CHAPTER 5

Working with Links

The following topics describe how to view information about static and dynamic links using the Cisco Prime Network Vision (Prime Network Vision) user interface:

- User Roles Required to Work with Links, page 5-1
- Understanding Dynamic and Static Links, page 5-3
- Link Discovery and Flickering Ethernet Topology Links, page 5-3
- Viewing Link Properties, page 5-4
- Viewing Link Impact Analysis, page 5-13
- Adding Static Links, page 5-16
- Filtering Links Using the Collection Method, page 5-18
- Selecting a Link, page 5-19

User Roles Required to Work with Links

This topic identifies the GUI default permission or element scope security level that is required to work with links in Prime Network Vision. Prime Network determines whether you are authorized to perform a task as follows:

- For GUI-based tasks (tasks that do not affect elements), authorization is based on the default permission that is assigned to your user account.
- For element-based tasks (tasks that do affect elements), authorization is based on the default permission that is assigned to your account. That is, whether the element is in one of your assigned scopes and whether you meet the minimum security level for that scope.

For more information on user authorization, see the *Cisco Prime Network 3.8 Administrator Guide*.

The following tables identify the tasks that you can perform:

- Table 5-1 identifies the tasks that you can perform if a selected element **is not in** one of your assigned scopes.
- Table 5-2 identifies the tasks that you can perform if a selected element **is in** one of your assigned scopes.

By default, users with the Administrator role have access to all managed elements. To change the Administrator user scope, see the topic on device scopes in the *Cisco Prime Network 3.8 Administrator Guide*.

Table 5-1 Default Permission/Security Level Required for Working with Links - Element Not in User's Scope

Task	Viewer	Operator	OperatorPlus	Configurator	Administrator
View link properties in Map view	X[1]	X[1]	X[1]	X[1]	X
View link properties in Links view	X[2]	X[2]	X[2]	X[2]	X
View link properties in the Link Properties window	—	—	—	—	X
View link impact analysis	—	—	—	—	X
Add static links	—	—	—	—	X
Filter links using collection method	X	X	X	X	X
Find and select a link in a map	X	X	X	X	X

1. Link properties are limited in the Map view; not all link information is available.
2. Link properties are limited in the Links view; not all link information is available.

Table 5-2 Default Permission/Security Level Required for Working with Links - Element in User's Scope

Task	Viewer	Operator	OperatorPlus	Configurator	Administrator
View link properties in Map view	X	X	X	X	X
View link properties in Links view	X[1]	X[1]	X[1]	X[1]	X
View link properties in the Link Properties window	X	X	X	X	X
View link impact analysis	—	—	—	—	X
Add static links	—	—	—	X	X
Filter links using collection method	X	X	X	X	X
Find and select a link in a map	X	X	X	X	X

1. Link properties are limited in the Links view; not all information is available.

Understanding Dynamic and Static Links

Prime Network Vision provides a topological model of the physical and logical links that exist between elements in the network. Prime Network Vision automatically discovers these links using various protocols (such as STP, CDP, and LLDP), and the ongoing process of autodiscovery maintains this topological information. Prime Network Vision discovers any new links that are added and continues to verify that the discovered links still exist; for this reason, they are called *dynamic* links.

Property information is provided for links that are:

- Between two devices.
- Between a device and an aggregation that connects this device to another device inside the aggregation.
- Between two aggregations that contain devices that cross the aggregations.

If a link is unidirectional, Prime Network Vision displays an arrowhead on the link. If it is bidirectional, an arrowhead is not displayed.

Prime Network Vision also provides functionality that allows you to create links on the VNE level. These links do not perform any configuration or provisioning on a device or in the network. Because the links do not really exist in the network, the links are not updated. For this reason they are called *static link*s. Static links are useful for map visualization and network correlation; for example, if Prime Network Vision does not discover a link that you know exists in the network, you can create a static link that is displayed in the map. For correlation purposes, Prime Network Vision treats the static link as if it were a physical or logical link and allows correlation flows to go through the static link. For information on creating static links, see Adding Static Links, page 5-16.

Related Topics

- Viewing Link Properties, page 5-4
- Adding Static Links, page 5-16

Link Discovery and Flickering Ethernet Topology Links

As mentioned in Understanding Dynamic and Static Links, page 5-3, Prime Network discovers topology links using various protocols, such as STP, CDP, and LLDP. In some situations, the link configurations themselves can prevent Prime Network from discovering the correct information. For example, if Layer 2 protocol tunneling is configured and the discovery protocols are tunneled, Prime Network can create an incorrect link. This scenario results in a flickering link that is first created incorrectly due to tunneled discovery information, and then disconnected when the Prime Network counters test discovers that the counters on the edges of the link do not match. During the next topology cycle, Prime Network recreates the link, which is disconnected again during the counters test.

A link is considered flickering when it is connected, disconnected, and reconnected when using the same connection technique because the topology information is conflicting. When this situation occurs, Prime Network generates a system event with the message “Physical Link discovery inconsistent.”

To prevent an ongoing cycle of link creation and disconnecting, Prime Network detects such case of flickering links, creates a system event with the message “Inconsistent Physical Link Discovery between *system:interface1* and *system:interface2*,” and stops the link from flickering by disconnecting it.

To remedy the situation, we recommend that you wait until the link disappears from the map and then create a static link.

Note This feature applies only to Ethernet links.

Related Topics

- Adding Static Links, page 5-16
- Understanding Dynamic and Static Links, page 5-3

Viewing Link Properties

By default, you can view links in maps only if both ends of the link are in your scope. However, Prime Network Vision 3.8 provides an option that allows you to view links and any associated tickets if only one end of the link is in your scope. For more information about this option, see the *Cisco Prime Network 3.8 Administrator Guide.*

Note Changes to the registry should only be carried out with the support of Cisco. For details, contact your Cisco account representative.

Prime Network Vision provides information about links in the following ways:

- Through the physical characteristics of the link in a map, tooltips, and link quick views—See Viewing Link Properties in Prime Network Vision Maps, page 5-4.
- In the Links view—See Viewing Link Properties in the Links View, page 5-8.
- In the link properties window—See Viewing Link Properties in the Link Properties Window, page 5-10.

Viewing Link Properties in Prime Network Vision Maps

The representation of a link in a map provides information about that link. The characteristics that provide information about a link are:

- Whether the link is solid or dashed.
- Whether or not the link displays an arrow at one end.
- Link color.

Table 5-3 describes the link variations that can be displayed in a map and provides examples of each.

Table 5-3 Link Properties in Prime Network Vision Maps

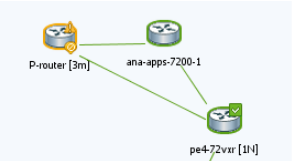
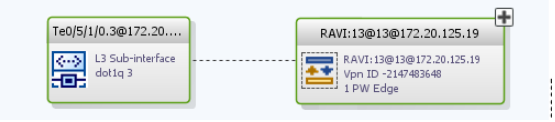
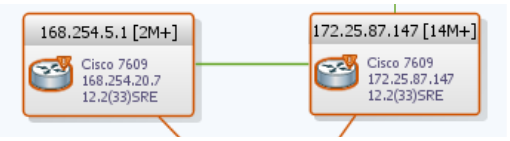
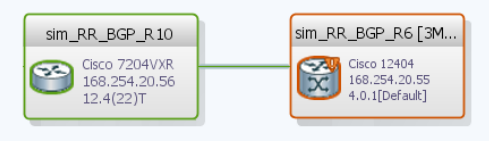
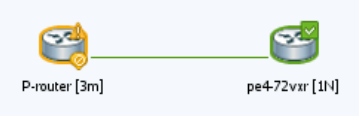
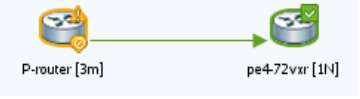
Link Characteristic	Description	Example
Solid Line vs. Dashed Line		
Solid line	Physical, topological, or service link, such as a link between two devices.	
Dashed line	Association or *business link* between such elements as EVCs, VPLS service instances, or VPN components.	
Link Widths		
Normal	Contains links of the same group. Available groups are: • Business • GRE • MPLS-TP • Pseudowire • VLAN • All others	
Wide	*Aggregated links* that contain links of different groups. When viewing a map at a low zoom level, aggregated links cannot be distinguished in the GUI.	
Tunnel	A tunnel, with the center color representing the severity of any alarms on the link.	
Arrowhead vs. No Arrowhead		
No arrowhead	Bidirectional link.	
Arrowhead	Unidirectional link, with the flow in the direction of the arrowhead.	

Table 5-3 Link Properties in Prime Network Vision Maps (continued)

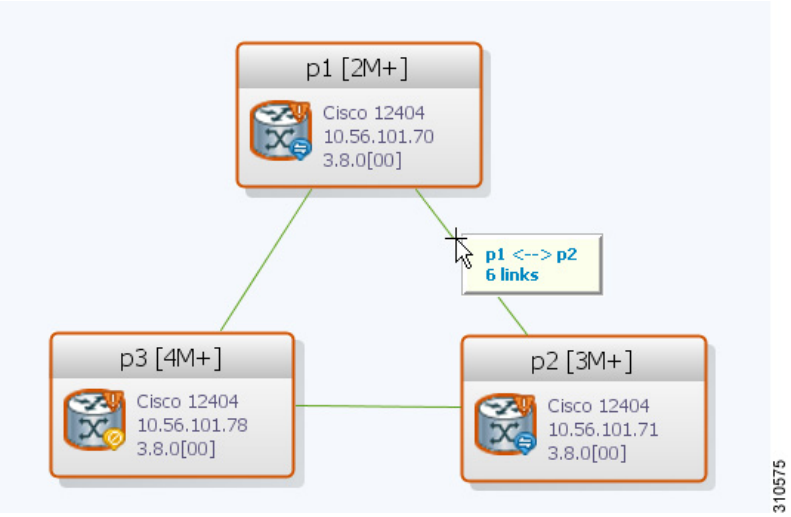
Link Characteristic	Description	Example
Link Color		
Red	Critical alarm is on the link.	
Orange	Major alarm is on the link.	
Yellow	Minor alarm is on the link.	
Green	Link is operating normally.	
Blue	Link is selected.	

Note The color of a selected link is customizable. The default color is blue. For more information on link colors, see Map View, page 2-12.

To view link properties:

Step 1 Hover your mouse cursor over the required link in a map. A link tooltip is displayed as shown in Figure 5-1.

Figure 5-1 Link Tooltip in Prime Network Vision



The tooltip contains the following information about the link:

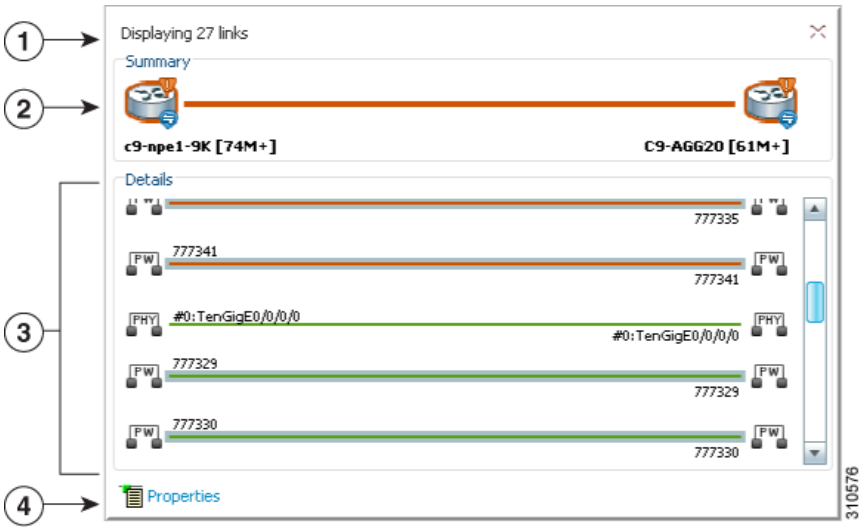
- Link endpoints, identified by the element or service name.
- The number of links represented by the line on the map.

Examples of tooltips are:

- `169.254.12.34 <--> 169.254.56.78 6 links`
- `22@169.254.12.34 <--> CEM1/2:1@169.254.56.78 1 link`

Step 2 To view additional link information, click the tooltip. The link quick view window is displayed as shown in Figure 5-2.

Figure 5-2 Link Quick View Example



1	Number of links represented by the single link in the map. In this example, 29 links.
2	Link endpoints.
3	List of all links represented by the link in the map with the following information, as appropriate: • Type of link, such as Physical, MPLS, or Tunnel. For a complete list of the types of links and their abbreviations, see Link Icons, page A-9. • Link detail, such as the interface used on each endpoint, service name, or type of service. • Link alarm status, indicated by the link color.
4	Hyperlink to the link properties window. The Properties button is available for physical, topographical, and service links, but is not available for business links (dashed links). For more information, see Viewing Link Properties in the Link Properties Window, page 5-10.

Step 3 To view more link properties, click **Properties** in the link quick view.

For more information about the link properties window, see Viewing Link Properties in the Link Properties Window, page 5-10.

Related Topics

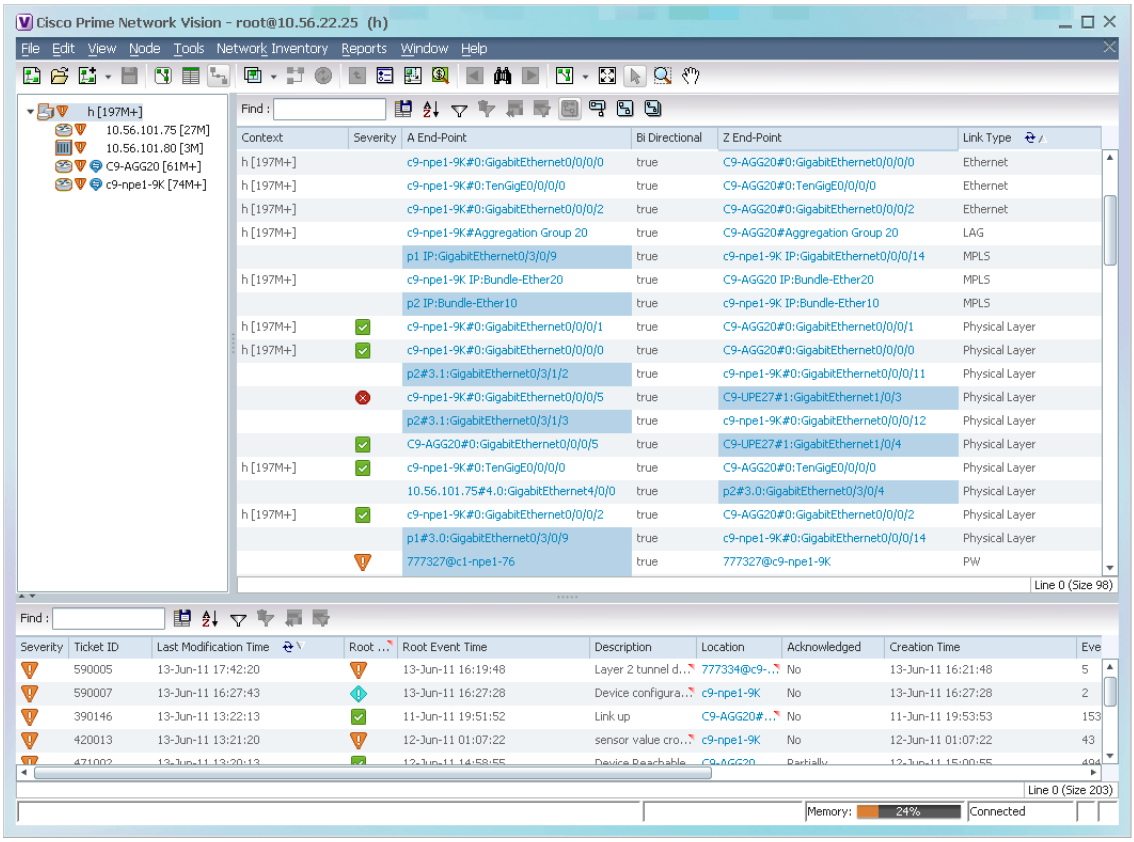
- Viewing Link Properties in the Links View, page 5-8
- Viewing Link Properties in the Link Properties Window, page 5-10
- Working with Links, page 5-1

Viewing Link Properties in the Links View

The links shown in a map represent many other links as described in Viewing Link Properties in Prime Network Vision Maps, page 5-4. By using the links view, you can view a list of all links represented in a map and their status.

To display the links view in the Prime Network Vision window, click **Show Links View** in the main toolbar. Figure 5-3 shows an example of the links view.

Figure 5-3 Links View



Note A link external to the network has a blue cell background in the table.

Any links that are added or removed from the map are automatically added or removed from the links view, provided they have not been filtered out.

Table 5-4 describes the information that is displayed in the links view.

Table 5-4 Links View Content

Field	Description
Context	Name of the map or aggregation containing the link. The links view can include multiple contexts. This field can be empty for either of the following reasons: • One side of the link is not included in the map. • The link is filtered out of all contexts.
Severity	Severity bell icon, colored according to the severity of the alarm on the link and indicating the impact of the alarm on the network. For more information, see Prime Network Vision Status Indicators, page 2-30.
A End Point	Device or site that is the source of the link, as a hyperlink to the inventory of the device or site.
Bidirectional	Whether the link is bidirectional or unidirectional: True (bidirectional) or False (unidirectional).
Z End Point	Device or site that is the destination of the link, hyperlinked to the relevant entry in inventory.
Link Type	Type of link, such as Physical Layer, VPN, MLPPP, or MPLS.

By default, the links displayed in the links view are sorted according to link type and the deep collection method.

The buttons in Table 5-5 are displayed at the top of the links view and enable you to filter the links according to the collection method.

Note If you load a map with many links (for example, thousands of links), it can take a while for the complete list of links to load. The filtering options in the table are unavailable until the table has completely loaded.

Table 5-5 Links View Tools

Icon	Name	Description
	All Links	Complete list of links for the selected map or aggregation.
	External Links	Links with one side of the link in the selected map or aggregation and the other side of the link outside the currently selected map or aggregation.
	Flat Links	Links currently visible in the map pane for the selected map or aggregation, excluding any thumbnails.
	Deep Links	Links for the selected aggregation and any nested aggregations, with both endpoints within the currently selected map or aggregation.

For more information about filtering links using the collection method, see Filtering Links Using the Collection Method, page 5-18.

Related Topics

- Viewing Link Properties, page 5-4
- Viewing Link Impact Analysis, page 5-13

Viewing Link Properties in the Link Properties Window

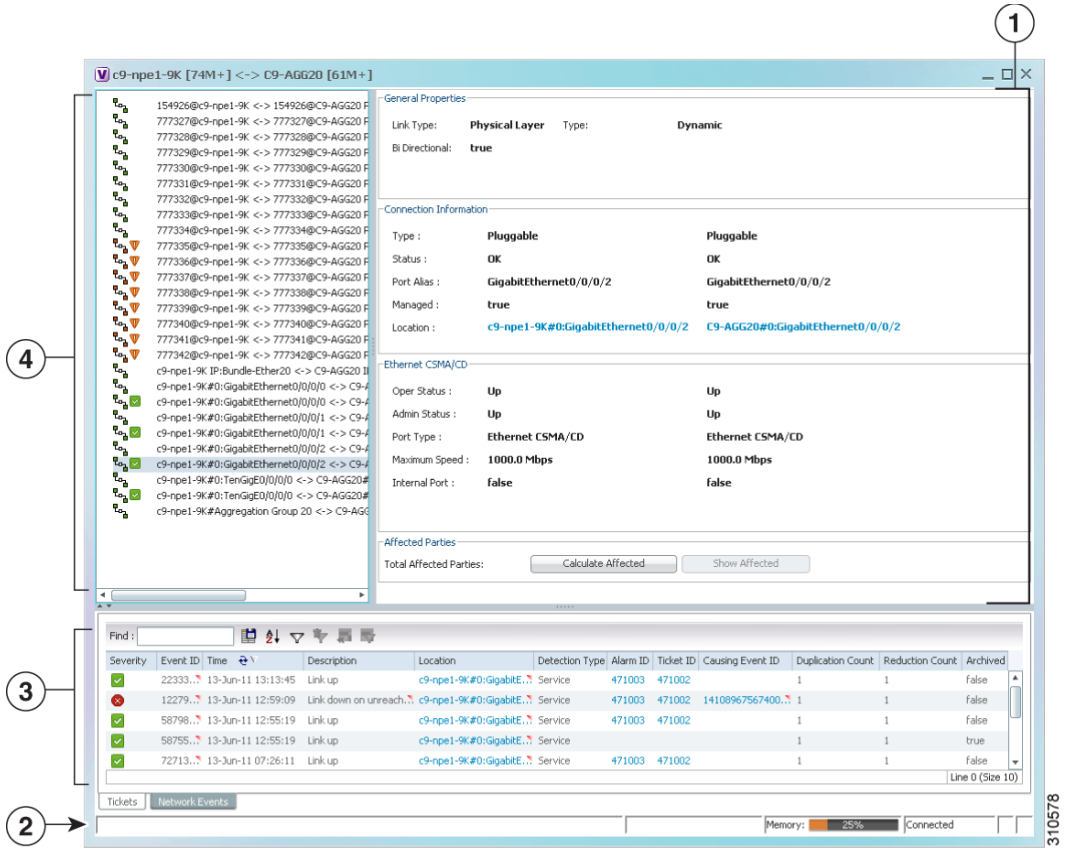
The link properties window contains general information about the selected link, details of the link connection, and technology-specific information appropriate for the link.

In a Prime Network Vision map, open the link properties window in one of the following ways:

- Double-click a link between two elements.
- Right-click a link and choose **Properties**.
- In the links quick view window, click **Properties**.

The link properties window is displayed as shown in Figure 5-4.

Figure 5-4 Link Properties Window



1	Properties pane	**3**	Ticket and events pane
2	Status bar	**4**	Link list pane

Note If multiple links exist between the elements or aggregations, the link properties window displays information for all the links.

See the following topics for more information about each of the panes in the link properties window:

- Link List Pane, page 5-11
- Properties Pane, page 5-11
- Ticket and Events Pane, page 3-20

The information displayed in the link properties window changes according to the ports or subports selected in the link list pane.

Related Topics

- Understanding Dynamic and Static Links, page 5-3
- Viewing Link Properties, page 5-4
- Viewing Link Properties in the Links View, page 5-8

Link List Pane

In the link properties window, the link list pane displays a list of the links that are represented by a single link on the map. Each link has a single entry in the link list pane.

When an entry is selected in the link list pane, the information displayed in the properties pane is updated. The color of the icon in the link list pane reflects its severity. For more information about severity, see Prime Network Vision Status Indicators, page 2-30.

The heading and the link list pane display the left and right link identifiers between the two nodes, the device alias, and Connection Termination Point (CTP).

Related Topics

- Viewing Link Properties, page 5-4
- Viewing Link Impact Analysis, page 5-13
- Adding Static Links, page 5-16

Properties Pane

The properties pane enables you to view the following, depending on your selection in the link list pane:

- Properties of a selected link, including port properties information.
- Hyperlinks to relevant entries in logical or physical inventory.
- Status.

The properties pane displays the link type, port alias, and port location, all of which uniquely identify the port. The port location information is also displayed as a hyperlink to the inventory window.

The properties pane also displays the parameters for each end of the link, aligned under the relevant link identifier. Any discrepancies between the link's ports are displayed in red.

The following fields are displayed in the Connection Information area for physical links:

- Type—Type of connector, such as fiber optic.
- Status—Status of the link, such as OK.
- Port Alias—Name used in the device CLI or EMS for the selected port.
- Managed—Whether or not the link is managed: True or False.
- Pluggable Port State—Whether or not a pluggable module is inserted.
- Location—Location of the entity, slot number, and port on the slot, as a hyperlink that opens the properties of the relevant location.

Depending on the link and its configuration, the following areas containing status and configuration information are displayed in the properties pane:

- Ethernet CSMA/CD
- Gigabit Ethernet
- LAG
- MLPPP
- MP-BGP
- MPLS Link Information
- PPP
- Pseudowire
- T1
- VRF

IP addresses are displayed in IPv4 or IPv6 format, as appropriate.

Depending on the type of link, the following areas might be displayed:

- Affected Parties—Enables you to view all elements potentially affected by the link. For more information, see Viewing Link Impact Analysis, page 5-13.
- Labels—Enables you to view all LSPs on an Ethernet link. For more information, see Viewing LSPs Configured on an Ethernet Link, page 17-12.
- VCs—Enables you to view configured and misconfigured VCs on an ATM link. For more information, see Viewing ATM VPI and VCI Properties, page 18-10.

Related Topics

- Viewing Link Properties, page 5-4
- Viewing Link Impact Analysis, page 5-13
- Adding Static Links, page 5-16

Ticket and Events Pane

The ticket and events pane is displayed at the bottom of the link properties window and contains the following tabs:

- Tickets—Displays the tickets that are collected on the selected element, service, or component in the navigation pane.

  Table 2-14 on page 2-28 describes the information that is available in the Tickets tab.

- Network Events—Displays all active network events associated with tickets and alarms, and all archived events with a timestamp that falls within the specified events history size (see Selecting Prime Network Vision Options, page 2-56).

  Table 3-7 on page 3-20 describes the information that is available in the Network Events tab.

When displaying network events, Prime Network Vision monitors the history size value defined in the Events tab of the Options dialog box (**Tools > Options > Events**). The default value is six hours and can be changed in Prime Network Administration. In addition, Prime Network Vision limits the maximum number of network and provisioning events that are sent from the server to client to 15,000 each. If the number of network or provisioning events exceeds the limit specified in the Options Events tab or the 15,000 maximum limit, Prime Network Vision purges the oldest events from table. The purging mechanism runs once per minute.

Tip You can display or hide the ticket and events pane by clicking the arrows displayed below the device view panel.

Related Topics

- Viewing Link Impact Analysis, page 5-13
- Viewing Link Properties in Prime Network Vision Maps, page 5-4
- Viewing Link Properties in the Links View, page 5-8

Viewing Link Impact Analysis

Prime Network Vision enables you to select a network link and calculate the elements that might be affected if the link were to go down. This enables you to perform proactive impact analysis when a fault has not actually occurred.

Note Impact analysis applies only to physical links.

To calculate impact analysis:

Step 1 Select a map or aggregation in the navigation pane, and click **Show Links View** in the main toolbar. The links view is displayed in the content pane.

Step 2 In the table toolbar, click **Link Filter**. The Link Filter dialog box is displayed. For information about the Link Filter dialog box, see Filtering Links in a Map, page 4-41.

Step 3 In the Filter dialog box:

a. In the Match drop-down list, choose **All**.

b. In the field drop-down list, choose **Link Type**.

c. In the operand drop-down list, choose **Equals**.

d. In the matching criteria drop-down list, choose **Physical Layer**.

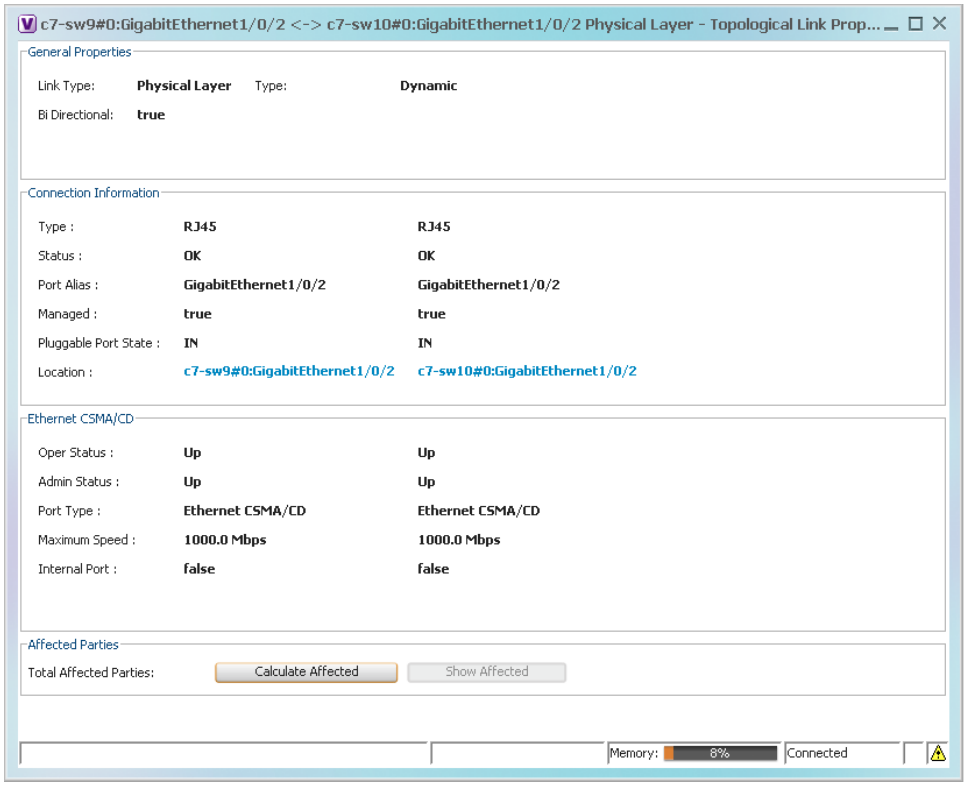
e. Click **OK**.

Only physical links are displayed in the links view.

Step 4 In the links view, right-click the required link and choose **Properties**. The Topological Link Properties window is displayed.

Note Resize the window as needed to view all the information.

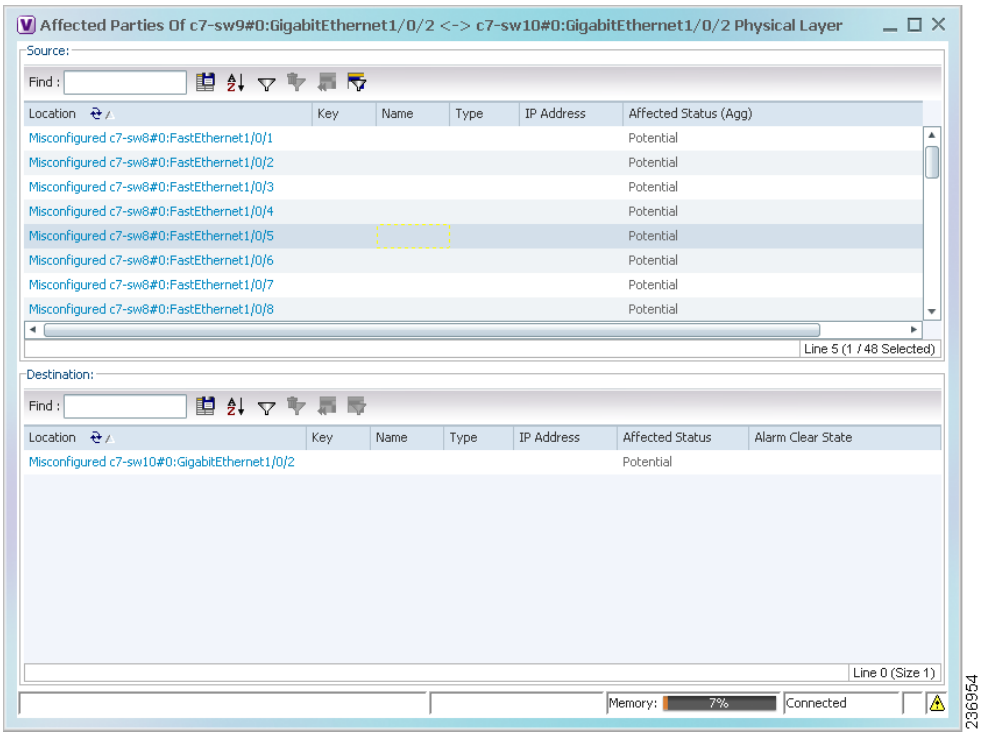
Figure 5-5 Topological Link Properties Window



Step 5 Click **Calculate Affected**. The total number of potentially affected parties is displayed in the Affected Parties area.

Step 6 Click **Show Affected**. The Affected Parties window is displayed as shown in Figure 5-6.

Figure 5-6 Affected Parties Window



Step 7 To view the potentially affected destinations if a link were go to down, click an entry in the Source table. The potentially affected destinations are displayed in the Destination table.

Step 8 To view source or destination properties in inventory, click the required hyperlinked entry.

Note The Affected Parties window occasionally displays entries that start with the word *Misconfigured*. Entries that start with Misconfigured indicate that the flow has stopped unexpectedly between the source and destination points. An unexpected termination point can be a routing entity, bridge, or VC switching entity. The significant aspects of Misconfigured entries are:
- Because the link does not terminate as expected, the link is not actually impacted.
- An error might exist in the configuration or status of the termination points.
We recommend that you check the configuration and status of the affected termination points.

Related Topics

- Adding Static Links, page 5-16
- Viewing Link Properties in the Links View, page 5-8
- Viewing Link Properties, page 5-4

Adding Static Links

Prime Network Vision enables you to create static links that exist only on the VNE level. Static links are useful for visualization and network correlation because Prime Network Vision allows correlation flows to go through the links, as if they were real physical or logical links. Static link properties are not updated because the links do not really exist in the network.

To create a static link, select a device or port and define it as the A side. Then define a second device or port as the Z side. Prime Network Vision validates the new link after the two ports are selected. Validation checks the consistency of the port types (for example, RJ45 on both sides), and Layer 2 technology type (for example, ATM OC-3 on both sides).

You can also create static links between Ethernet Link Aggregation Groups (LAGs) by choosing a LAG and the desired port channel for the A or Z side as described in the following procedure.

When you add a new link, the color of the link reflects its current state. For example, if the operation status of a port is down, the link is colored red. You can add links from either the Prime Network Vision window's navigation and a map (method 1), or from the inventory window navigation pane (method 2).

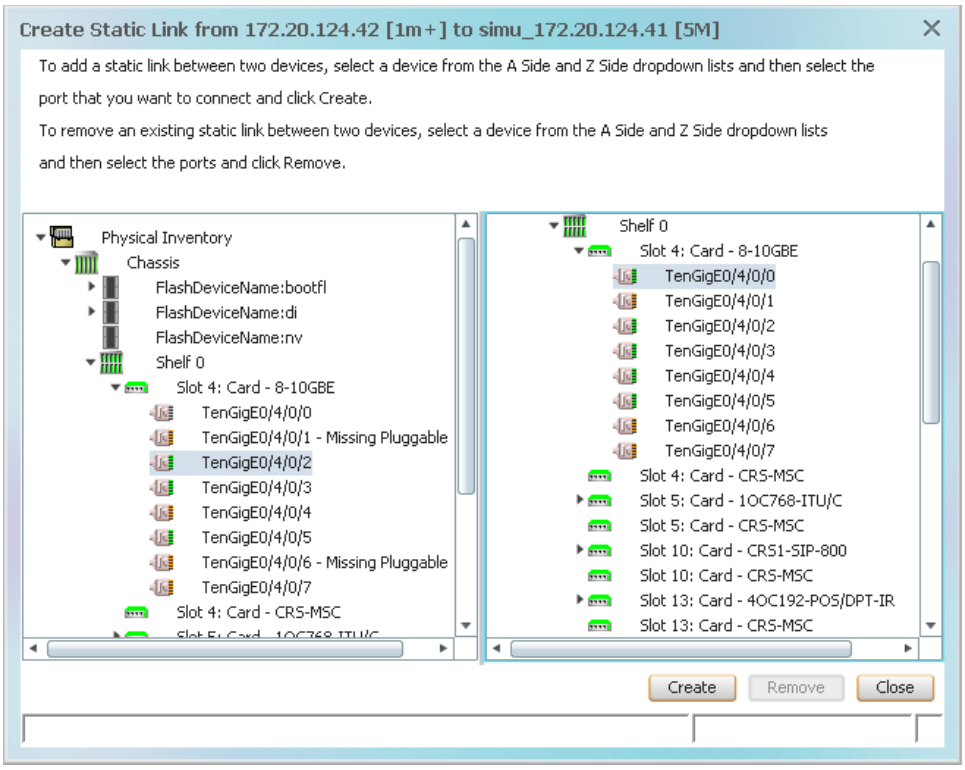
In addition, you can add a new link using Cisco Prime Network Administration. For more information, see the *Cisco Prime Network 3.8 Administrator Guide*.

Adding a Link (Method 1)

Step 1 Right-click the required A Side device in the navigation pane or in a map, and choose **Topology > Mark as A Side**.

Step 2 Right-click the required Z Side device or LAG in the navigation pane or properties pane to display the right-click menu and choose **Topology > Mark as Z Side**. The Create Static Link window is displayed as shown in Figure 5-7, so that you can select the ports to connect.

Figure 5-7 Create Static Link Window



Step 3 Select the required port on both the A Side device and the Z Side device.

Step 4 Click **Create** to validate the connection and create the new link.

A success message is displayed.

A warning message is displayed if any of the following apply:

- A validation check fails.
- The operation status of one port is Up and the other port is Down.
- The selected ports are not of the same type.
- The Layer 2 technology type is not the same.
- One of the ports is part of another link.

Adding a Link (Method 2)

Step 1 Open the inventory window for the required A Side device.

Step 2 In the navigation pane, navigate to the required port or LAG.

Step 3 Right-click the required port or LAG and choose **Topology > Mark as A Side**.

Step 4 Repeat Step 1 and Step 2 for the Z Side port or LAG.

Step 5 Right-click the required port or LAG and choose **Topology > Mark as Z Side**. A confirmation message is displayed.

Step 6 Click **Yes.**

The ports are connected, and a link is created between the selected ports.

A warning message is displayed if any of the following conditions exist:

- One of the validation checks fails.
- The operation status of one port is Up and the other port is Down.
- The ports selected are not of the same type.
- The Layer 2 technology type is not the same.
- One of the ports is part of another link.

For information about removing a static link, see the *Cisco Prime Network 3.8 Administrator Guide*.

Related Topics

- Viewing Link Properties in the Links View, page 5-8
- Viewing Link Properties, page 5-4
- Viewing Link Impact Analysis, page 5-13

Filtering Links Using the Collection Method

The links view table enables you to view links that are not displayed graphically in the Prime Network Vision window map pane. The links view table is dynamic and automatically refreshes itself so that you can view up-to-date network links in real time.

The collection method enables you to filter the links displayed in the links view by selecting the collection method from the toolbar.

Note

- The deep collection method is applied by default in the links view.
- The filter applies only to the links view; it has no effect elsewhere in Prime Network Vision.

To filter links according to the collection method:

Step 1 Click **Show Links View** in the Prime Network Vision main toolbar.

Step 2 Select a map or aggregation in the navigation pane or links view.

Step 3 In the links view toolbar, click one of the following buttons in the toolbar:

- **All Links**
- **External Links**
- **Flat Links**
- **Deep Links**

The links are displayed in the links view according to the selected collection method.

Related Topics

- Viewing Link Properties, page 5-4
- Viewing Link Impact Analysis, page 5-13

Selecting a Link

Prime Network Vision enables you to select a link listed in the links view and highlight the link in the map in the content pane.

To select and highlight a link in a map:

Step 1 In the Links view, right-click the required link and choose **Select Link in Map**. The link is displayed in blue in the map.

Step 2 If two or more links are the same (for example, two VRF links), but they are in different contexts or aggregations, the Select Link Context dialog box is displayed. Select the required context from the drop-down list, then click **OK**. The link is displayed in blue in the map.

Step 3 To remove the blue highlight from the selected link, click the map background.

Related Topics

- Viewing Link Properties, page 5-4
- Viewing Link Impact Analysis, page 5-13