average utilization or the peak utilization. You can also specify the time period for which you want to show utilization data - 15 minutes, 1 hour, 6 hours, or 1 day.
- For cable L2TP links, L2TP utilization is calculated for available L2TP tunnels. If L2TP tunnels are present then L2TP link utilization is calculated per RPD by getting the OFDM channels utilization of the associated downstream controller.

Note To show utilization for packet and cable links, an Interface Health monitoring policy must be created and enabled on the relevant devices. See Set Up Basic Interface Monitoring for more information.

Define Color Thresholds for Link Bandwidth Utilization

When bandwidth utilization visualization is enabled, links in the map are colored based on the percentage of total bandwidth currently utilized on the link. See Show Bandwidth Utilization for Links on the Map, on page 19. Default thresholds are defined by the system, however, you can define your own thresholds to determine how bandwidth utilization will be reflected on the links.

To define color thresholds:

Step 1 Select **Administration > Settings > System Settings > Maps > Bandwidth Utilization**.

Step 2 Select the type of link for which you are defining thresholds.

Step 3 In the Link Coloring Thresholds area, define the criteria for coloring the links. Each row defines a color and the bandwidth percentage range that the color will represent. The default thresholds are: Green - 0-25%, Yellow - 26-50%, Orange - 51-75%, and Red - 76-100%.

Note the following:

- A maximum of 4 thresholds can be defined.
- The first threshold must start from zero and the last threshold must end with 100.
- The thresholds must be sequential, meaning that each row's range must follow on from the previous row's range. For example, if the range in row 1 is 0-25%, row 2's range must start with 26%.

Step 4 Click **Save**.

If you enable bandwidth utilization visualization in your map, the links will be colored according to these thresholds.

View Fault Information for Devices and Links

If a device or link has an alarm associated with it, an alarm badge is displayed on the device icon or on the link in the topology map. The color of the alarm badge corresponds with the alarm severity—minor (yellow), major (orange), or critical (red)—and matches the alarms displayed in the Alarm Browser.

For groups, the alarm badge represents the most severe alarm that is currently active for any of the group members.

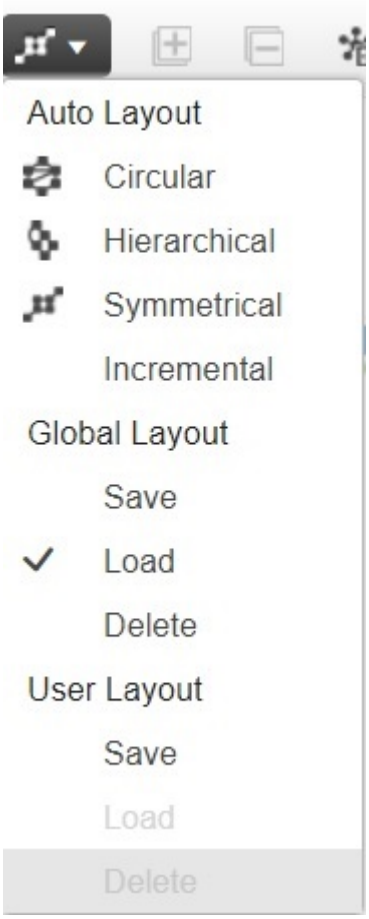
Link-related alarms, such as Link Down, generate an alarm badge on the relevant link in the topology map. After the link up alarm is received, the link alarms and corresponding badges are cleared.

See Alarm Severity Icons for more information.

Change the Layout of a Network Topology Map

When you first open the topology map, it is displayed according to the default global layout. The global layout can be changed by users with network topology "edit" privileges. Any changes you make in the map are maintained for the current browser session only, meaning that when you next open the map, the global layout will be applied. If you want your own map layout to be preserved for future sessions, you can save your layout. Your saved layout overrides the global layout.

Click the **Layout** icon in the topology toolbar to access the layout options.



- A checkmark indicates which layout is currently being used. For example, a checkmark next to "Load" under Global Layout indicates that the global layout is currently being used.
- If you move devices around in the map and you want to save the new layout as the global layout for all users, click **Save** under **Global Layout**. This option is only available for users with network topology "edit" privileges.
- If you move devices around in the map and you want to save your own layout for the next browser session, click **Save** under **User Layout**.
- If the global layout is being used and you want to use your own saved layout, click **Load** under **User Layout**.

You can specify how the devices and other network elements (such as labels, nodes, and the connections between them) are arranged in the topology map by dragging them to the required position in the map or by selecting one of the predefined options:

- Symmetrical (default)—Maintains the symmetry that is inherent in the topology. This ensures that adjacent nodes are closer to each other and prevents node overlapping.
- Circular—Arranges the network elements in a circular style highlighting the clusters inherent in the network topology.

- Hierarchical—Ensures that the dependencies on the relationships and flows between elements are maintained.
- Incremental—Maintains the relative positions of specific elements while adjusting the positions of newly added elements. Use this layout to re-render nodes/links and to clean up overlaps.

Add a Background Image to the Network Topology

A background image can be applied to the topology map for any selected group. This is useful if, for example, you want to group your network according to geographic location. A sub-group can have a different image from its parent group. For example, you could apply a country map to one group and state maps to its sub-groups. Background images are saved per group and per user.

When a background image is applied, zoom functionality is supported and devices maintain their location on the image as you zoom in and zoom out.

The system provides some predefined images that you can select as background images. Alternatively, you can use your own custom background images.

Before you begin

When adding a custom background image, follow these guidelines:

- The background image file must reside on the server in a directory that is covered by high availability (HA), meaning that it will be moved to the secondary server in the case of primary server failure.
- Images should be in .png or .jpg format (.png is recommended).
- The file size should be as small as possible because the time taken to render the map is directly proportional to the size of the image.

Step 1 In the left sidebar, choose **Maps** > **Topology Maps** > **Network Topology**.

Step 2 In the Network Topology window, click the **Add Background Image** icon in the topology toolbar. The Manage Group Background Image dialog opens.

Step 3 Choose the required group from the Select Group drop-down list.

Step 4 Choose **Predefined** or **Custom Image** from the Background Image drop-down list.

Step 5 For a custom image, click **Select Image** , navigate to the image file and double-click it. For a predefined image, select one of the displayed images.

Step 6 Click **Apply**.

Step 7 In the topology map, arrange the devices as required (devices are arranged randomly on the map).

Step 8 Save the new layout by choosing **Layout** > **Save Current Layout**.

Visualize and Trace Circuits/VCs

When working with circuits/VCs, it is very useful to see how a circuit/VC is deployed within the existing network topology. Cisco EPN Manager overlays the circuit/VC on an existing topology map, clearly indicating the endpoints and midpoints of the circuit/VC, the role of the endpoint (where relevant), and relevant fault information for the circuit/VC. If the selected group does not contain all the devices participating in the

circuit/VC, a popup is displayed asking if you want to switch groups to show the full overlay. See View and Manage Discovered/Provisioned Circuits/VCs for more information.

Display Routes of a Circuit

For optical and CEM circuits, MPLS-TE, and SR-TE services, you can display routes associated with a specific circuit.

To do this use the **Routes** drop-down menu in the topology toolbar. The Routes menu calculates the routes from the links within a service. You can also see more data about the circuit routes. For example, the working path is represented with a 'W' label and the Protected path with a 'P' label on the links. See Display the Routes Associated With a Circuit.

For Optical Channel (OCH) circuits, you can launch the Chassis View of a participating device and view the end-to-end physical route of the circuit. To do this, choose an OCH circuit for which you want to view the physical route. From the map, click any of the participating device to launch the Chassis View.

The Chassis View displays the physical routes of the circuit. The internal connections between the ports of the same card are displayed as dotted lines. Use the eye icon in the Chassis View to show or hide the physical routes, power levels, and span loss.

Note You can launch the Chassis view of participating device only in case of OCH circuits. This feature is not supported for other types of circuits or services.

Trace and Visualize the Full Route of a Circuit

You can do a full multi-layer trace of a circuit from the Network Topology window. See Trace and Visualize the Full Route of Circuits/VCs for more information.

Show Clock Synchronization Networks on a Network Topology Map

If Synchronous Ethernet (Sync-E) or Precision Time Protocol (PTP) clock synchronization is configured on the devices in your network, you can visualize the clock synchronization network on the topology map.

- The Sync-E overlay shows the topology and hierarchy of the sync-E network, including the primary clock and the primary and secondary clock inputs for each device. This allows the clock signal to be traced from any Sync-E enabled device to the primary clock or from the primary clock to a Sync-E enabled device.
- The PTP overlay shows the clock synchronization tree topology, the PTP hierarchy, and the clock role of each device in the tree - primary, boundary, subordinate, or transparent.

Step 1 In the left sidebar, choose **Maps** > **Topology Maps** > **Network Topology**.

Step 2 Click on the **Device Groups** button, select the required device group(s), and click **Load**.

Step 3 Click **Show** in the topology toolbar and choose **Technology**. Click the question mark icon for a description of what will be displayed on the map for each technology.

Step 4 Select the required technology and click **OK**.

The clock synchronization network is shown as an overlay over the existing network in the map. The legend at the bottom right explains the notations used in the map for the selected technology.

Note If you select a different device group, the technology overlay will be removed.

Show Routing Networks on the Topology Map

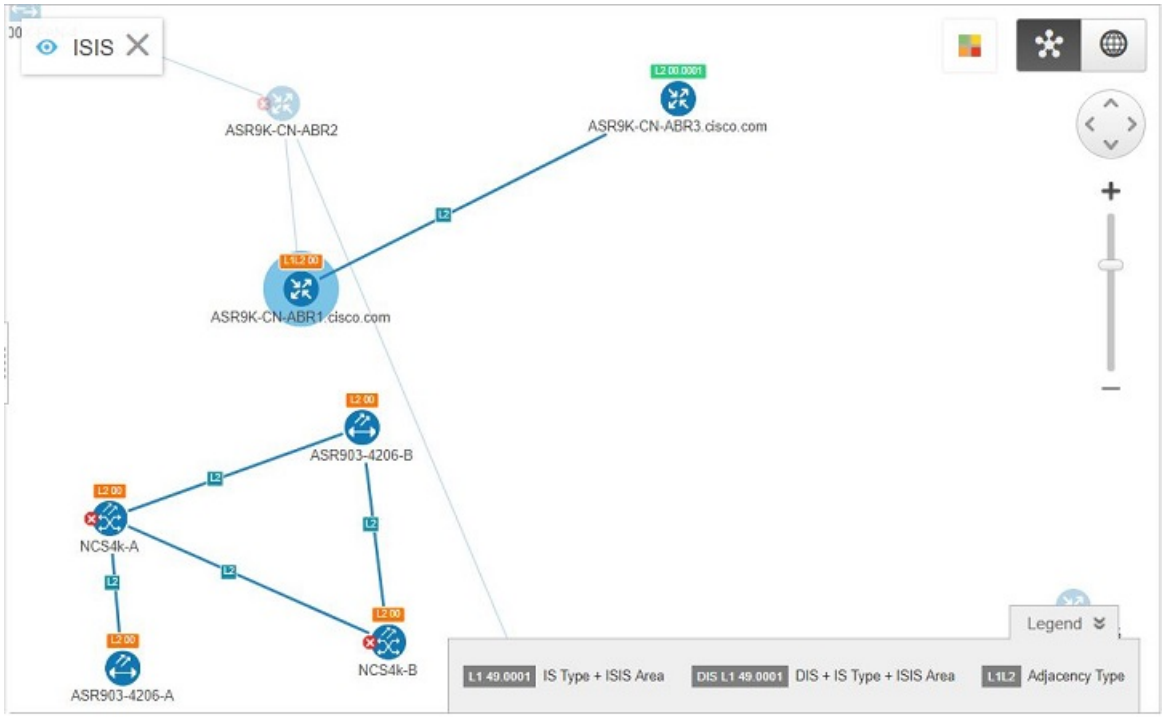
Routing protocols used in your network can be graphically represented as an overlay on the topology map. Overlay of the following routing protocols is supported:

- OSPF:
  - The OSPF overlay shows the different OSPF domains in the network and the links between them, which are labeled as inter-area OSPF links. The overlay shows the OSPF area ID to which each link belongs and the role of each router, for example, Area Border Router (ABR), Designated Router (DR), and so on.
  - OSPF overlay is supported on devices running IOS-XE (ASR 90x, ASR 920, and NCS 42xx devices) as well as devices running IOS-XR (ASR 9000, NCS 4000 devices). OSPF overlay is also supported on XR-XE cross-platform devices.
- BGP:
  - The BGP overlay labels each device with the ID of the autonomous system to which it belongs and shows the links within and between autonomous systems.
  - If two connected routers belong to the same autonomous system, the link is an internal BGP link. If they belong to different autonomous systems, the link is marked as an external link.
  - Each unique autonomous system has a different color so that you can easily identify devices belonging to the same AS.
  - The overlay also marks the devices that serve as route reflectors or route clients.
  - BGP overlay is supported on ASR 920, ASR 901, ASR 901_10G, NCS 42xx and ASR 9000 devices.
- ISIS:
  - The ISIS overlay shows the devices (Intermediate Systems - IS) running ISIS as the Interior Gateway Protocol (IGP). Above these devices, you will see a notation that indicates the IS type, the area ID which identifies the different ISIS domains, and an indication if the device is a Designated Intermediate System (DIS). The notation shows the first 6 bytes of the NET address. Hovering over the notation displays a tooltip containing the complete NET address and the process ID.
  - The IS type can be L1 for intra-area routing, L2 for routing between areas, or L1L2 for both intra- and inter-area routing.
  - Each ISIS domain is represented in a different color.

- A notation on the links in the ISIS network indicates the ISIS adjacency. For aggregated links where multiple adjacency types exist, multiple adjacency type notations will be shown on the link.
- ISIS overlay is supported on devices running IOS-XE (ASR 903, ASR 907, and NCS 42xx devices) as well as devices running IOS-XR (ASR 9000, NCS 4000 devices).

Note DIS indication is presented on the device level and not in the context of a specific IS level.

Following is an example of an ISIS overlay in the map:



To show a technology overlay in the map:

Step 1 In the left sidebar, choose **Maps** > **Topology Maps** > **Network Topology**.

Step 2 Click on the **Device Groups** button, select the required device group(s), and click **Load**.

Step 3 Click **Show** in the topology toolbar and choose **Links**. Make sure that the map is showing the relevant types of link, for example, ISIS links, BGP links, OMS links. In addition, if Bandwidth Utilization is enabled, disable it.

Step 4 Click **Show** in the topology toolbar and choose **Technology**. Click the question mark icon for a description of what will be displayed on the map for each technology.

Step 5 Select the required routing protocol and click **OK**.

The routing network is shown as an overlay over the existing network in the map. The legend at the bottom right explains the notations used in the map for the selected technology.

Note If you select a different device group, the technology overlay will be removed.

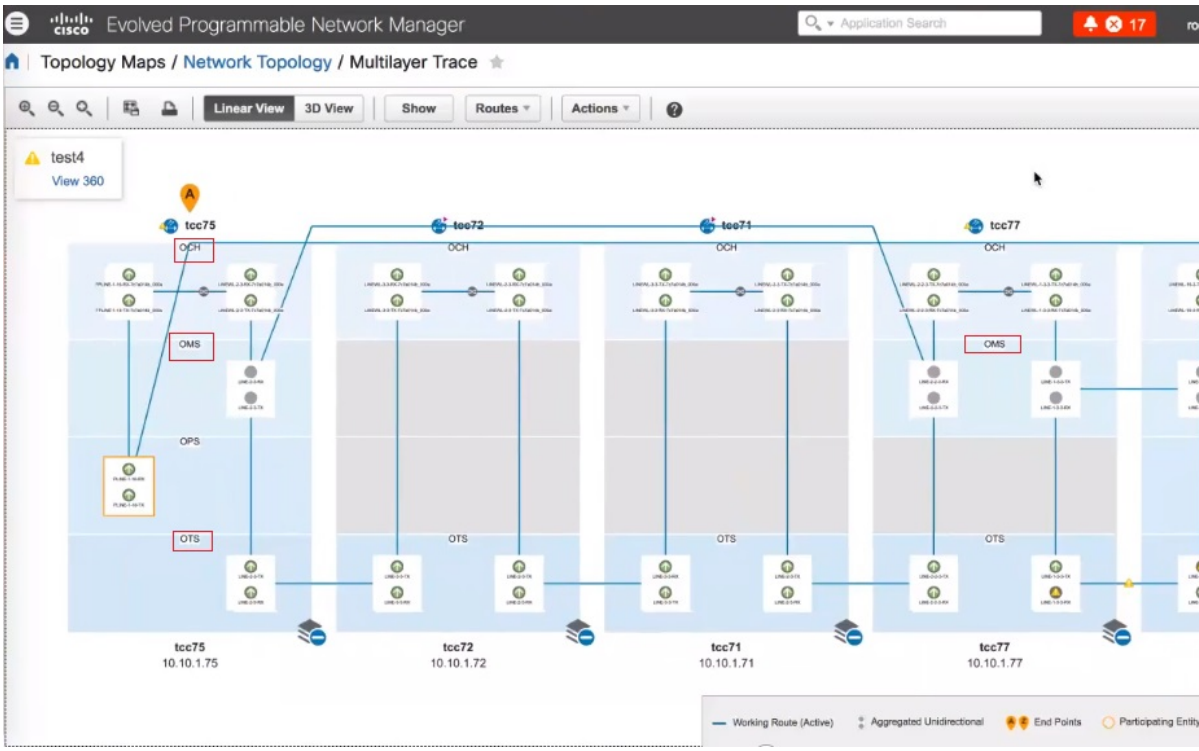
View OMS Links

In EPNM, view the auto discovered OMS links for ROADM devices that are connected by means of sequence of OTS links. You can view the multitrace view of the OMS links, Circuit/VCs 360* view, and the characteristics of OMS links and alarm link layers of OMS.

To view the multitrace view of OMS links:

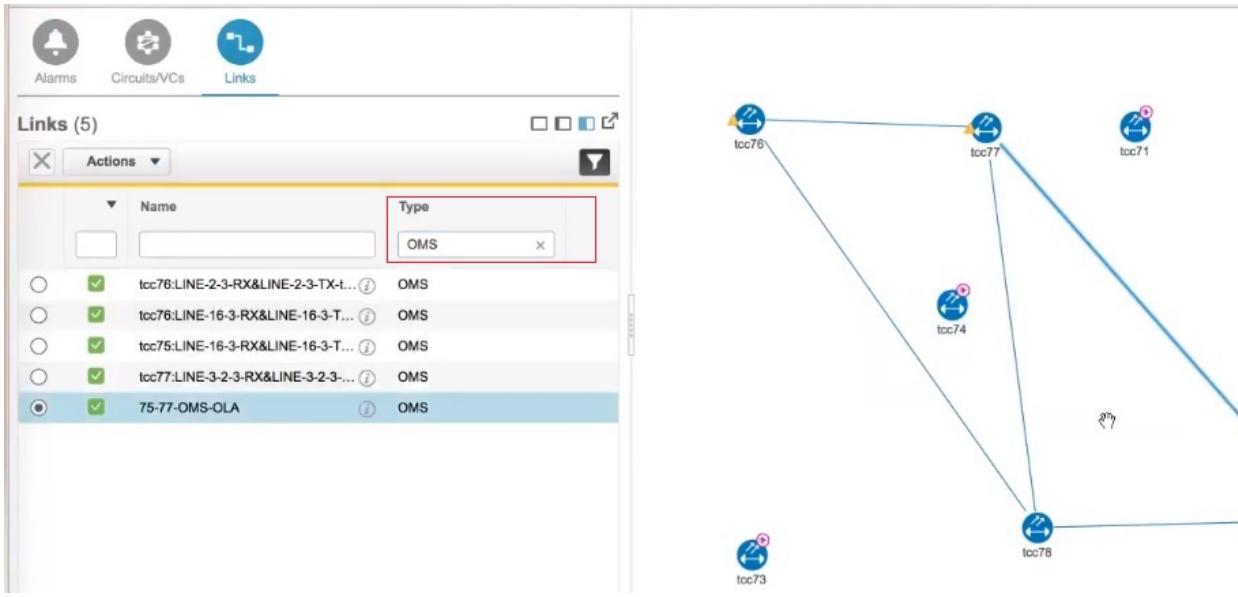
- Choose **Maps** > **Topology Maps** > **Network Topology**.
- Click **Circuit/VCs**, choose the device then click the **Multilayer Trace** link to view the connected links. For example, the following image shows the multitrace view of OMS links along with OCH and OPS link layers.

Figure 1: Multilayer Trace View



Use the **Type** filter to select and view only the OMS link and its network .

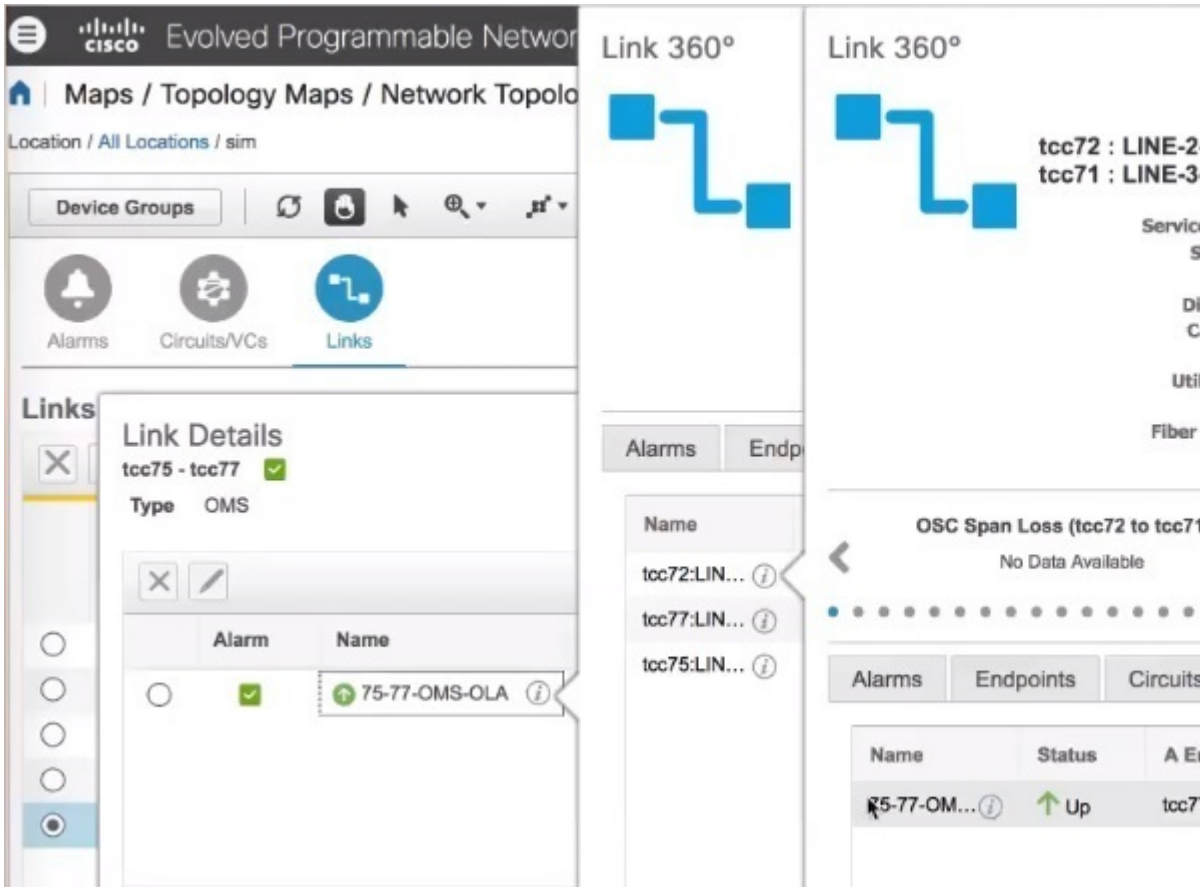
Figure 2: Choose OMS from Type Filter



To view the characteristics of the OMS link:

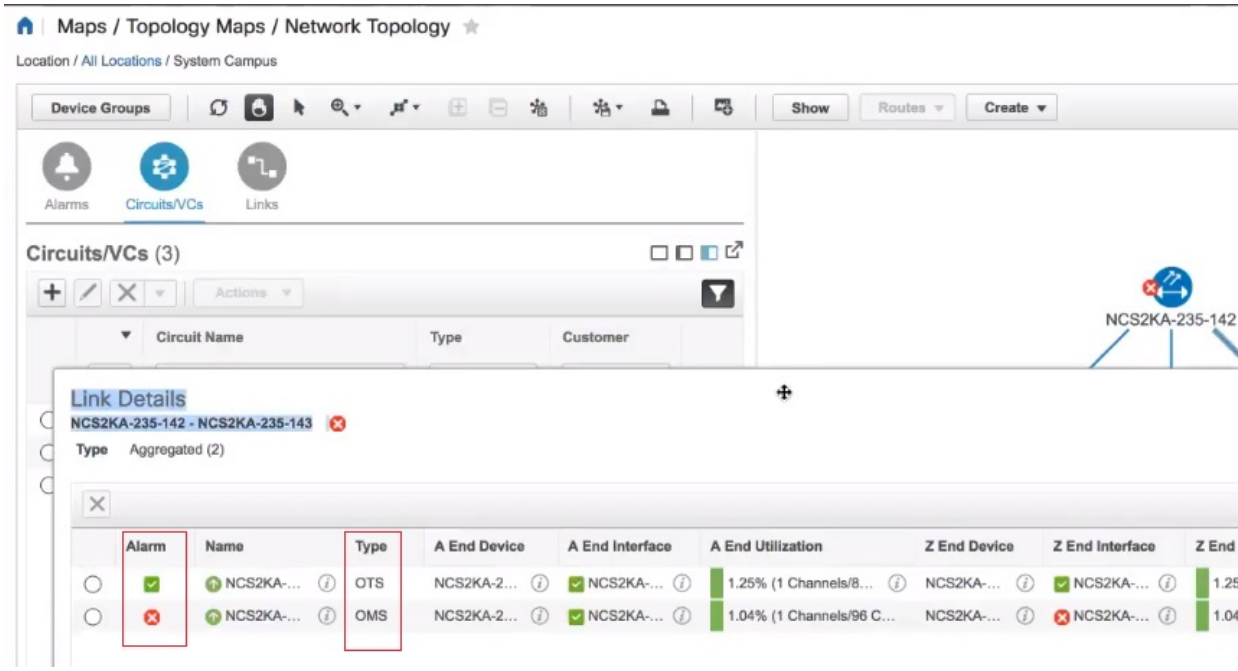
- Click the **Show** button and view where the OMS link is used in the **Link Details** dialog box. For the selected OMS link type , view the endpoints , the planned circuit VCs, if any and the sequence of OTS link details.

Figure 3: Link Details and Link 360 View*



- Click the *i* icon next to the OTS link name to view the Link 360* view of the OMS link type.
- View the alarm link layers for OMS links.

Figure 4: Link Details with Alarms



Locate the SR Path Between Devices on the Topology Map

To find the the active SR paths between SR supported devices on the topology map:

Step 1 Click on the SR supported device from which you want to find the SR path. A popup appears showing the basic device information and alarm information for the device.

Step 2 Click **Show SR Path**. The Show SR Path dialog opens.

Step 3 To select the endpoint, click on the SR supported device to which you want to find the SR path. The endpoint field gets populated with the details of the selected device.

Note Error message is displayed if the selected device does not support segmented routing.

You can also select a device by entering the device name in the field or selecting it from the drop down list.

Step 4 Click **OK**. The SR path gets highlighted on the topology map for the selected devices.

Save the Topology Map as an Image File

You can save the entire topology map or selected objects from the topology map as an image file. This will enable you to store copies of the topology map in a specific state which you can use as a point of reference in the future when multiple changes are made to the topology.

To save the topology map as an image file:

Step 1 Choose **Maps** > **Topology Maps** > **Network Topology**.
Step 2 Click on the **Device Groups** button, select the required device group(s), and click **Load**.
Step 3 Make content and layout changes to the topology map as required.
Step 4 Click the Save Image icon in the topology toolbar.
Step 5 From the **Save Image** drop down list, select the file type of the image being saved.
The image is saved in your local Temp folder.

View Your Network on a Geographical Map (Geo Map)

- Geo Map Overview, on page 31
- Geo Map Setup, on page 33
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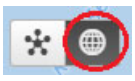
Geo Map Overview

The geo map enables you to position your network devices on a world map and monitor them within their geographical context. The displayed world map is either imported by accessing the map provider's site over the Internet (online mode) or from locally installed map resources (offline mode).

Note When working with the geo map in online mode, a connection to the Internet is required from each client or from the Cisco EPN Manager server if it is being used as a proxy.

The geo map is accessed via the topology map. To open the geo map:

Step 1 In the left sidebar, select **Maps** > **Topology Maps** > **Network Topology**
Step 2 Click on the Geographical Map toggle button in the top right corner of the map.



About the geo map:

- You can switch back and forth between the topology map and the geo map using the toggle buttons in the top right corner of the map.
- The geo map displays devices for which GPS coordinates have been defined. Devices that do not have GPS coordinates do not appear on the geo map and are called “unmapped devices.” See Place Unmapped Devices on the Geo Map, on page 34.
- You can click on a device in the geo map to see alarms, basic information, location coordinates and civic location (if it has been defined for the device).
- For optical devices that support GPS location configuration (NCS 2000 devices), any change that is made to the device's location in the geo map is synched with the device and vice versa (location changes made on the device itself will be reflected in the geo map).
- GPS coordinates are shown in DMM format (degrees and decimal minutes) but users can define GPS coordinates in DMM, DD (Decimal Degrees), or DMS (Degrees, Minutes, and Seconds) formats.
- If there are no devices on the geo map, the full world map is shown. If there are devices in a specific area, only that area of the world will be shown. The geo map shows only the portion of the world map that contains devices.
- As in the topology map, the geo map shows the devices in the selected device group. The device group selection is synchronized between the topology map and the geo map such that if you change the selection in one map, it will change in the other map as well.
- If there is a device group that has a defined geographical location within the selected device group it will be represented in the geo map with a device group icon. If the device group does not have a geographical location, its contained devices will be shown individually in the geo map. See Device Groups in the Geo Map, on page 32 for more information.
- The geo map groups devices that are close to one another geographically in clusters, represented by a cluster icon with a number indicating the number of devices in the cluster. Zoom in to see the individual devices. See Identify the Members of a Cluster, on page 36.
- As in the topology map, you can show a circuit/VC in the geo map. However, when initiating provisioning actions such as creating a circuit/VC or modifying a circuit/VC, the view will switch to the topology map.

Device Groups in the Geo Map

In addition to individual devices, the geo map shows device groups that have a defined location, for example, devices in a building at a specific address.

Take the following into consideration when viewing groups in the geo map:

- Only location-type device groups can be shown in the geo map, and they are only visible if they have a defined geographical location. The location is defined in the device group properties. To create or edit a location device group and define the geographical location of the group, go to **Inventory > Group Management > Network Device Groups**. See Create Location Groups for more information.
- Group members inherit the location of the group.
- If a group's location is the same as other devices/groups, it will be included in a cluster. The number displayed on the cluster icon represents the total number of devices in the cluster (including devices contained in groups).
- If there are alarms on any of the devices within a group, the highest severity alarm icon will be displayed on the device group icon.

- Click on the location group icon to see a panel containing information about the group, including its name, GPS coordinates, and alarm information. If civic location information is defined for the group, it will also be shown in this panel. Click on the **Show Members** link in the panel to show a list of the devices and sub-groups that belong to the group. Alternatively, double-click on the location group icon to achieve the same results.
- If a group member device is given a geographical location, the device will be shown on the geo map as an individual device and alarms will be shown on the device itself, not on the group. It is preferable to have all devices in a geographical location group inherit the GPS coordinates of the group in order to retain the significance of the group's location.

Geo Map Setup

The system is set up by default to get the map tiles from a specific Mapbox URL through a direct Internet connection from the client or via the EPN Manager server which acts as a proxy. If required, you can use a different map tiles provider by providing a specific URL. Both of these options require an Internet connection. If you do not have an Internet connection, you can install the map resources locally and specify that you want the system to use the local map resources, which means that you are effectively working in offline mode.

The geo map setup can be managed in the System Settings. In the left navigation pane, select **Administration** > **Settings** > **System Settings** > **Maps** > **Network Topology**.

In the Network Topology page, you can do the following:

- Enable/disable the geo map. By default, geo map is enabled, meaning that all clients will have the geo map functionality. You can deselect the **Enable geo map** checkbox to disable the functionality.
- Identify the source for the map tiles (using an Internet connection). The default map tiles provider is Mapbox. If you are working with another map tiles provider, you need to provide the URL for map tiles access. Be sure to request the exact format of this URL from the map tiles provider. Select **Custom** in the Map Provider dropdown list and enter the URL. Note that the geo map functionality has not been tested with map tiles from providers other than Mapbox.
- Make the Cisco EPN Manager server a proxy for accessing the Internet to retrieve the map tiles. For security reasons, you might not want direct Internet access from each client. If you enable the **Via management application proxy** check box, Internet access to the map provider URL is via the Cisco EPN Manager server, not directly via the clients.
- Specify that you want to display the geo map using installed map resources that do not require a connection to the Internet. Select **Installed Map Resources** in the Map Provider dropdown list. Refer to the Cisco Evolved Programmable Network Manager Installation Guide for instructions on how to install the map resources.

Identify Which Devices are not Showing on the Geo Map (Unmapped Devices)

For any selected device group, only the devices that are defined with GPS coordinates will automatically be shown on the geo map. When you switch to the geo map or when you select a different device group, a popup message will indicate how many unmapped devices there are, meaning how many devices that do not have coordinates and therefore do not appear on the map.

To identify which devices are not being shown on the geo map, click the **Unmapped Devices** button above the map.

Place Unmapped Devices on the Geo Map

You can either drag and drop unmapped devices onto the required location on the geo map or you can specify the GPS coordinates to define the device's location on the geo map.

GPS coordinates can be specified in any of the following formats:

- Degrees and decimal minutes (DMM): 41 24.2028, 2 10.4418
- Decimal degrees (DD): 41.40338, 2.17403
- Degrees, minutes, and seconds (DMS): 41°24'12.2""N 2°10'26.5""E

Note When using DMS format, please use a double quotation mark ("") to indicate the seconds.

To place unmapped devices on the geo map:

Step 1 In the left sidebar, select **Maps** > **Topology Maps** > **Network Topology**

Step 2 Click on the Geographical Map toggle button in the top right corner of the map.

Step 3 Click the Unmapped Devices button above the map.

Step 4 In the Unmapped Devices panel on the right, either:

a) Drag and drop a device onto the map or select multiple devices and drag and drop them onto the map.

b) Select the device(s) you want to place on the map and click **Set Location**. In the displayed dialog, specify the GPS coordinates, for example, Latitude 59.623325, Longitude-103.535156. Click **Place Device**.

Note If you select multiple devices, they will be consolidated into a cluster and placed on the same location on the map. The cluster icon indicates how many devices the cluster contains.

Change the Location of a Device on the Geo Map

To move a device to a different location on the geo map, you need to open the Edit Location dialog and then either drag the device to the required location on the map or set the coordinates manually. If the device is in a cluster, you must open the cluster to view the devices and then change the location of the device.

GPS coordinates can be specified in any of the following formats:

- Degrees and decimal minutes (DMM): 41 24.2028, 2 10.4418
- Decimal degrees (DD): 41.40338, 2.17403
- Degrees, minutes, and seconds (DMS): 41°24'12.2""N 2°10'26.5""E

Note When using DMS format, please use a double quotation mark ("") to indicate the seconds.

To change the location of a device:

Step 1 Click on the device on the geo map. A popup appears showing basic device information and alarm information for the device.

Step 2 From the **Actions** drop-down list, select **Edit Location**. The Edit Location dialog opens.

Step 3 Drag the device to the required location or change the GPS coordinates as required.

Step 4 Click **Save**.

Change the Location of a Device in a Cluster

Devices that are very close to each other in location are grouped in a cluster on the geo map. You can change the location of one or more of the devices in the cluster. The device will be removed from the cluster and will appear on the geo map as an individual device.

To change the location of a device in a cluster:

Step 1 Click on the cluster in the geo map. A popup appears showing basic information for the cluster.

Step 2 Click **Show Devices**. A panel is displayed to the right of the map and lists all the devices in the cluster.

Step 3 In the panel on the right, either:

a) Drag and drop a device onto the map or select multiple devices and drag and drop them onto the map.

b) Select the device(s) you want to place on the map and click **Set Location**. In the displayed dialog, specify the GPS coordinates, for example, Latitude 59.623325, Longitude-103.535156. Click **Place Device**.

The device(s) will be removed from the cluster and placed in the specified location on the map.

Remove a Device from the Geo Map

If you no longer want to display a device on the geo map, you can remove it. The removed device will appear in the Unmapped Devices list.

To remove a device from the geo map:

Step 1 Click on the device on the geo map. A popup appears showing basic device information and alarm information for the device.

Step 2 From the **Actions** drop-down list, select **Edit Location**. The Edit Location dialog opens.

Step 3 In the Edit Location dialog, click **Remove Location**.

Remove a Clustered Device from the Geo Map

Devices within clusters can be removed from the geo map. You can remove an individual clustered device or you can remove multiple devices in the same cluster at one time. The removed device(s) will appear in the Unmapped Devices list.

To remove clustered devices from the geo map:

Step 1 Click on the cluster containing the device(s) you want to remove. A popup appears showing basic device information and alarm information for the device.

Step 2 Click **Show Devices**. A list of the devices contained in the cluster is displayed.

Step 3 Select the device(s) you want to remove.

Step 4 Click **Set Location**.

Step 5 In the displayed dialog, click **Remove Location**.

Step 6 Click **Yes** in the warning message informing you that the devices will be moved to the Unmapped Devices list.

Identify the Members of a Cluster

A cluster is formed when two or more devices or device groups are located close to one another on the map. The cluster is represented on the geo map by a circle with a number in its center, indicating the number of devices in the cluster (including individual devices and devices within groups). Zoom in to see the individual cluster members on the map.

Note If cluster members are very close to each other (approximately 8 meters apart or less), zooming in will not show the individual devices/groups. Follow the procedure below to see the individual members of the cluster.

To see a list of the devices/groups in a cluster:

Step 1 Click on the cluster icon.

Step 2 In the displayed popup, click **Show Members**. The devices or device groups contained in the cluster are listed in the panel to the right of the map. If the cluster contains groups, you can drill down to see the devices in the group. Use the navigation links at the top of the dialog to return to the previous list.

Step 3 You can change the location of a device by dragging it from the list onto the map or by clicking **Set Manually** and specifying new coordinates.

Search for a Specific Location in the Geo Map

You can search for a specific location in the geo map, for example, a state, country, town, or a specific address. If you enter a keyword in the search box, the results will show all locations that contain that keyword, down to the level of a specific street. You can then select the required location in the search results to pinpoint it in the map.

Note Internet connectivity is required to perform this location search.

To search for a specific location in the geo map:

Step 1 Click the **Search** icon in the toolbar.

Step 2 Type the full or partial result in the search text box and press **Enter**.
The Address tab in the search results panel lists locations that match your search.

Step 3 Select a location in the search results.
The map pans and zooms to the specified location and a marker on the map indicates the exact location.

Location Filter in the Geo Map

To use the location filter in the geo map:

Step 1 Go to the **Map** > **Topology Maps** > **Network Topology**, click the **Show** button and select **Location**.

Step 2 In the **Location** pop-up window, check the **Enable Filter** option. Specify values for any of the following fields:

- *Civic location*: any civic location, regardless of the location the device.
- *Latitude/Longitude*: location coordinates (you can also click on the map, and the values are automatically populated)
- *Location by Device name*: name of the device (from the list of devices currently displayed in Geo Map.

Step 3 Specify value for the **radius**, and all devices within the prescribed search area are displayed.

Step 4 Once completed, click **Save**.

View Link Layers in the Geo Map

In the geo map, you can see a three-dimensional view of the links in your network, separated by link type.

Click the Link Layers icon on the right to access the 3D link layers view. Click the icon again to return to the full geo map.

The 3D link layers view consists of up to three separate layers. The lower layer shows the geo map with all its links and devices. The two upper layers show links of a specific link type category (e.g., physical layer, control plane, and so on), together with the relevant devices. The layers shown in the 3D link layers view correspond with the link type categories currently selected for display in the link filter (click the Filter icon in the toolbar and select Link Types).

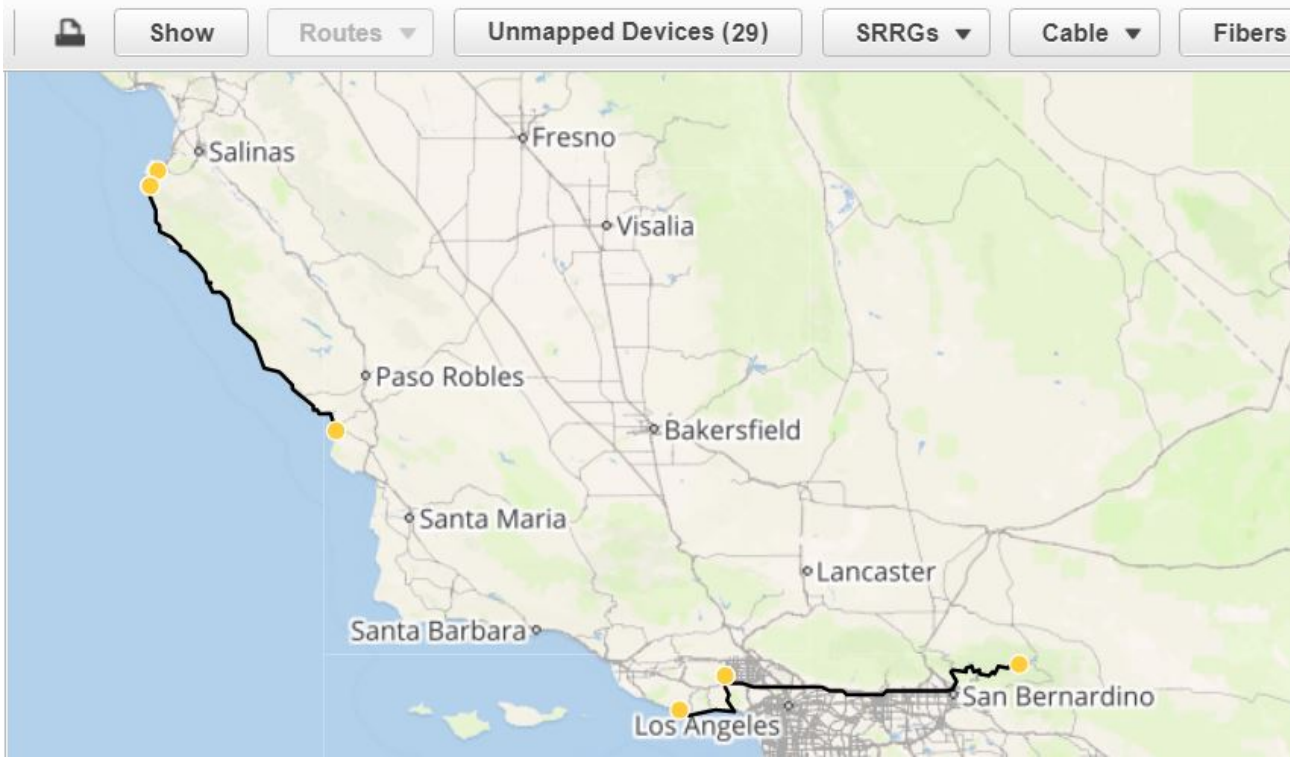
Note Several operations such as pan, zoom, filter, and search are not available in the 3D link layers view.

View and Manage Optical Fiber Paths in the Geo Map

To view optical fibers in the geo map, you must create a KML file with the location data for the fibers and import it into Cisco EPN Manager. For information about importing fiber location data, see Import Location Data from a KML File, on page 40.

After you import a KML file that contains fiber location data, the fibers are shown on the geo map. If you do not want to see them on the map, go to **Show** > **Links** and deselect **Fiber** under Physical Layer links.

Optical fibers are represented as follows in the geo map:



See Manage Fiber Paths, on page 38 and Associate Links to Fibers, on page 39 for information about editing/deleting fibers and associating fibers to links.

Manage Fiber Paths

Fiber paths that are displayed in the geo map can be edited, deleted, or associated to links in the Fiber Management dialog. Click the **Fibers** button in the geo map toolbar to open the Fiber Management dialog.

Note the following:

- The Fiber Management dialog lists fibers that are currently visible in the map only. If you cannot see the fibers in the geo map, they will not appear in the Fiber Management dialog. Set up your geo map so that the fibers you want to manage are being displayed.
- When you select a fiber in the Fiber Management dialog, the selected fiber is highlighted in purple in the geo map. If the fiber is associated with a link, the link will also be highlighted in purple in the map. When you click on a fiber in the geo map, the fiber is selected in the Fiber Management dialog.
- To show additional details about a specific fiber, click the arrow next to the fiber name to show the fiber description.
- You can edit the fiber name, length (in km), and description. To edit a fiber, select it in the list and click the **Edit** button. Click **Save** when you have completed your edits.
- To delete fibers, select the required fibers and click the **Delete** button.

- The Associated Link column shows the link to which the fiber is associated (if any). You can disassociate the link if necessary by selecting the fiber and clicking the Remove Fiber to Link Association icon above the table. See Associate Links to Fibers, on page 39 for more information.

Associate Links to Fibers

A fiber can be associated to an OTN or OTS link so that you can visualize both the fiber and its associated link on the map. To associate a fiber to a link, you must populate a KML file with the necessary information and then import the KML file into the system.

A KML template that outlines the format for providing fiber-link associations can be downloaded and then imported after you have added the required information.

To associate a link to a fiber:

Step 1 Download the KML template that contains the correct KML format and instructions for fiber-link associations:

- Click the **Import** icon in the geo map toolbar and choose **KML**.
- Download the KML template by clicking the link at the bottom of the displayed dialog.
- In the KML file, locate the folder called "Links association info". This folder contains the format and instructions for creating a fiber-link association.

Step 2 Enter the required information in the KML file, save it, and then import it into the system. See Import Location Data from a KML File, on page 40.

Step 3 In the geo map, check that your fibers are displayed, then click on **Fibers** in the toolbar. In the Fiber Management dialog, the links should show up in the Associated Links column. You can remove the link association by selecting the fiber and clicking the Remove Fiber to Link Association icon above the table.

Visualize Circuits/VCs on the Geo Map

The circuit/VC overlay functionality in the geo map is very similar to overlay in the topology map. However, because of some differences in the functioning of the maps, a few items regarding overlay functionality in the geo map need to be noted:

- To overlay a circuit on the geo map, select the circuit/VC in the Circuits/VCs tab on the left, as you would in the topology map.
- Select the **Show Participating Devices Only** check box to remove all devices from the map except for those participating in the selected circuit/VC.
- Click the **Participating Devices** link to show a list of all the devices participating in the circuit/VC. The list shows the role of the devices, for example, A-side and Z-side, and you can change the location of the devices or remove them from the map.
- If a participating device is in a cluster on the geo map, the badge denoting the role of the device is shown on the cluster icon. Zoom in to see the individual devices so that you can see exactly which device the role badge is marking. Alternatively, click on the **Participating Devices** link to see all the devices and their roles in the circuit/VC.

- If some of the participating devices are not currently displayed on the map, a message will be displayed and will enable you to open the list of unmapped devices. You can place them on the map by dragging and dropping the devices or click **Set Location** and enter their GPS coordinates.

Locate the SR Path Between Devices on the Geo Map

To find the the active SR paths between devices on the geo map:

Step 1 Click on the SR supported device from which you want to find the SR path. A popup appears showing the basic device information and alarm information for the device.

Step 2 From the **Actions** drop-down list, select **Show SR Path**. The Show SR Path dialog opens.

Step 3 To select the endpoint, click on the SR supported device to which you want to find the SR path. The endpoint field gets populated with the details of the selected device.

Note Error message is displayed if the selected device does not support segmented routing.

You can also select a device by entering the device name in the field or selecting it from the drop down list.

Step 4 Click **OK**. The SR path gets highlighted on the geo map for the selected devices.

Import Location Data

In addition to manually placing devices on the geo map, you can specify the coordinates of devices or fibers in an external file and then import the file. The system reads the coordinates from the file and places the devices/fibers on the map. This is useful for locating items on the map in bulk or for transferring location data from another system. You can also export your existing locations from the geo map, make changes, and then import the data back into the system.

You can import device and fiber path locations and manually-created managed links from a KML file.

For the KML file format you can download a template from the GUI which will guide you on the format in which you need to enter the information so that the system can read it. To download the template, click on the Import Locations icon above the geo map, and click on the template link.

See Import Location Data from a KML File, on page 40 for more information.

Import Location Data from a KML File

Keyhole Markup Language (KML) is a file format used to display geographic data in two- or three-dimensional maps or in Earth browsers like Google Earth. KML is based on the XML standard and uses a tag-based structure with nested elements and attributes. You can create a KML file with your device and fiber path location data and import it in order to place your devices and fibers on the geo map. The following location data can be included in the KML file:

- Device location data
- Fiber location data
- Fiber to link associations

- Manually-created managed links. After import, the managed links will be displayed in the topology map and in the geo map (if both endpoints of the managed link are "mapped" in the geo map).

A template is provided to guide you as to the required format in which to enter information within the KML file.

Note Coordinates must be entered in Decimal degrees (DD) format, for example, 41.40338, 2.17403.

Following is an example of the KML format for device locations:

```
<Placemark>
 <name>454A-234-157</name>
 <Point>
  <coordinates> -121.930938,37.411522</coordinates>
 </Point>
 <ExtendedData>
  <Data namename="nodeIpAddress">
   <value>10.56.23.47</value>
  </Data>
 </ExtendedData>
</Placemark>
```

Following is an example of the KML format for fiber paths:

```
<Placemark>
 <name>Fiber-1</name>
 <description>Fiber-1 long description</description>
 <LineString>
  <coordinates> -121.930938,37.411522,0.0 -121.931405,37.413011,0.0 -121.929364,37.413588,0.0
 -121.930973,37.414602,0.0
  </coordinates>
 <LineString>
</Placemark>
```

Following is an example of the KML format for fiber-link associations, where you must:

- Define one link association per folder, with the name "linkAssociation".
- Specify the segments of the fiber in the sequence that follows the A to Z path of the link to be associated.
- Specify the IP address of the A and Z sides of the link to be associated.

```
<Folder>
 <name>Links association info</name>
  <Folder>
   <name>linksAssociation</name>
   <description>OTS link-1</description>
   <ExtendedData>
    <Data> name="segments">
     <value>Fiber-1,Fiber-1-to-2-segment,Fiber-2</value>
    </Data>
    <Data> name="nodeAIpAddress">
     <value>10.56.23.47</value>
    </Data>
    <Data> name="nodeZIpAddress">
     <value>2001:cdba:0000:0000:0000:0000:3257:9652</value>
    </Data>
    <Data> name="nodeAInterfaceName">
     <value>LINE-2-17-3-TX</value>
    </Data>
```

```
    <Data> name="nodeZInterfaceName">
     <value>LINE-1-1-3-TX</value>
    </Data>
    <Data> name="linktype">
     <value>OTS</value>
    </Data>
   </ExtendedData>
  </Folder>
</Folder>
```

Following is an example of the KML format for fiber-link associations, where you must:

- Define one link association per folder, with the name "linkAssociation".
- Specify the segments of the fiber in the sequence that follows the A to Z path of the link to be associated.
- Specify the IP address of the A and Z sides of the link to be associated.

```
<Folder>
 <name>Links association info</name>
  <Folder>
   <name>linksAssociation</name>
   <description>OTS link-1</description>
   <ExtendedData>
    <Data> name="segments">
     <value>Fiber-1,Fiber-1-to-2-segment,Fiber-2</value>
    </Data>
    <Data> name="nodeAIpAddress">
     <value>10.56.23.47</value>
    </Data>
    <Data> name="nodeZIpAddress">
     <value>2001:cdba:0000:0000:0000:0000:3257:9652</value>
    </Data>
    <Data> name="nodeAInterfaceName">
     <value>LINE-2-17-3-TX</value>
    </Data>
    <Data> name="nodeZInterfaceName">
     <value>LINE-1-1-3-TX</value>
    </Data>
    <Data> name="linktype">
     <value>OTS</value>
    </Data>
   </ExtendedData>
  </Folder>
</Folder>
```

To import location data from a KML file:

Step 1 Click the **Import** icon in the geo map toolbar and choose **KML**.

Step 2 Optionally download the KML template by clicking the link at the bottom of the displayed dialog.

Step 3 Create a KML file and enter device/fiber/link data using the format and information in the template as a guide. Save the KML file.

Step 4 In the Import KML dialog, browse to the saved KML file and click **Import**. The devices and fibers will be placed on the geo map in the locations you specified. Managed links will be displayed in the topology map. To see the imported managed links in the geo map, make sure that the devices on either side of the link are mapped in the geo map.

Export Location Data from the Geo Map

You can export location data for devices, fibers, fibers with link associations, and manually-created managed links from the geo map to a KML file. Once you have the data in a KML file, you can edit it as required and then import it back into the geo map.

Note Fiber location data cannot be exported together with the other location data - it must be exported in a separate operation.

Step 1 Click the **Export KML** icon in the geo map toolbar.

Step 2 In the Export Options (KML) dialog, select the location data you want to export. Note that if you select Unassociated Fibers, the other options will be disabled because these fibers must be exported independently of the other location data.

Step 3 Click **Export**. A KML file with your selected location data is created.

Manage Shared Risk Resource Groups (SRRGs) in the Geo Map

Note This feature is supported on optical devices and links only, specifically NCS 2000 and NCS 4000 devices and OTS, OTU and OCH links.

A Shared Risk Resource Group (SRRG) is a set of devices and links that share a common resource, which if it fails, would affect all the devices and links in the group and the circuits in which they participate. The devices and links in the group share the same risk of failure and are therefore considered to belong to the same SRRG. For example, links sharing a common fiber are said to be in the same SRRG because a fault with the fiber might cause all links in the group to fail.

Each SRRG has a 32-bit numeric identifier. For devices, the SRRG is configured on the global device level. For links, the same SRRG is configured on the A-side and Z-side interfaces.

The following SRRG functionality is available from the geo map, from the **Shared Risks (SRRGs)** button above the map:

- Visualization of the devices and links on which SRRGs have been configured.
- User-defined naming of an SRRG so that it is easier to identify than a numeric identifier.
- Creation of new SRRGs that can be assigned to SRRG resource pools.
- Cross-launch to the system settings window where you can create and manage SRRG pools and pool types.

When managing SRRGs, the map is filtered to show only devices that support SRRG.

For more information, see:

- About SRRG Pools and SRRG IDs, on page 44
- View Assigned and Unassigned SRRGs, on page 45

• Manage SRRG Assignments, on page 46
• Create and Manage SRRG Pools Types and Resource Pools, on page 46

About SRRG Pools and SRRG IDs

Using SRRG pool types and resource pools, SRRGs can be grouped into categories for identification and ID allocation purposes. Each pool type has a range of SRRG IDs. You can create multiple SRRG resource pools of a specific pool type, each with a range of SRRG IDs that is within the range defined for the pool type. When you create a new SRRG for devices or links, you can assign it to a specific SRRG pool type and resource pool. The ID for the new SRRG will be created from the ID range of the selected resource pool.

Note Configlet Access permissions are required to manage SRRG pool types and pools.

See Create and Manage SRRG Pools Types and Resource Pools, on page 46 for more information.

Pool Types

Before creating SRRG resource pools, you must create pool types. Pool types allow you to create categories of SRRGs according to your network.

There are 15 available pool types plus one pool type which is reserved. Each pool type has a range of IDs. The following table provides an example of SRRG pool type definitions:

Pool Type ID	Binary	Pool Type Name	Range Start	Range End
0	0000	Central Office	0	1048575
1	0001	ROADM Node	1048576	2097151
2	0010	ROADM Degree	2097152	3145727
3	0011	ROADM Add/Drop	3145728	4194303
4	0100	Switch Node	4194304	5242879
5	0101	Link	5242880	6291455
6	0110	Card	6291456	7340031
7	0111	Future	7340032	8388607
8	1000	Fiber Duct/Conduit	8388608	9437183
9	1001	Future	9437184	10485759
10	1010	Future	10485760	11534335
11	1011	Future	11534336	12582911
12	1100	Future	12582912	13631487
13	1101	Future	13631488	14680063

Pool Type ID	Binary	Pool Type Name	Range Start	Range End
14	1110	Future	14680064	15728639
15	1111	EPNM Preserved Global	15728640	16777215

SRRG Resource Pools

After you have created pool types, you can create resource pools of a specific type. Each resource pool can have a range of IDs that is within the pool type's range. The pool ranges cannot overlap with one another.

You can assign new SRRGs to a specific resource pool. The SRRG's ID will be taken from the range defined for the resource pool.

The SRRG pool's identifier is 32-bit number which is made up of the following:

- **Bits 0-1:** Reserved. It will be set to 00
- **Bit 2:** Indicates that the SRRG is configured using Cisco EPN Manager. It will be set to 1.
- **Bits 3-7:** The groups/regions selected for the resource pool
- **Bits 8-11:** Pool type ID
- **Bits 12-31:** Pool ID range

View Assigned and Unassigned SRRGs

You can view a global list of the SRRGs configured on the managed devices. Since these SRRGs were discovered by the system or user-defined on specific devices or links, they are all "assigned" SRRGs. You can also see unassigned SRRGs. SRRGs can only be deleted from the system if they are unassigned.

Note Ensure that you unassign a SRRG or delete a SRRG on a device from Cisco EPN Manager only. Doing so from the device will not unassign or delete the SRRG from ENE in Cisco EPN Manager.

Each SRRG has a numeric ID that cannot be changed but you can assign a label to the SRRG to provide a more easily identifiable name.

You can select an SRRG to show the devices/links to which it is assigned in the geo map.

To view and label SRRGs:

Step 1 In the left sidebar, select **Maps > Topology Maps > Network Topology**.

Step 2 Click on the Geographical Map toggle button in the top right corner of the map.

Step 3 Click the **Shared Risks (SRRGs)** button above the map and select **View and Name**. The Shared Risk Resource Groups dialog is displayed. It contains two tabs showing assigned and unassigned SRRGs. Note that when viewing SRRG assignments, your device group selection is changed to the default All Locations group.

Step 4 Select a SRRG to view it in the geo map. The devices and links on which the SRRG is defined will be highlighted in the map.

Step 5 To rename a SRRG, click in the SRRG Label column alongside the relevant SRRG ID, type in the required unique name, and click **Save**.

Note SRRG Label column can be edited only for assigned SRRGs.

Manage SRRG Assignments

A simple wizard enables you to select specific devices and links, see which SRRGs are assigned to them and change the assignments as required.

To manage SRRG assignments:

Step 1 In the left sidebar, select **Maps > Topology Maps > Network Topology**.

Step 2 Click on the Geographical Map toggle button in the top right corner of the map.

Step 3 Click the **Shared Risks (SRRGs)** button above the map and select **Manage Assignments**. The Manage SRRG Assignments wizard opens.

Step 4 Select the devices/links for which you want to manage SRRG assignments. You can either click on the required devices/links in the map or click in the box in Step 1 of the wizard and select devices from the list.

Step 5 Click **Next**. You will see a list of all the SRRGs common to all the devices/links you selected in the previous step. If an SRRG is assigned to one of the selected devices but not to the others, it will not be shown in the list. The SRRGs are color-coded based on whether they are the default on the device, assigned, or yet to be assigned. Click on the question mark icon to see the legend.

Step 6 Click the Plus icon and select additional SRRGs for the selected devices/links or create a new SRRG on the fly by typing an SRRG name. If the name is unique, a Create New link will appear. Click on the link to create the SRRG.

Step 7 If you created a new SRRG in the previous step, you can now choose a pool type and an SRRG resource pool of the selected type. The SRRG's ID will be taken from the range defined for the selected SRRG pool. The SRRG ID includes the bits for region and type in addition to the number within the range.

Step 8 Click **Next** to see a summary of your selections and SRRG assignments.

Step 9 Click **Finish**. You will be notified if the SRRG modification was successful. If it failed, an error dialog will provide details of the failure.

Create and Manage SRRG Pools Types and Resource Pools

Using SRRG pool types and resource pools, SRRGs can be grouped into categories for identification and ID allocation purposes. Each pool type has a range of SRRG IDs. You can create multiple SRRG resource pools of a specific pool type, each with a range of SRRG IDs that is within the range defined for the pool type. When you create a new SRRG for devices or links, you can assign it to a specific SRRG pool type and resource pool. The ID for the new SRRG will be created from the ID range of the selected resource pool.

Note Configlet Access permissions are required to manage SRRG pool types and pools.

To create SRRG pool types and resource pools, go to **Administration > System Settings > Inventory > Pool Types** or select **Pool Settings** from the SRRGs menu in the geo map.

To create a new SRRG pool:

Step 1 Go to **Administration > System Settings > Inventory > Pool Types** and check the existing pool types for the relevant pool type for your new SRRG pool. If it doesn't exist, create a new pool type as follows:

a) In the SRRG Pool Types window, click the Plus icon to add a row to the table.
b) In the Name field, enter a unique name for the pool type that represents the grouping you want to create for the SRRGs. For example, "NCS 2000 devices".
c) In the Type ID field, enter an ID from 0 to 14. Refer to the table of pool type definitions in About SRRG Pools and SRRG IDs, on page 44 for guidance as to the available range of IDs per pool type ID.
d) Enter a value for the start and end of the ID range for this pool type. You can use the full range or a subset of the available range. The tooltip on the Start Range or End Range field displays the available range for the pool type.
e) Click **Save**.

Step 2 Create the SRRG pool as follows:

a) Go to **Administration > System Settings > Inventory > SRRG Pool**.
b) In the SRRG Pool window, click the Plus icon to add a row to the table.
c) In the SRRG Pool Details area, select the required pool type from the Type dropdown menu.
d) Enter a unique name for the SRRG pool and optionally, a description.
e) From the Group dropdown menu, select a device group for this SRRG pool.
f) Enter the start and end of the range of SRRG IDs for this pool. The range must be within the selected pool type's range.
g) Click **Save**.

The new SRRG pool is added to the SRRG Pools table. It will also be available for selection when creating an SRRG ID for selected devices or links.