Building the Network

After you have planned your network, you can begin building the network components: groups, network partitions, subnetworks, NEs, links, and network maps.

This chapter contains the following sections:

Overview

The Cisco Prime Optical management domain is the top-level root node in the Domain Explorer tree. The management domain contains NEs and the following network components:

- Groups—Collection of groups or collection of NEs. NEs are often grouped geographically or by domain.
- Network Partitions—Logical segment of NEs (grouped in subnetworks) in which NEs of the same model type are managed by a single NE service.
- Subnetworks—Sets of NEs interconnected at a specific network layer (such as physical, section, line, and so on). Subnetworks are contained within network partitions. NEs must belong to the same subnetwork to create circuits between them.
- Links—Physical or logical entities (for example, a fiber) between two physical points (for example, ports). Circuits are provisioned through links.
- Network Maps—Geographic representation of the NEs in the domain, the circuits and links between NEs, and the number of alarms associated with NEs.

How Do I Build Groups?

NEs in the Domain Explorer are organized into groups, which consist of NEs or other groups. NEs are often grouped geographically or by domain. The same NE or group can be assigned to different groups. The following sections describe how to add, copy, move, and delete groups.

Adding Groups

Step 1 Select a node or group in the Domain Explorer tree.

Note You cannot add a new group to the Discovered Network Elements or Deleted Network Elements groups.

Step 2 Choose **File > New Group** (or click the **Add a New Group** tool). The New Group dialog box opens.

Step 3 Enter the following information in the New Group dialog box.

Table 3-1 Field Descriptions for the New Group Dialog Box

Field	Description
Group ID	Unique name for the group.
Location Name	Geographic location of the group.
Description	Description of the group.

Step 4 Click **OK**. The new group appears in the Domain Explorer tree.

Copying Groups

You can easily create domains for multiple users in Prime Optical. Just copy the same groups in different domains, so that users who work different shifts can use the same group.

Step 1 In the Domain Explorer tree, select the group to be copied.

Step 2 Choose **Edit > Copy** (or click the **Copy** tool).

Step 3 Select the group where the group will be pasted and choose **Edit > Paste** (or click the **Paste** tool). This pastes the group under the selected group.

Note You cannot paste a group into the Discovered Network Elements or Deleted Network Elements groups.

Tip The drag-and-drop feature can also be used to copy groups. Use the mouse to drag and drop the group to a new location.

Since they cannot see the entire domain, users with the Assign NEs property (Provisioner, Operator, and some custom user profiles) are not allowed to modify the topology using copy, cut, paste, or drag and drop. See Chapter 8, "Managing Security" for information about the Assign NEs property.

Moving Groups

Prime Optical provides drag-and-drop capabilities to easily move groups in the Domain Explorer tree.

Step 1 In the Domain Explorer tree, select the group to be moved.

Step 2 Use the mouse to drag and drop the selected group to a new location.

Note You cannot move groups into the Discovered Network Elements or Deleted Network Elements groups.

Deleting Groups

Prime Optical allows you to delete a single group or multiple groups.

Deleting a Single Group

Step 1 In the Domain Explorer tree, select the group to be deleted.

Step 2 You can delete either the selected instance of the group or all instances of the group:

- To remove the selected instance of the group, choose **Edit > Delete**; then, click **Yes** in the confirmation dialog box.
- To remove all instances of the selected group, choose **Edit > Delete All**; then, click **Yes** in the confirmation dialog box.

Note Before deleting the last instance of a group, the group must be empty. Move all of the NEs and groups that the group contains to a different group.

Deleting Multiple Groups

Step 1 In the Domain Explorer tree, select the group to be deleted. Select multiple groups by pressing the **Ctrl** key, then click each group that will be deleted.

Step 2 You can delete either the selected instance of the groups or all instances of the groups:

- To remove the selected instance of the groups, choose **Edit > Delete**; then, click **Yes** in the confirmation dialog box.
- To remove all instances of the selected groups, choose **Edit > Delete All**; then, click **Yes** in the confirmation dialog box.

Note Before deleting the last instance of a group, the group must be empty. Move all of the NEs and groups that the group contains to a different group.

How Do I Build Network Partitions?

Network partitions are groups of subnetworks or groups of NEs that are managed by the same NE service. Different network partitions mean different NE services. You can add, modify, or delete network partitions in the Subnetwork Explorer window.

Note Prime Optical contains one network partition by default.

Note A single network partition should contain fewer than 500 CTC-based NEs. Multiple network partitions must be used if your NE counts exceed these limits or if you are managing ANSI and ETSI devices in the same Prime Optical domain.

Note When automatic subnetwork grouping is enabled while performing operations on a network partition, NE visibility might be affected. Wait for a few minutes while Prime Optical arranges the NEs and subnetworks in the correct network partition. For more information on automatic subnetwork grouping, see Automatically Grouping NEs in Subnetworks, page 3-20.

Adding Network Partitions

Step 1 In the Domain Explorer window, choose **File > Subnetwork Explorer**.

Step 2 In the Subnetwork Explorer window, choose **File > Add New Network Partition** (or click the **Add a New Network Partition** tool). The Add New Network Partition dialog box opens.

Step 3 Enter the following information.

Table 3-2 Field Descriptions for the Add New Network Partition Dialog Box

Field	Description
Network Partition ID	ID of the network partition. The range is from 1 to 128 alphanumeric or special characters.
Description	Network partition description.

Step 4 Click **OK**. The new network partition appears in the Subnetwork Explorer tree.

Modifying Network Partitions

Step 1 In the Domain Explorer window, choose **File > Subnetwork Explorer**. The Subnetwork Explorer opens.

Step 2 In the Subnetwork Explorer tree, select a network partition to modify.

Step 3 In the Network Partition Properties pane, click the **Identification** tab.

Step 4 Modify the following information as needed.

Table 3-3 Field Descriptions for the Network Partition Properties Pane

Field	Description
Network Partition ID	ID of the network partition. The range is from 1 to 128 alphanumeric or special characters.
Description	Network partition description.

Step 5 Click **Save**.

Step 6 In the confirmation dialog box, click **Yes**. The modifications are visible in the Subnetwork Explorer tree and Network Partition Properties pane.

Deleting Network Partitions

Step 1 In the Domain Explorer window, choose **File > Subnetwork Explorer**. The Subnetwork Explorer opens.

Step 2 In the Subnetwork Explorer tree, select the network partition that you want to delete; then, choose **Edit > Delete**.

Note A network partition cannot be deleted if it is associated with any subnetwork in the domain, or if it is the last network partition in the domain. When the network partition is deleted, any running instances of the NE Service that were associated with the partition stop running.

Step 3 In the confirmation dialog box, click **Yes**. The network partition is removed from the Subnetwork Explorer tree.

How Do I Build Subnetworks?

Subnetworks are sets of NEs interconnected at a specific network layer (such as physical, section, line, and so on). Subnetworks are contained within network partitions. NEs must belong to the same subnetwork to create circuits between them.

The following sections describe how to add, move, and delete subnetworks. Users with the Assign NEs property (Provisioner, Operator, and some custom user profiles) can see only the subnetworks of the NEs that are assigned to them.

Note When automatic subnetwork grouping is enabled while performing operations on a subnetwork, NE visibility might be affected. Wait for a few minutes while Prime Optical arranges the NEs in the correct subnetwork. For information on automatic subnetwork grouping, see Automatically Grouping NEs in Subnetworks, page 3-20.

Adding Subnetworks

Step 1 In the Domain Explorer window, choose **File > Subnetwork Explorer**.

Note To open the Subnetwork Explorer, the domain must contain at least one NE. If the domain does not contain any NEs, the Subnetwork Explorer menu option is unavailable.

Step 2 In the Subnetwork Explorer tree, select the network partition where you will add the subnetwork and choose **File > Add New Subnetwork** (or click the **Add a New Subnetwork** tool). The Add New Subnetwork dialog box opens.

Step 3 Enter the following information in the Add New Subnetwork dialog box.

Table 3-4 Field Descriptions for the Add New Subnetwork Dialog Box

Field	Description
Subnetwork ID	Unique name for the subnetwork. The name can contain up to 32 alphanumeric or special characters.
Subnetwork Type	Type of subnetwork (SONET, SDH, other, or unknown).
Subnetwork Topology	Subnetwork topology.
Description	Description of the subnetwork.

Step 4 Click **OK**. The new subnetwork appears in the Subnetwork Explorer tree.

Note The Add New Subnetwork feature is not available for users with the Assign NEs property (Provisioner, Operator, and custom user profiles) because they cannot see the entire domain.

Moving Subnetworks

A subnetwork can be moved from one network partition to another if there are no routable links among the NEs that belong to that subnetwork and if automatic subnetwork grouping is disabled. (For information about automatic subnetwork grouping, see Automatically Grouping NEs in Subnetworks, page 3-20.)

Step 1 In the Domain Explorer window, choose **File > Subnetwork Explorer**.

Step 2 In the Subnetwork Explorer tree, select the subnetwork to be moved.

Step 3 Use the mouse to drag and drop the selected subnetwork to a new network partition.

Deleting Subnetworks

Step 1 In the Domain Explorer window, choose **File > Subnetwork Explorer**.

Step 2 In the Subnetwork Explorer tree, click the subnetwork that will be deleted.

Note Only an empty subnetwork can be deleted. An empty subnetwork is one that does not contain any NEs or deleted NEs. Trying to delete a subnetwork that contains deleted NEs will generate the error message: "Selected subnetwork has some deleted NEs. Prune those NEs to delete the subnetwork." Before deleting the subnetwork, remove the deleted NEs from the Prime Optical database. For more information, see Removing a Deleted NE, page 3-23.

Step 3 Choose **Edit > Delete**.

Step 4 In the confirmation dialog box, click **Yes** to remove the subnetwork from the tree.

How Do I Build NEs?

When you add a new NE, you select the subnetwork to which you will add it. Consequently, the NE is added to the network partition that contains the selected subnetwork. This allows you to create circuits between NEs.

You can also add a new NE without selecting a subnetwork. A new subnetwork will be created for each new NE.

Prerequisites for Adding NEs

Before adding a new NE, enable the NE service for that NE. (You can, however, add the NE even if the NE service is disabled.) The NE service is enabled by default, but the service is not started as a process unless you activate an NE for that particular service. You must also meet certain other specific prerequisites depending on the type of NE you are adding.

Note There are no prerequisites for adding ONS 15327, ONS 15600 SONET, or ONS 15600 SDH NEs.

Prerequisites for Adding ONS 15216 EDFA2 and EDFA3 NEs

Before adding ONS 15216 EDFA2 and EDFA3 NEs to Prime Optical, you must do the following:

- Configure the Prime Optical SNMP community string with read-write access on the ONS 15216 EDFA2 or EDFA3. Refer to the NE documentation for more information.
- Ensure that the Prime Optical SNMP community string value and the CommTrapEntry community string value on the ONS 15216 EDFA2 or EDFA3 match. To ensure that these values match, enter the value from the CommTrapEntry in the ONS 15216 EDFA2 or EDFA3 into the SNMP Community String field in the Domain Explorer.
- (For the ONS 15216 EDFA3 only) Start the FTP service. To verify that the FTP service has started, enter the **ftp 0** command and enter the username and password specified during installation.
- (For the ONS 15216 EDFA2 only) Configure the TFTP service on the Prime Optical server to publish the TFTP directory and start the TFTP service. The directory to be published as a TFTP directory should have read-write access.

To configure the default tftpboot directory:

Step 1 Start the TFTP service on the Prime Optical server by uncommenting the TFTP service entry from the /etc/inetd.conf file, and update the name of the directory to be published as a TFTP directory. For example:

```
tftp dgram udp6 wait root /usr/sbin/in.tftpd in.tftpd -s /tftpboot
```

Step 2 Stop and restart the inetd process.

The name of the ONS 15216 EDFA3 NE must be unique and cannot be a null value. To set the name of the ONS 15216 EDFA3 NE:

Step 1 Log into TL1 for that particular NE. For example, enter:

telnet *IP-address* **3083**

Step 2 Enter the username and password. For example, enter:

ACT-USER::*username***:123::***password***;**

Step 3 Enter the following command to set the new name on the ONS 15216 EDFA3 NE:

ED-NE-GEN:::123:::NAME=*new-name***;**

Step 4 Enter the following command to verify that the name is correct:

RTRV-NE-GEN:::123;

Step 5 Enter the following command to log out:

CANC-USER::*username***:123;**

Note For passive ONS 15216 NEs, there is no communication between Prime Optical and the NE itself, and all the information is user-defined. For example, you can add inventory information in the Domain Explorer and add specific information (such as a serial number) in the NE Explorer. For passive ONS 15216 NEs with multiple slots, you can use the NE Explorer to specify the content of each slot. The information you define is maintained in the database and propagated to an external OSS by using Prime Optical GateWay/CORBA.

Prerequisites for Adding ONS 15305 NEs

Before adding ONS 15305 NEs to Prime Optical, be sure that a valid SNMP community string is set up on the ONS 15305 to allow performance monitoring and fault management data collection from the NE.

Note To enable you to add an ONS 15305 NE to Prime Optical, its SNMP Users table must contain the row 0.0.0.0 public true, where *public* is the community string. In addition, to obtain trap events from the NE, the Prime Optical server IP address must be added to the NE. See the Cisco Edge Craft user documentation for more information.

Important Note About Upgrading from ONS 15305 R2.0.2, R2.0.3, or R2.0.4 to ONS 15305 R3.0

When upgrading from ONS 15305 R2.0.2, R2.0.3, or R2.04 to ONS 15305 R3.0, note the following constraints:

- After you upgrade the NE to ONS 15305 R3.0, you must delete the R2.0 NE (with NE model "ONS 15305") from Prime Optical and add it again with the correct NE model attribute ("ONS 15305 CTC").
- All PM data that was collected before the upgrade will be lost.

These constraints exist because the NE service that manages the ONS 15305 R2.0.2, R2.0.3, and R2.0.4 is different from the NE service that manages the ONS 15305 R3.0.

Prerequisites for Adding ONS 15310 CL, ONS 15310 MA SONET, ONS 15310 MA SDH, ONS 15454 SONET, and ONS 15454 SDH NEs

Before adding ONS 15310 CL, ONS 15310 MA SONET, ONS 15310 MA SDH, ONS 15454 SONET, and ONS 15454 SDH NEs with ML-series cards to Prime Optical, be sure the NEs are set up as follows:

- Because Prime Optical does not support duplicate IP addresses, be sure that your ONS network does not contain duplicate IP addresses before adding ONS 15310 CL, ONS 15310 MA SONET, ONS 15310 MA SDH, ONS 15454 SONET, and ONS 15454 SDH NEs.
- A valid SNMP community string must be given when adding an NE with ML-series cards to resynchronize Syslog and Configuration events. Audit log messages will be added in case of a resynchronization failure.

Note For SNMPv3 node configuration, see Managing SNMPv3—CTC-Based Release 9.6 NEs, page 8-62.

- A trap destination with IP address equal to the Prime Optical server IP address, UDP port 162, SNMP version as SNMPv2c, maximum traps per second set to 0, and SNMP community string must be created and must allow SNMP sets to receive traps from ML-series cards.
- The Cisco IOS startup-config file must have the **snmp-server enable traps** command to receive traps from ML-series cards.
- Whenever the user changes the trap destination for NE IP address and port=162/391 in either CTC or Prime Optical, NEs must be out of service to resynchronize the ML-series card events and be registered for traps. Change the operational state of the NE to In Service after making the changes.
- CTC SuperUser credentials (NE username and password) are required to exploit full Prime Optical functionalities.
- If your network contains ML cards, SNMPv1/SNMPv2c uses the following configurations on GNEs and ENEs for traps:
  - GNE trap destination: Prime Optical server IP address
  - GNE trap port: 162
  - GNE community string: public
  - GNE version: v1 or v2c
  - ENE trap destination: GNE IP address
  - ENE trap port: 391
  - ENE community string: Same as on GNE
  - ENE version: v1 or v2c

Note Keep the SNMP version consistent across all the GNEs/ENEs in the ring.

Adding a DWDM Node to an Existing Multi-Service Transport Platform (MSTP) Network

Step 1 Mark the two NEs of the DWDM span (where you want to insert the new node) as Out of Service.

Step 2 Delete all invalid DWDM links between the two NEs from Prime Optical.

Step 3 Complete the steps in the *NTP-G129 Add a DWDM Node* section, described in the *Cisco ONS 15454 DWDM Procedure Guide*.

Step 4 Mark the two NEs as In Service. The newly added NE will be automatically discovered when the new links are running.

Prerequisites for Adding CPT 200 and CPT 600 NEs

If a CPT 200 or CPT 600 NE is connected to an ONS 15454 NE, the CPT NE model must match the ONS 15454 NE model. For example, if the ONS 15454 NE is added as a SONET NE, the CPT 200 or CPT 600 NE must be added as a SONET NE.

If the CPT 200 or CPT 600 NE is a standalone NE, the NE model is irrelevant.

Adding NEs

From the Domain Explorer or Subnetwork Explorer tree, you can use the Add New NE wizard to add a single NE or multiple NEs.

Note Prime Optical does not support duplicate IP addresses. Before adding NEs, be sure that your network does not contain duplicate IP addresses.

Adding a Single NE

Step 1 Select a node in the Domain Explorer or Subnetwork Explorer tree; then, choose **File > Add Network Element(s)** (or click the **Add Network Element(s)** tool). The Add New NE wizard opens. Table 3-5 provides descriptions.

Note You cannot add a new NE to the Discovered Network Elements or Deleted Network Elements groups.

Step 2 Enter the following information:

- NE model
- NE type

Step 3 Click one of the following radio buttons in the NE Addition area:

- **Single NE Addition**—To add only one NE.
- **Single NE Addition (Use TL1 Tunnel)**—To add only one tunnel NE (TNE). Prime Optical can connect to a TNE that belongs to an OSI network behind a non-Cisco GNE.

Step 4 Complete the following substeps if you are adding a single NE:

a. Click one of the following radio buttons in the IP Address area:

- IP
- Hostname

b. Enter the IP address or hostname; then, click **Add**.

Note You can enter an IP address in IPv4 or IPv6 format.

To enable you to add an NE using its hostname, the hostname must be resolved inside the Domain Name Service (DNS).

Step 5 Complete the following substeps if you are adding a single TNE:

a. Enter the gateway NE.

b. Click one of the following radio buttons:

- Use Default TL1 Port.
- Use Other TL1 Port—If selected, enter the TL1 port number.

c. Choose a TL1 encoding mode from the drop-down list.

d. Check the GNE Login Required check box if GNE login is required.

e. Enter the GNE TID (*available if the GNE Login Required check box is checked*)

Step 6 Click **Next**.

Note If you click **Finish** in this window, Cisco default values are assigned to the remaining fields. In addition, the NE is placed in a preprovisioned state, and discovery does not start automatically. If you want to add the NE in a nonpreprovisioned state, click **Next** and proceed to the next window; then, in the Operational State field, select a state other than Preprovisioned.

Step 7 Enter the following information. Fields shown depend on the NE type.

a. NE ID

Note

- Do not use "Prime Optical" as an NE ID because the Alarm Browser might contain Prime Optical alarms with the source ID "Prime Optical." It will be difficult to distinguish between NE alarms and Prime Optical alarms if they both have the same source ID. For the same reason, do not cause Prime Optical to automatically populate an NE whose NE ID is "Prime Optical."
- If you are using Prime Optical with Prime Central, do not use "None" or "All" as the NE ID, because those names have internal meaning to Prime Central.
- If the NE ID field is left blank, it will default to the IP address. After communication is established, Prime Optical discovers the NE ID from the NE.

b. Alias

c. Operational state

d. Description

e. Location name

f. Subnetwork ID

Note This field is dimmed when the Automatically Group NEs in Subnetworks check box is checked in the UI Properties pane of the Control Panel.

g. Network partition ID.

Step 8 Click the  icon to view the parameters.

Step 9 Click **OK** to change the discovery mode of the network partition.

Note You can also create new network partitions by clicking the ellipsis (...) icon. Specify a name and description for the new network partition.

Step 10 To view the threshold of the new network partition, the number of NEs (which will be 0), and the option to change the discovery mode, select either Manual or Automatic (the default) from the drop-down list.

If you choose Automatic, Prime Optical automatically discovers all NEs and adds them to the network partition. If you choose Manual, the NE is added and remains in the Undiscovered Network Elements folder (**Administration > Control Panel**).

Note If you have no NEs in a network partition but are still unable to change the discovery mode, check if the Allow Provisioning (**Administration > Control Panel > UI Properties**) check box is unchecked. Also, check the value of the Discovery Mode drop-down list.

Caution Be sure to specify the correct partition. If you specify the wrong partition, the new NE will not be added, and you will get an error message.

Step 11 Click **Next** if you are adding an ONS 15305, ONS 15327, ONS 15454 SONET, ONS 15454 SDH, or ONS 15600 SONET NE.

Note If you click Finish in this window, Cisco default values will be assigned to the remaining fields.

Step 12 Click **Finish** if you are adding an ONS 15216, ONS 15310 CL, ONS 15310 MA SONET, ONS 15310 MA SDH, ONS 15600 SDH, or Not Managed/Other Vendor NE.

Step 13 Select the grouping option for the NE.

Step 14 Click **Finish** to add the new NE to the domain.

Wait 2 to 5 minutes while the Prime Optical server completes the node discovery. (Not applicable if the operational state is Preprovisioned.)

Step 15 Check to see if the communication state is correct. If Prime Optical cannot connect to the NE, the NE displays an unavailable communication state icon in the tree.

Step 16 Verify that the NE software version is listed in the Supported NE table (Domain Explorer > Administration > Supported NE table). If it is not listed, see Adding a New NE Software Version to the Prime Optical Domain, page 4-35.

Adding Multiple NEs

Step 1 Select a node in the Domain Explorer or Subnetwork Explorer tree; then, choose **File > Add Network Element(s)** (or click the **Add Network Element(s)** tool). The Add New NE wizard opens. Table 3-5 provides descriptions.

Note You cannot add a new NE to the Discovered Network Elements or Deleted Network Elements group.

Step 2 Enter the following information:

- NE model.
- NE type.
- NE addition—Click the **Bulk NE Addition** radio button.

Note Bulk NE addition does not apply to passive ONS 15216 NEs or Not Managed/Other Vendor NEs.

- IP address range—Enter the IP addresses in the From and To fields; then, click **Add**.

Note The IP addresses must be from the same subnetwork.

You can enter IP addresses in IPv4 or IPv6 format. You can only enter IPv6 addresses if all of the selected NE models support IPv6. Prime Optical provides IPv6 support for the following NE releases: ONS 15310 MA SDH R9.3, ONS 15310 MA SONET R9.3, ONS 15454 SDH R9.3, and ONS 15454 SONET R9.3.

- IP address selection—Add or remove IP addresses using the **Add** or **Remove** button.

Step 3 Click **Next**.

Note If you click Finish in this window, Cisco default values are assigned to the remaining fields.

Step 4 Enter the following information. Fields shown depend on the NE type.

a. NE ID—*Display only.*

b. Alias—*Display only.*

c. Operational state.

d. Description.

e. Location name.

f. Subnetwork ID.

Note This field is dimmed when the Automatically Group NEs in Subnetworks check box is checked in the UI Properties pane of the Control Panel.

g. Network partition ID.

Step 5 Click the  icon to view the parameters.

Step 6 Click **OK** to change the discovery mode of the network partition.

Note You can also create new network partitions by clicking the ellipsis (...) icon. Specify a name and description for the new network partition.

Step 7 To view the threshold of the new network partition, the number of NEs (which will be 0), and the option to change the discovery mode, select either Manual or Automatic (the default) from the drop-down list.

If you choose Automatic, Prime Optical automatically discovers all NEs and adds them to the network partition. If you choose Manual, the NE is added and remains in the Undiscovered Network Elements folder (**Administration > Control Panel**).

Note If you have no NEs in a network partition but are still unable to change the discovery mode, check if the Allow Provisioning (**Administration > Control Panel > UI Properties**) check box is unchecked. Also, check the value of the Discovery Mode drop-down list.

Caution Be sure to specify the correct partition. If you specify the wrong partition, the new NE will not be added, and you will get an error message.

Step 8 Click **Next** if you are adding an ONS 15305, ONS 15327, ONS 15454 SONET, ONS 15454 SDH, or ONS 15600 SONET NE.

Note If you click Finish in this window, Cisco default values are assigned to the remaining fields.

Step 9 Click **Finish** if you are adding an ONS 15310 CL, ONS 15310 MA SONET, ONS 15310 MA SDH, or ONS 15600 SDH NE.

Step 10 Select the grouping option for the NE.

Step 11 Click **Finish** to add the NEs to the domain.

Wait 2 to 5 minutes while the Prime Optical server completes the node discovery. (Not applicable if the operational state is Preprovisioned.)

Step 12 Check to see if the communication state is correct. If Prime Optical cannot connect to the NE, the NE displays an unavailable communication state icon in the tree.

Step 13 Verify that the NE software version is listed in the Supported NE table (Domain Explorer > Administration > Supported NE table). If it is not listed, see Adding a New NE Software Version to the Prime Optical Domain, page 4-35.

Table 3-5 Field Descriptions for the Add New NE Wizard

Field	Description
NE Addition Panel	
NE Model	Select the NE model (Carrier Packet Transport 200, Carrier Packet Transport 200 SDH, Carrier Packet Transport 600, Carrier Packet Transport 600 SDH, Cisco ONS 15216 [all types], Cisco ONS 15305, Cisco ONS 15305 CTC, Cisco ONS 15310 CL, Cisco ONS 15310 MA SONET, Cisco ONS 15310 MA SDH, Cisco ONS 15327, Cisco ONS 15454 SONET, Cisco ONS 15454 SDH, Cisco ONS 15600 SONET, Cisco ONS 15600 SDH, or Not Managed/Other Vendor).
NE Type	Select the type of NE. Available types depend on the selected NE model.
NE Addition	Click one of the following radio buttons. The available fields change, depending on which option you select: • **Single NE Addition**—To add only one NE. • **Bulk NE Addition**—To add several NEs simultaneously. • **Single NE Addition (Use TL1 Tunnel)**—To add only one TNE.
IP Address	Click one of the following radio buttons: • IP—To enter an IP address in IPv4 or IPv6 format. • Hostname—To enter a hostname.

Table 3-5 Field Descriptions for the Add New NE Wizard (continued)

Field	Description
IP/Hostname (*for single NE additions*)	Enter a unique IP address or hostname for the NE. You can enter an IP address in IPv4 or IPv6 format. The IPv4 address must be in the form *ddd.ddd.ddd.ddd*, where *ddd* is a decimal octet expressed as an integer between 0 and 255. The first octet cannot be a zero. The IPv6 address is a 128-bit address (*hhhh:hhhh:hhhh:hhhh:hhhh:hhhh:hhhh:hhhh*) that is divided into 16-bit blocks, where each block is converted to a 4-digit hexadecimal number and separated by a colon (:). An IPv6 address is valid only if the NE model that you selected supports IPv6 addresses. **Note** Prior to the NE ID discovery, Prime Optical uses the NE IP address as a temporary NE ID. To enable you to add an NE using its hostname, the hostname must be resolved inside the DNS. The IP/Hostname field is unavailable when adding passive NEs and Not Managed/Other Vendor NEs.
From IP Address (*for bulk NE additions*)	Enter the beginning IP address for the range of NEs you want to add. **Note** You can enter an IP address in IPv4 or IPv6 format.
To IP Address (*for bulk NE additions*)	(Optional) Enter the ending IP address for the range of NEs you want to add. Click **Add** to add the range to the Selected IP field.
IP Address Selection (*for bulk NE additions*)	Select one or more IP addresses in the Deleted IP field and click **Add** to add them to the Selected IP field. Select one or more IP addresses in the Selected IP field and click **Remove** to remove them. Only the IP addresses in the Selected IP field are affected by clicking **Next**. **Note** You can add IPv6 addresses only if the selected NE model supports IPv6. Prime Optical provides IPv6 support for the following NE releases: ONS 15310 MA SDH R9.3, ONS 15310 MA SONET R9.3, ONS 15454 SDH R9.3, and ONS 15454 SONET R9.3.
Gateway NE (*for single TNE additions*)	If you selected Single NE Addition (Use TL1 Tunnel) in the NE Addition area, the Gateway NE area becomes visible. Fill in the following fields to add a TNE to the Prime Optical domain. The following NE models support TL1 tunnels: ONS 15310 CL, ONS 15310 MA SONET, ONS 15310 MA SDH, ONS 15327, ONS 15454 SONET, and ONS 15454 SDH. • GNE IP Address—IP address of the non-Cisco GNE that supports the TL1 tunnel. This field is mandatory. • Use Default TL1 Port—If selected, the default value for the TL1 port is used. • Use Other TL1 Port—If selected, specify the TL1 port number in the text field. • TL1 Encoding Mode—Specify the TL1 encoding mode: – LV + Base64 Payload: (Default) If selected, and if Use Default TL1 Port is selected, TL1 port 3081 is used. – LV + Binary Payload: If selected, and if Use Default TL1 Port is selected, TL1 port 3081 is used. – Raw: If selected, and if Use Default TL1 Port is selected, TL1 port 3082 is used. • GNE Login Required—If checked, a login is required on the non-Cisco GNE. The GNE login uses the following settings: – GNE TID: The value specified in the GNE TID field. – Username and password: The values specified in the Control Panel > Security Properties pane > CTC-Based SDH or CTC-Based SONET tab > Server - GNE Connection (TL1 Tunnel) area.

Table 3-5 Field Descriptions for the Add New NE Wizard (continued)

Field	Description
NE Properties Panel	
NE ID	Enter a unique name for the NE in the form of an ASCII text string. Apostrophes (') and quotation marks (") are not accepted. The NE ID you enter should be the same as the NE ID that is configured on the NE itself. If it is not the same, this field will be updated with the NE hostname. **Note** Do not use "Prime Optical" as an NE ID because the Alarm Browser might contain Prime Optical alarms with the source ID "Prime Optical." It will be difficult to distinguish between NE alarms and Prime Optical alarms if they both have the same source ID. For the same reason, do not cause Prime Optical to automatically populate an NE whose NE ID is "Prime Optical." **Note** If the NE ID field is blank, it will default to the IP address. After communication is established, Prime Optical autodiscovers the NE ID from the NE.
Alias	Enter a unique alias name for the NE. The alias name can contain alphanumeric characters. It can also contain characters from international character sets.
Operational State	Specify the operational state of the NE. There are four states: • Preprovisioned—The NE has been added to the database for provisioning but is not yet in service. • Under Maintenance—The NE is temporarily under maintenance but requires monitoring. • In Service—The NE is currently deployed and requires monitoring. • Out of Service—The NE has been marked Out of Service and does not require monitoring.
SNMP Community String	Enter the SNMP community string for the NE. The Cisco default is **public**. **Note** The SNMP community string applies only to the ONS 15216 EDFA2, ONS 15216 EDFA3, ONS 15305, ONS 15310 CL, ONS 15310 MA SONET, ONS 15310 MA SDH, ONS 15327, ONS 15454 SONET, and ONS 15454 SDH NEs.
Description	Enter a description of the NE.
Location Name	Enter the NE geographic location.
Subnetwork ID (*not selectable if automatic subnetwork grouping is enabled*)	Select the subnetwork ID associated with the NE.
Network Partition ID	Select the network partition associated with the NE. To add a CTC-based NE that was discovered manually, do the following: • To view the NE partition details, click the  icon next to the NE partition ID. • Click **OK** to change the discovery mode. The discovery mode can be changed only if the network partition is empty. • You can also create new network partitions by clicking the ellipsis (...) icon. Specify a name and description for the network partition. **Note** When you are adding manually discovered NEs to a network partition, only the partitions that are compatible with the selected NE model are listed.

Table 3-5 Field Descriptions for the Add New NE Wizard (continued)

Field	Description
Group Properties Panel	
Grouping Option for Discovered NEs	Select one of the following grouping options for the discovered NEs: • Group discovered NEs in the Discovered Network Elements group • Group NEs with the NE that discovered them (Cisco default) • Group NEs by subnet **Note** If you are adding manually discovered NEs, the first option is preselected, and the other options are dimmed. To move an NE, cut and paste it into the desired group.

Note

- For Prime Optical to communicate with certain NE types, you must set the username and password that the Prime Optical server uses to establish a session with the NE. To enter user information, choose **Administration > Control Panel > Security Properties** tab; then, enter the username and password on the **ONS 15216 EDFA2**, **ONS 15216 EDFA3**, **ONS 15216 OADM**, **ONS 15305 CTC, ONS 15327**, **ONS 15454**, **ONS 15454 SDH**, **ONS 15600 SDH**, or **ONS 15600** tab.
- Regardless of the actual length of the password, the Password and Confirm Password fields display only a fixed-length string of 15 asterisks (*).
- For more information, see Configuring Prime Optical Security Parameters, page 8-29. For NEs that do not use SNMP, you can set the username and password in the NE Authentication tab of the Domain Explorer. For more information, see Setting NE Authentication, page 8-40.
- When adding more than one data communications channel (DCC)-connected, CTC-based NE, add one NE to a subnetwork and allow the other NEs to be automatically discovered and placed in the same subnetwork. When moving NEs from one subnetwork to another, move all DCC-connected NEs to the same subnetwork. Move the entire subnetwork instead of splitting DCC-connected NEs between subnetworks.
- Errors encountered while adding NEs are listed in the Error Log.

Copying an NE from One Group to Another

Groups for multiple users can easily be created in Prime Optical. Just copy the same NE into different groups.

Step 1 In the Domain Explorer tree, select the NE to be copied.

Step 2 Choose **Edit > Copy** (or click the **Copy** tool).

Step 3 Select the group or management domain node where the NE will be pasted and choose **Edit > Paste** (or click the **Paste** tool). This pastes the NE under the selected node.

Note You cannot paste an NE in the Discovered Network Elements or Deleted Network Elements groups. Also, you cannot paste an NE in a group where the same instance of the NE already exists.

Tip The drag-and-drop feature can also be used to copy NEs. Use the mouse to drag and drop the NE to a new location.

Note Since they cannot see the entire domain, users with the Assign NEs property (Provisioner, Operator, and some custom user profiles) are not allowed to modify the topology using copy, cut, paste, or drag and drop.

Moving an NE from One Group to Another

Prime Optical provides drag-and-drop capabilities to allow you to easily move NEs from one group to another.

Step 1 In the Domain Explorer tree, select the NE to be moved.

Step 2 Choose **Edit > Cut**, then **Edit > Paste**. You can also use the mouse to drag and drop the selected NE to a new location.

Note You cannot copy or move NEs into the Discovered Network Elements group.

Note Since they cannot see the entire domain, users with the Assign NEs property (Provisioner, Operator, and some custom user profiles) are not allowed to modify the topology using copy, cut, paste, or drag and drop.

Moving an NE from One Network Partition to Another

Caution Prime Optical cannot manage circuits across network partitions. Be sure that all connected NEs are managed under the same network partition.

Note Do not add SONET and SDH NEs in the same network partition.

Step 1 In the Domain Explorer tree, select **File > Subnetwork Explorer**. The Subnetwork Explorer opens.

Step 2 Identify the network partition ID:

a. In the Subnetwork Explorer tree, click the new network partition where you will move the NE.

b. In the Network Partition Properties pane, click the **Identification** tab.

Step 3 Identify the subnetwork(s) assigned to the new network partition.

Note A subnetwork can only be assigned to one network partition.

Step 4 In the Domain Explorer, click the NE to be moved. In the Network Element Properties pane, click the **Address** tab.

Step 5 Change the subnetwork ID to a subnetwork ID assigned to the new network partition. Choose from the list of subnetwork IDs; then, click **OK**.

Step 6 Click **Save**.

Automatically Grouping NEs in Subnetworks

Note An NE can be assigned to only one subnetwork.

Prime Optical allows you to automatically group NEs in a subnetwork. When this feature is enabled, Prime Optical automatically creates the subnetwork, which consists of NEs that are connected by topological links; you cannot change the subnetwork of the NE. This means that:

- When adding a new NE, the option to select the subnetwork ID is disabled. The Subnetwork ID field displays *System Default*.
- In the Address tab of the Domain Explorer > Network Element Properties pane, you cannot change the subnetwork ID.
- You cannot drag and drop NEs in the Subnetwork Explorer tree.

Complete the following steps to automatically group NEs in a subnetwork:

Step 1 In the Domain Explorer window, choose **Administration > Control Panel** and click **UI Properties**.

Step 2 In the Subnetwork Grouping area, check the **Automatically Group NEs in Subnetworks** check box.

Step 3 Click **Save**.

Note If a topological link is deleted while NEs are automatically grouped in subnetworks, Prime Optical deletes isolated NEs, creates a new subnetwork, and moves the deleted NEs to the new subnetwork.

If a topological link is discovered or added manually, it will result in a network that contains disjointed

subnetworks. Prime Optical deletes the NEs from the disjointed subnetwork that contains fewer NEs, deletes the disjointed subnetwork, and adds the deleted NEs to the subnetwork where the topological link was added manually.

Deleting NEs

From the Domain Explorer tree, you can delete a single NE, multiple NEs, or out-of-service NEs.

Note All links from the NE are deleted automatically from the database during the purge phase of NE deletion. The purge process does not start if there are valid links on the NEs scheduled for permanent deletion. You must wait until all links on the NE become invalid and then try again.

Deleting a Single NE

Only out-of-service or preprovisioned NEs can be placed in the Deleted Network Elements group.

If a CTC-based NE is deleted and then DCC connectivity to the deleted NE is removed, Prime Optical rediscovers the deleted NE. If DCC connectivity is removed *before* deleting the NE, Prime Optical does not rediscover the NE. Therefore, remove DCC connectivity to the NE before deleting the NE from Prime Optical.

Step 1 In the Domain Explorer tree, select the NE that will be deleted.

Step 2 In the Status tab of the Network Element Properties pane, set the Operational State field to **Out of Service**; then, click **Save**. Click **Yes** in the confirmation dialog box.

Note If there is more than one instance of an NE (that is, if the NE was copied so two versions exist), you do not need to move the NE to Out of Service before deleting it.

Step 3 You can delete either a selected instance of the NE or all instances of the NE:

- Deleting the selected instance of the NE—Only the specific NE that you selected in the Domain Explorer tree is deleted. To delete the selected instance of the NE, choose **Edit > Delete**; then, click **Yes**. If this is the last instance of the NE, the NE is placed in the Deleted Network Elements group.

  Note A GNE that has associated subtending NEs cannot be deleted. A subtending NE can be disassociated from the GNE by removing the NE from the Prime Optical domain or by assigning it to a different GNE.

- Deleting all instances of the NE—All NEs in the user domain that have the same NE ID are deleted. To delete all instances of the selected NE, choose **Edit > Delete All**; then, click **Yes** in the confirmation dialog box. The NE is placed in the Deleted Network Elements group.

Note Check the Audit Log to confirm that the selected NE has been successfully deleted from the database. The deletion is not complete until the following message is displayed in the Audit Log: *AUD-5015 NE ID has been successfully purged*. See Viewing the Audit Log, page 8-70 for information on how to view the Audit Log.

No client views for an NE can be opened in the Deleted Network Elements group. Also, no properties of a deleted NE can be modified. The deleted NE and its associated data are removed from all client views except the Domain Explorer.

Step 4 To purge the NEs in the Deleted Network Elements group, see Removing a Deleted NE, page 3-23.

Deleting Multiple NEs

Step 1 For each NE that will be deleted:

a. In the Domain Explorer tree, select the NE that will be deleted.

b. In the Status tab of the Network Element Properties pane, set the Operational State field to **Out of Service**; then, click **Save**.

Step 2 In the Domain Explorer tree, select again all the NEs that will be deleted. To select multiple NEs, press and hold down the **Ctrl** button; then, click each NE that will be deleted.

Step 3 You can delete the selected instance of the NEs or all instances of the NEs:

- Deleting the selected instance of the NE—Only the specific NEs that you selected in the Domain Explorer tree will be deleted. To delete the selected instance of the NEs, choose **Edit > Delete**; then, click **Yes** in the confirmation dialog box. If the selected NEs are the last instance of the NE, the NEs are placed in the Deleted Network Elements group.

  Note A GNE that has associated subtending NEs cannot be deleted. A subtending NE can be disassociated from the GNE by removing the NE from the Prime Optical domain or by assigning it to a different GNE.

- Deleting all instances of the NEs—All NEs in the user domain that have the same NE ID as the NE being deleted will be deleted. To delete all instances of the selected NEs, choose **Edit > Delete All**; then, click **Yes** in the confirmation dialog box. The NEs are placed in the Deleted Network Elements group.

  Note Both the Delete and Delete All menu options are enabled if at least one of the selected NEs can be deleted. The confirmation dialog box lists the NEs that can and cannot be deleted.

  Note Check the Audit Log to confirm that the selected nodes have been successfully deleted from the database. The deletion is not complete until the following message is displayed in the Audit Log: *AUD-5015 NE ID has been successfully purged*. See Viewing the Audit Log, page 8-70 for information on how to view the Audit Log.

  Note You can use the mouse to drag and drop the selected NEs to the Deleted Network Elements group only if all the selected NEs can be deleted.

Step 4 To purge the NEs in the Deleted Network Elements group, see Removing a Deleted NE, page 3-23.

Using the prune_ne.sh Script to Remove an Out-of-Service NE from the Database

Note It is recommended that you delete an out-of-service NE from the Prime Optical client (see Deleting a Single NE, page 3-21 or Deleting Multiple NEs, page 3-22), because doing so does not involve stopping and starting the Prime Optical server.

Aside from using the Domain Explorer to remove an out-of-service NE from the database, you can also use the **prune_ne.sh** script.

Note Shut down the Prime Optical server and all Prime Optical clients before running the prune_ne.sh script.

Step 1 In the Domain Explorer tree, select the NE that will be removed.

Step 2 In the Status tab of the Network Element Properties pane, set the Operational State field to **Out of Service**; then, click **Save**.

Step 3 Close the Prime Optical client.

Step 4 Log into the Prime Optical server as the root user and enter the following command to stop the server:

```
opticalctl stop
```

Step 5 Enter the following command to verify that all Prime Optical processes have stopped:

```
opticalctl status
```

a. If any processes are still running, enter the following command:

```
kill -9 process-id
```

b. Re-enter the following command to verify that the processes have stopped:

```
opticalctl status
```

Step 6 Change the directory to /opt/CiscoTransportManagerServer/bin and enter the following command:

```
prune_ne.sh NE-name
```

Step 7 Enter the following command to start the Prime Optical server:

```
opticalctl start
```

Removing a Deleted NE

Complete the following steps to remove an NE from the client view and delete all records associated with the NE from the database:

Step 1 In the Domain Explorer tree, click the **Deleted Network Elements** group.

Step 2 Click the NE that will be removed from the Prime Optical domain.

Step 3 Choose **Edit > Delete**; then, click **Yes**.

One of the following happens:

- The NE purge begins for NEs without any valid links.

- If the NEs that are scheduled for permanent deletion contain any valid links, the purge process does not start. You must wait until all links become invalid; then, then try again.

While the purge is in progress, the following icon is displayed in the Domain Explorer tree.

Figure 3-1 Domain Explorer Icon—NE Purge In Progress

If the NE purge fails, the following icon is displayed in the Domain Explorer tree. The Audit Log reports the purge failure. You can repeat the purge and view the progress.

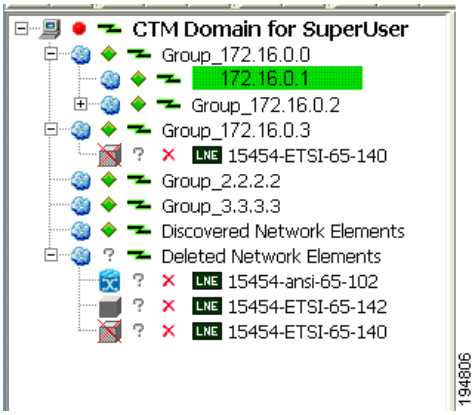
Figure 3-2 Domain Explorer Icon—NE Purge Failed

Step 4 When the NE purge completes successfully, the NE is removed from the Deleted Network Elements group.

The following figure shows the different purge states, where:

- 15454-ansi-65-102—NE has been deleted but not yet purged.
- 15454-ETSI-65-142—Purge is in progress.
- 15454-ETSI-65-140—Purge failed.

Figure 3-3 Sample Purge States: Deleted, In Progress, Failed



Note

- Wait until all records associated with the NE are deleted from the database before adding the NE back again.
- The amount of time it takes to prune NEs depends on the amount of data that needs to be removed, the amount of data in the database, the system performance, and so on. The Deleted Network Elements group is visible to users who have the add_delete_NE_group permission. You can purge or undelete an NE that is in the Deleted Network Elements group only if that NE was assigned to you.

Restoring a Deleted NE

Step 1 In the Domain Explorer tree, click the Deleted Network Elements group.

Step 2 Click the NE to restore.

Step 3 Choose **Edit > Undelete**.

Prime Optical restores the selected NE under the management domain node.

Searching for an NE

Prime Optical allows you to search for a specific NE in the network. See Finding Data in the Domain Explorer, page 1-37.

How Do I Build Links?

A link is a connection between two termination points (TPs). Prime Optical represents the physical connectivity between NEs in the domain by defining the physical links between NEs. It is through these links that circuits (if supported on the NE) are provisioned. Links can be viewed, modified, created, and deleted. Prime Optical automatically discovers links between CTC-based (including the ONS 15305 R3.0) NEs. For CTC-based NEs, links are autodiscovered only when the DCCs are created on both ends of the link. For the ONS 15216, links are manually added.

Note An autodiscovered link between two TPs will override previously autodiscovered links and any manual links on any of the TPs.

Overview of Supported Links

Links can be created at different layer rates depending on the card type. See Table 3-6 for the links supported between NEs at compatible layer rates. See Table 3-7 for the supported links per layer rate.

Note Links can be created for a Not Managed/Other Vendor NE only if the NE is in service or under maintenance. Links created for CTC-based NEs are for circuit routing purposes only. Links created for Not Managed/Other Vendor NEs are not used for circuit routing.

Note Physical nonroutable links can be created between NEs that are in the same or a different network partition(s).

Links between TXP_MR_2.5G, TXPP_MR_2.5G, MXP_2.5G_10G, TXP_MR_10G, 2.5G_DM, 2.5G_DMP, TXP_MR_10E, or MXP_MR_10E cards are automatically discovered and cannot be manually created. They can exist if:

- The layer rate is Optical Channel Layer (OCH).
- Both cards support the same wavelength.
- The links are bidirectional.

Links between TXP_MR_2.5G, TXPP_MR_2.5G, MXP_2.5G_10G, TXP_MR_10G, 2.5G_DM, 2.5G_DMP, TXP_MR_10E, MXP_MR_10E cards or DWDM cards are manually created and cannot be automatically discovered. They can be created if:

- The layer rate is Physical.
- The link is unidirectional.
- The link rate is 10G ITU if a MXP_2.5G_10G, TXP_MR_10G, TXP_MR_10E or MXP_MR_10E card is used at one end of the link, or 2.5 G ITU if a TXP_MR_2.5G, TXPP_MR_2.5G, 2.5G_DM or 2.5G_DMP card is used at one end of the link.
- The link is unprotected.
- The link is created between TXP_MR_2.5G, TXPP_MR_2.5G, MXP_2.5G_10G, TXP_MR_10G, 2.5G_DM, 2.5G_DMP, TXP_MR_10E, or MXP_MR_10E trunk ports and DWDM channel ports.
- DWDM channel ports are unidirectional and can only be used as the link source if they are transmit ports and as the link destination if they are receive ports.
- The working wavelength of TXP_MR_2.5G, TXPP_MR_2.5G, MXP_2.5G_10G, TXP_MR_10G, 2.5G_DM, 2.5G_DMP, TXP_MR_10E, and MXP_MR_10E cards is equal to the expected wavelength set on the DWDM channel port on the other end of the link.

Prime Optical discovers links that are created in CTC as L2 trunk-to-trunk links and displays them with a layer rate of L2. Only 10GE_XP and GE_XP cards in L2 mode support L2 trunk-to-trunk links.

When a DWDM transponder card (including a DWDM line card) is used as the destination of a manual link with a channel port, the wavelength is not calculated, because the physical connection works correctly. Therefore, verify that you want to create a manual link between a given channel (for example, a demux card) and a TXP card whose trunk port is set to a different wavelength.

Table 3-6 Links Supported Between NEs at Compatible Layer Rates

NE Model	Supports Links with These NEs at Compatible Layer Rates
ONS 15216	ONS 15216
	ONS 15327
	ONS 15454 SONET/SDH
	ONS 15600 SONET
ONS 15305 (R2.x)	ONS 15305
	ONS 15327
	ONS 15454 SONET/SDH
	ONS 15600 SONET/SDH
ONS 15305 (R3.0)	ONS 15305
	ONS 15327
	ONS 15454 SONET/SDH
	ONS 15600 SONET/SDH
	Unmanaged NEs
ONS 15310 CL	ONS 15310 CL
	ONS 15310 MA SONET/SDH
	ONS 15327
	ONS 15454 SONET/SDH
	ONS 15600 SONET/SDH
ONS 15310 MA SONET	ONS 15310 CL
	ONS 15310 MA SONET/SDH
	ONS 15327
	ONS 15454 SONET/SDH
	ONS 15600 SONET/SDH
ONS 15310 MA SDH	ONS 15310 CL
	ONS 15310 MA SONET/SDH
	ONS 15327
	ONS 15454 SONET/SDH
	ONS 15600 SONET/SDH

Table 3-6 Links Supported Between NEs at Compatible Layer Rates (continued)

NE Model	Supports Links with These NEs at Compatible Layer Rates
ONS 15327	ONS 15216
ONS 15454 SONET	—
ONS 15454 SDH	ONS 15305
	ONS 15310 CL
	ONS 15310 MA SONET/SDH
	ONS 15327
	ONS 15454 SONET/SDH
	ONS 15600 SONET/SDH
	Unmanaged NEs
ONS 15600 SONET	ONS 15216
ONS 15600 SDH	ONS 15305
	ONS 15310 CL
	ONS 15310 MA SONET/SDH
	ONS 15327
	ONS 15454 SONET/SDH
	ONS 15600 SONET/SDH
Unmanaged NEs	ONS 15305 (R3.0)
	ONS 15327
	ONS 15454 SONET/SDH
	Unmanaged NEs

Table 3-7 Supported NE Links

NE Model	NE Card	Physical	OTS	OMS	OCH	SONET/SDH	Layer 2
ONS 15216	**100-GHz Filter**	X		X			
	100-GHz OADM 1/2/4	X		X			
	200-GHz Filter	X		X			
	200-GHz OADM 1/2	X		X			
	DCU	X					
	EDFA 1	X	X				
	EDFA2	X	X				
	EDFA3	X	X				
	FlexLayer	X		X			
	OSC	X		X			

Table 3-7 Supported NE Links (continued)

NE Model	NE Card	Physical	OTS	OMS	OCH	SONET/SDH	Layer 2
ONS 15305	STM-1	X				X	
	STM-4	X				X	
	STM-16	X				X	
ONS 15310 CL	CTX-CL600 (OC-3 port)	X				X	
	CTX-CL600 (OC-12 port)	X				X	
	PoS						X
ONS 15310 MA SONET	CE-MR-6						X
	CTX-2500 (OC-3 port)	X				X	
	CTX-2500 (OC-12 port)	X				X	
	CTX-2500 (OC-48 port)	X				X	
	PoS						X
ONS 15310 MA SDH	CE-MR-6						X
	CTX-2500 (STM-1 port)	X				X	
	CTX-2500 (STM-4 port)	X				X	
	CTX-2500 (STM-16 port)	X				X	
	PoS						X
ONS 15327	E10/100-4						X
	G1000-2						X
	OC-3/STM-1	X				X	
	OC-12/STM-4	X				X	
	OC-48/STM-16	X				X	

Table 3-7 Supported NE Links (continued)

NE Model	NE Card	Physical	OTS	OMS	OCH	SONET/SDH	Layer 2
ONS 15454 SONET and ONS 15454 SDH	10GE_XP and GE_XP				X		X
	32MUX-O	X					
	32DMX-O	X					
	4MD-xx.x	X					
	AD-1C-xx.x	X					
	AD-2C-xx.x	X					
	AD-4C-xx.x	X					
	CE-MR-10						X
	E100T-12						X
	E100T-12-G						X
	E1000-2						X
	E1000-2-G						X
	ML100-12						X
	ML1000-2						X
	MXP_2.5G_10G	X			X		
	OC-3/STM-1	X				X	
	OC-12/STM-4	X				X	
	OC-48/STM-16	X				X	
	OC-48/STM-16 ITU	X			X		
	OC-192/STM-64	X				X	
	OC-192/STM-64 ITU	X			X		
	OPT-AMP-C	X	X				
	OPT-BST	X	X				
	OPT-RAMP-C	X	X				
	OSC-CSM	X	X				
	OTU2-XP	X			X		
	TXP_MR_2.5G and TXPP_MR_2.5G	X			X		
	TXP_MR_10G	X			X		
ONS 15600 SONET	ASAP (OC-3 port)	X				X	
	ASAP (OC-12 port)	X				X	
	ASAP (OC-48 port)	X				X	
	OC-48	X				X	
	OC-192	X				X	
ONS 15600 SDH	STM-16	X				X	
	STM-64	X				X	

Viewing the Link Table

The Link table shows information about each link attribute. Use the Link table to view, modify, and delete links. You can open the Link table for the Prime Optical domain, network partition, subnetwork, group, or NE.

- If you select the Prime Optical domain, network partition, subnetwork, or group, the Link table shows all links that terminate on any of the NEs contained in the Prime Optical domain, subnetwork, or group.
- If you select an NE, the Link table shows all links that terminate on that particular NE.

Use one of the following methods to open the Link table:

- From the Network Map—In the Domain Explorer or Subnetwork Explorer, choose **File > Network Map**. In the Network Map, select a network partition, subnetwork, group, or NE; then, choose **Configuration > Link Table**.
- From the Network Map—Right-click a link or server trail and choose **Link Table** from the shortcut menu.
- From the Domain Explorer—Select the Prime Optical domain, group, or NE; then choose **Configuration > Link Table**.
- From the Subnetwork Explorer—Select the Prime Optical domain, network partition, subnetwork, or NE; then, choose **Configuration > Link Table**.

Note

- A link is visible in the Link table even if the source or destination NE has been deleted, but this same link is not visible in the Network Map. If the NE is deleted from the Deleted Network Elements group, the references to that NE are removed from the Link table.
- When launching the Link table in a large or high-end network setup and on a larger scope (for example, for the Domain Explorer), a database timeout can occur due to the large volume of data that needs to be retrieved. As a workaround, launch the Link table on a smaller scope.

Note the following constraints for OCH unidirectional and bidirectional patchcord links, Optical Transmission Section (OTS) links, Y-cable patchcord links, server trail links, and autodiscovered links:

- An invalid patchcord link is a link that has been deleted from the Network Control Protocol (NCP) layer but is still present in the Prime Optical database. The resources allocated for the patchcord link are freed up and made available for a new link.
- Invalid links are shown in strikethrough font.
- An invalid patchcord link is removed from the Prime Optical database and disappears from the Link table only if a Prime Optical user deletes that link. All logical and physical resources are released from the deleted link.
- If the Link table contains an invalid patchcord link and you create a new patchcord link using the same termination points and attributes as the invalid link, the invalid patchcord link becomes valid and is shown in the Link table as a valid link.

- When an invalid patchcord link becomes valid, the link name changes. Prime Optical uses link identification numbers to create the patchcord link name. The NCP layer associates identification numbers to both terminations during the link creation phase. These numbers are used to identify the patchcord link inside the NCP layer and are required to delete the patchcord link. To change the patchcord link name:
  1. Use the Create Link wizard to create a new patchcord link.
  2. Force the patchcord link validity to change to INVALID (for example, by marking the NE as Out of Service or deleting the patchcord link).
  3. Create a new patchcord link that uses the same termination points and attributes as the invalid link.
  4. View the patchcord link name in the Link table. The link name has changed.

The following table describes the fields in the Link table.

Table 3-8 Field Descriptions for the Link Table

Field	Description
Link Alarm Severity	Highest severity alarm associated with the selected link.
Link Source ID	ID of the link source.
Link Source Termination Point	PTP of the link source.
Link Destination ID	ID of the link destination.
Link Destination Termination Point	PTP of the link destination. Because a link can have up to two destinations on the same NE, a "DST1" or "DST2" label is affixed to the destination to indicate the destination number.
Layer Rate	Layer rate, defined as per ITU-T standard G.872 for multilayered optical networks. Values are Physical, Transmission Section, Optical Multiplex Section (OMS), OCH, SONET/SDH, Layer 2, Composite, and OTU.
Layer Detail	Bandwidth of the link as per the layer rate: • For SONET links, the link rate is OC-3, OC-12, OC-48, OC-192, or Layer 2, depending on the NE configuration. • For SDH links, the link rate is STM1, STM-4, STM-16, STM-64, or Layer 2. • For DWDM links, the link rate is 40G ITU, 10G ITU, 2.5G ITU, or OTS. • For OCH links, the link rate is 10G ITU or 2.5G ITU. • For patchcord links on Layer 2, the link rate is 10G ITU, 1G ITU, or Fast Ethernet. • For links between Not Managed/Other Vendor NEs, the link rate is Not Applicable. • For links between Not Managed/Other Vendor NEs and a CTC-based NE, the rate is that of the CTC-based NE. Links between a SONET/SDH link and a Not Managed/Other Vendor NE depend on the link source. If the link source is the Not Managed/Other Vendor NE, the layer rate is Not Applicable. If the link source is the SONET/SDH link, the layer rate is that of the SONET/SDH link. For server trails, this field displays the server trail type and the number of server trails.
Link Direction	Whether the link is unidirectional or bidirectional.

Table 3-8 Field Descriptions for the Link Table (continued)

Field	Description
Link Provision Type	Whether the selected link is automatically discovered by an NE. Values are: • Manual—For manual links. • Auto—For automatically discovered links. • PatchCord—For patchcord links. For server trails, the value displayed is *Server Trail*. **Note** Autodiscovered links between transponder or muxponder cards on release 4.6 NEs are always reported with a constant size, regardless of payload type.
Is Link Valid	Validity of the link. Values are Valid or Invalid. For autodiscovered links, the value is Valid if both the terminating NEs are in service and the NEs are able to confirm the presence of the link. An autodiscovered link is invalid if (1) the DCC is disabled on either PTP; (2) either PTP is marked as Out of Service (OOS); (3) there is a fiber cut or transmitter/receiver failure; or (4) either NE is marked as OOS. The following rules apply to link validity: • All invalid links are shown as gray in the Network Map. • Valid links are shown in the Network Map with a color corresponding to alarm severity, with green for no alarm, yellow for minor alarms, orange for major alarms, and red for critical alarms. • Manual and unmanaged links can be valid or invalid. • A link between an unmanaged NE and a managed NE can be valid or invalid. If the link is valid, it is shown with the same color as the PTP alarm on the managed NE. • The delete link operation is available for all links except for valid, autodiscovered links. You can delete links of the following type: – Manual (valid and invalid) – Virtual (valid and invalid) – Unmanaged (valid and invalid) – Invalid autodiscovered
Link Connection Type	Whether the link connection is inter-NE or intra-NE. An inter-NE link represents an external fiber connection between PTPs on different NEs. An intra-NE link represents a fiber connection between two PTPs on the same NE.
Link Protection Type	Whether the link protection is unprotected, 1+1, 1+1 with Y-cable protection, 2-fiber BLSR/MS-SPRing, 4-fiber BLSR/MS-SPRing, or not applicable. The Y-cable protection type also applies to ONS 15454 SONET and ONS 15454 SDH NEs.
Used for Routing	Whether the selected link is used for routing. Values are Yes or No.
Link Name	Name of the selected link. **Note** The names of bidirectional links are prone to change when they are rediscovered as a result of a system restart. Prime Optical assigns names to the links, combining their source and destination points. Because the links are bidirectional, the order of the source and destination points could change when the links are rediscovered.
Link Description	User-entered description of the selected link. If you do not modify the *System Default* string in the Create Link wizard, the description is a string built from the endpoint information.

Table 3-8 Field Descriptions for the Link Table (continued)

Field	Description
Alarm Counts	Total number of critical, major, minor, and warning alarms associated with the selected link.
Link Cost	Numeric cost associated with the selected link. The link cost is used while routing a circuit. The lowest link cost is preferred in circuit routing. The Cisco default value is 1024. This attribute is editable for manual links in the SONET or SDH layer.
Shared Risk Link Groups	(SONET/SDH layer rates only) Free-format string that represents the shared risk link group (SRLG), or a group of links that share a common risk. For example, a set of links that originate at a node share the node as the common risk. SRLGs allow you to classify links into logical groups. By grouping the links, you can specify diverse link routing for a circuit. That is, if the circuit is fully protected, it is routed on the working and protect paths with a diverse SRLG attribute. The Shared Risk Link Groups field supports up to 5 comma-separated values, with 32 characters per value.
Link Utilization	Link utilization information for Layer 3, SONET/SDH, and OTS links. For non-Layer 3, non-SONET/SDH, non-OTS links, this field shows Not Applicable. For detailed information about link utilization, see Viewing Link Utilization, page 3-43.
Link Alias Name	Alias name of the link.

Filtering the Link Table

Step 1 In the Link table, choose **File > Filter**. The Filter dialog box opens.

Step 2 Specify the filter parameters described in the following table.

Step 3 Click **OK** to run the filter.

Table 3-9 Field Descriptions for the Link Table Filter Dialog Box

Field	Description
Source/Destination ID	Filters by source/destination IDs of the available NEs. Click **Add** and **Remove** to move NEs to and from the Selected NEs list.
Connection Type	Filters out inter-NE or intra-NE links. By default, all links are shown. You can also filter on server trails.
Link Layer	Filters by layer combination. You can select any subset of the following layers: Physical, OTS, OMS, OCH, SONET/SDH, Layer 2, Layer 3, and OTU.

Creating Links

Step 1 Open the Create Link wizard by using one of the following methods:

- From the Network Map—Select the source NE and choose **Configuration > Create Link** (or right-click the NE and choose **Create Link**). Connect the line to the destination NE or click the map. The Create Link wizard opens. The Link Destination panel displays a list of NEs that support compatible layer rates with the source NE.
- From the Domain Explorer or Subnetwork Explorer—Select the source NE and choose **Configuration > Create Link** (or right-click the NE and choose **Create Link**). The pointer changes to a plus sign; select the destination NE or group. The Create Link wizard opens.

Note If you press the **Esc** key while the plus sign is enabled, the operation is canceled and the plus sign returns to a pointer.

Note Table 3-10 describes the fields in the Create Link wizard. Fields shown depend on the NE selected.

Step 2 Create the link, as follows:

a. Enter the following information in the Link Attributes panel:

- Name
- Link alias
- Description
- Provision type
- Layer
- Layer detail

Note Links from a Not Managed/Other Vendor NE to a CTC-based or Not Managed/Other Vendor NE will have a link rate of Not Applicable. Links from a CTC-based NE to a Not Managed/Other Vendor NE will have the link rate allowed for the CTC-based NE.

Note The layer details displayed in the Create Link wizard are based on the NE selected as the link source. For example, when you attempt to create a link from NE A to NE B, the link sizes displayed are based on the supported sizes and inventory of NE A. If the link is attempted in the reverse direction, from NE B to NE A, the link sizes displayed are based on the inventory and sizes for NE B. As a result, the link sizes displayed could differ when the operation is attempted differently. An error message is displayed in the Link Destination panel when the size displayed is not applicable for the destination NE.

- Wavelength (available only if the layer is *Optical Channel*, the provisioning type is *Patchcord,* and the direction is *Unidirectional*)
- Protection
- Direction

Note Prime Optical allows creation of bidirectional SONET/SDH links as well as unidirectional and bidirectional physical links.

If the layer rate is SONET/SDH or Layer 2, only bidirectional links are available. For other layer rates, both unidirectional and bidirectional links are available.

- Cost
- Shared risk link groups

b. Click **Next**.

c. Enter the following information in the Link Source panel:

- Node
- PTP slot
- PTP port
- PTP value
- Name

d. Click **Next**.

e. Enter the following information in the Link Destination panel:

- Node
- PTP slot
- PTP port
- PTP value
- Name

Note A PTP can be associated with only one bidirectional link or two unidirectional links at a particular layer rate for all NEs except Not Managed/Other Vendor NEs. For Not Managed/Other Vendor NEs, a PTP can terminate in only one link.

Note If you are creating a SONET/SDH-layer manual link between two CTC-based NEs, verify that no DCC exists on the endpoints that are selected for the link termination.

Note You can create a provisional patch cord (PPC), a virtual link, between 15600 and 15454 NEs destination points.

f. Click **Next**.

Step 3 The Link Summary panel summarizes the attributes of the new link. To change the link summary information, click **Back** and change the selections as needed.

Step 4 Click **Finish**.

Table 3-10 Field Descriptions for the Create Link Wizard

Field	Description
Link Attributes Panel	
Name	Enter a unique name for the new link. The link name is a free-format string, up to 256 characters.
Link Alias	Enter a unique alias name for the new link. The alias name can contain alphanumeric characters. It also supports international character sets.
Description	Enter a description of the new link. The link description is a free-format string, up to 256 characters.
Provision Type	Specify the type of link provisioning. Values are: • Manual—The link is manually provisioned. • Patchcord—(*Applicable only to links involving transponders and DWDM modules*) The link is an internode or intranode termination provisioned between homogeneous ports. A patchcord link represents the connection between a line card and a transponder, or the connection between a transponder and a DWDM card. Patchcord links can be provisioned by Prime Optical or CTC users and are maintained by the NEs. **Note** Protection groups are not recognized when creating patchcord or manual links.
Layer	Choose the link layer rate, defined as per ITU-T standard G.872 for multilayered optical networks. Values are: • Physical • Transmission Section • OMS • OCH • SONET/SDH • Layer 2 **Note** Patchcord links on Layer 2 can be created between NNI ports on GE-XP or 10GE-XP cards if the card modes are set to *L2 over DWDM*.
Layer Detail	Choose the bandwidth of the link as per the layer rate. • For SONET links, the link rate is OC-3, OC-12, OC-48, OC-192, or Layer 2, depending on the NE configuration. • For SDH links, the link rate is STM1, STM-4, STM-16, STM-64, or Layer 2. • For DWDM links, the link rate is 100G ITU, 40G ITU, 10G ITU, 2.5G ITU, or OTS. • For OCH links, the link rate is 10G ITU or 2.5G ITU. • For patchcord links on Layer 2, the link rate is 10G ITU,1G ITU, or Fast Ethernet. • For links between Not Managed/Other Vendor NEs, the link rate is Not Applicable. • For links between Not Managed/Other Vendor NEs and CTC-based NEs, the rate is that of the CTC-based NE. Links between a SONET/SDH link and a Not Managed/Other Vendor NE depend on the link source. If the link source is the Not Managed/Other Vendor NE, the layer rate is Not Applicable. If the link source is the SONET/SDH link, the layer rate is that of the SONET/SDH link.

Table 3-10 Field Descriptions for the Create Link Wizard (continued)

Field	Description
Wavelength	Filter the wavelength in the first drop-down list. In the second drop-down list, select the appropriate wavelength value according to the selected filter. The Wavelength drop-down lists are available only if the layer is *Optical Channel*, the provisioning type is *Patchcord*, and the direction is *Unidirectional*. **Note** When the layer is *Optical Channel*, the provisioning type is *Patchcord*, and the direction is *Bidirectional*, the Wavelength drop-down lists are disabled, but Prime Optical executes an automatic wavelength check on the endpoints before creating the link. If the link endpoints do not have the same wavelength value, the link is not created and a wavelength error is generated.
Protection	Specify the link protection: Unprotected, 1+1, Y-Cable (meaning 1+1 with Y-cable protection), 2-Fiber BLSR/MS-SPRing, 4-Fiber BLSR/MS-SPRing, or Not Applicable. For CTC-based NEs, select Unprotected, 1+1, or Y-Cable. For links between Not Managed/Other Vendor NEs, the link protection is Not Applicable. For links between Not Managed/Other Vendor NEs and CTC-based NEs, the link protection is that of the CTC-based NE.
Direction	Specify whether the link is unidirectional or bidirectional.
Cost	Specify a numeric cost associated with the SONET or SDH layer link. The cost range is 0 to 999999. This field applies only to links in the SONET or SDH layer between CTC-based NEs. For all other links, the Cisco default value is 1024. All autodiscovered links have the Cisco default cost 1024.
Shared Risk Link Groups	(SONET/SDH layer rates only) Enter a free-format string that represents the SRLG, or a group of links that share a common risk. For example, links that originate at a node share the node as the common risk. The Shared Risk Link Groups field supports up to 5 comma-separated values, with 32 characters per value.
Link Source Panel	
Node	Identify which NE serves as the source of the link.
Physical Termination Point	Identify the physical side, shelf, slot, subslot (if applicable), and port in the source NE. For the ONS 15216, identify the name of the PTP. **Note** The card type is shown adjacent to the slot number; for example, “1 (OC3_8)” represents the OC3_8 card in slot 1. **Note** If the port name is available, it is shown adjacent to the port number.
PTP Value	(Not Managed/Other Vendor NEs only) Specify the PTP value. The maximum length is 30 characters; the minimum length is 1 character.
Link Destination Panel	
Node	This is a display-only field if you selected an NE as the destination of the link. If you selected a group as the destination of the link, select from the drop-down list a specific NE that will be the destination of the link.
Physical Termination Point	Identify the physical side, shelf, slot, subslot (if applicable), and port in the destination NE. For the ONS 15216, identify the name of the PTP. **Note** The card type is shown adjacent to the slot number; for example, “1 (OC3_8)” represents the OC3_8 card in slot 1. **Note** If the port name is available, it is shown adjacent to the port number.
PTP Value	(Not Managed/Other Vendor NEs only) Specify the PTP value. The maximum length is 30 characters; the minimum length is 1 character.

Table 3-10 Field Descriptions for the Create Link Wizard (continued)

Field	Description
Name	
Link Summary Panel	
Link Summary	Summarizes the selections you made. To change the Link Summary, click **Back** and change your selection(s).

Note

- After the links are created, each link has a different color notation depending on the alarm status of the PTP on which the link is created. Links between Not Managed/Other Vendor NEs are always black. The color of the link between a Not Managed/Other Vendor NE and a CTC-based NE is the color of the TP of the CTC-based NE. The colors are green for no alarm, yellow for minor alarms, orange for major alarms, and red for critical alarms. Invalid links (as reflected in the Is Link Valid field) are gray. An autodiscovered link can become invalid if (1) the DCC is disabled on either PTP; (2) either PTP is marked as Out of Service (OOS); (3) there is a fiber cut or transmitter/receiver failure; or (4) either NE is marked as OOS. Manual links are colored to match the highest alarm severity on either PTP. L2 links are always gray.
- Links that are supported in different layer rates can be created only if the link endpoints are compatible with the specified layer rate.
- If Prime Optical discovers a link, it automatically assigns layer rates based on its endpoint.

The following table summarizes link color as it relates to link type and the involved NEs.

Table 3-11 Summary of Link Color

Link Type	Link Validity	Link Color	Can the Link Be Deleted?
Manual	Valid	Color of the highest severity alarm on the PTP.	Yes
Manual	Invalid	Gray.	Yes
Virtual	Valid	Color of the highest severity alarm on the PTP.	Yes
Virtual	Invalid	Gray.	Yes
Unmanaged	Valid	Black, if the link is between two unmanaged NEs. Otherwise, the color corresponds to the highest severity alarm on the PTP.	Yes
Unmanaged	Invalid	Gray.	Yes
Autodiscoverd	Valid	Color of the highest severity alarm on the PTP.	No
Autodiscovered	Invalid	Gray.	Yes

Modifying Links

Use the Modify Link wizard to modify the name, alias, description, cost, or SRLG (if applicable) of links displayed in the Link table. You can modify a link in the Link table or in the Network Map.

Note You cannot modify patchcord links.

Step 1 Open the Modify Link wizard (see Table 3-12) by using one of the following methods:

- In the Link table, select a link and choose **Edit > Modify Link** (or click the **Modify Selected Link** tool).
- In the Network Map, select a link and choose **Configuration > Modify Link** (or click the **Modify Selected Link** tool).

Step 2 In the Link Attributes panel, modify the following information, as needed:

- Name
- Link alias
- Description
- Direction
- Cost
- Shared risk link groups

Note If you modify the SRLG value, you receive the warning popup "There might be circuits routed with diverse SRLG constraints on this link. Changing risk link groups might affect the diversity constraint." Click **OK**; then, verify the SRLG value that you entered.

Step 3 Click **Next** until you reach the Finish panel.

Step 4 Verify the link summary and click **Finish**.

Note After certain topology reconfigurations that involve removing fiber, the Network Map might not report the correct links. This problem occurs because the Prime Optical server is not synchronized with the new network topology and cannot retrieve network or link updates. This problem applies only to CTC-based NEs. The workaround is to remove the links completely by deleting the SDCC termination on the ports, rather than by simply unplugging the fiber cable.

Table 3-12 Field Descriptions for the Modify Link Wizard

Field	Description
Link Attributes Panel	
Name	Modify the name of the selected link. The link name is a free-format string, up to 256 characters. The link name must be unique.
Link Alias	Modify the alias name of the selected link. The alias name can contain alphanumeric characters. It also supports international character sets.
Description	Modify the link description. The link description is a free-format string, up to 256 characters.
Provision Type	*Display only.* View the type of link provisioning (Manual or Patchcord).
Layer	*Display only.* View the link layer.

Table 3-12 Field Descriptions for the Modify Link Wizard (continued)

Field	Description
Layer Detail	*Display only.* View the link size.
Wavelength	*Display only.* View the link wavelength value.
Protection	*Display only.* View the link protection.
Direction	Modify whether the link is unidirectional or bidirectional.
Cost	Modify the numeric cost associated with the SONET or SDH layer link. The cost range is 0 to 999999. This field is editable only for links in the SONET or SDH layer. For all other links, the Cisco default value is 1024. All autodiscovered links have the Cisco default cost 1024.
Shared Risk Link Groups	(SONET/SDH layer rates only) Modify the strings that represent the SRLG. The SRLG attribute supports up to 5 comma-separated values, with 32 characters per value.
Link Summary Panel	
Link Summary	Summarizes the changes you made to the editable fields. To change the Link Summary, click **Back** and change your selection(s).

Deleting Links

You can delete one or multiple links from the Link table. You can delete a single link from the Network Map.

Step 1 In the Link table, select one or multiple links and choose **Edit > Delete Link** (or click the **Delete Selected Link** tool). In the Network Map, select a single link and choose **Configuration > Delete Link**.

Step 2 Click **OK** in the confirmation dialog box.

Step 3 For multiple link deletion, complete the following substeps:

a. The Deleting Links dialog box tracks the progress of the deletion. If you selected links that cannot be deleted, you receive the message: "Some of the links can't be deleted, proceed anyway?" Review the links that you selected for deletion; then, click **OK**.

b. The Multiple Link Deletion Summary dialog box opens, summarizing the results of the deletion. Click the **Details** button to see which links were deleted, and which links could not be deleted.

The following rules apply to single and multiple link deletion:

- User-created links or invalid autodiscovered links can be deleted.
- Valid autodiscovered links cannot be deleted.
- An autodiscovered link is marked Invalid when Prime Optical can no longer verify the link from either of the NEs at the ends of the link.
- To remove a valid autodiscovered link from Prime Optical, you must remove the topology neighbors from both NEs at the end of the link.
- Prime Optical can delete physical links even if there is an autodiscovered SONET/SDH link.
- If you use Prime Optical to delete invalid autodiscovered links, verify that the DCCs are deleted on both ends of the link. If you delete a partial link with a DCC up on one end, it might cause problems later with the creation of phantom links.

- When you delete an OSC termination, any autodiscovered links become invalid. If you then delete the invalid links and recreate the OSC termination, an update event is generated. But because Prime Optical cannot find a link to update, it discards the event and does not discover the link. This is normal Prime Optical behavior in response to the deletion of invalid links. The workaround is to mark the NE(s) as Out of Service and then In Service.

Viewing the Link Maintenance Report

The following new functionality is supported on the OCHCC, OCHNC and OCH Trail circuits:

- Protection groups related to the circuits sharing a selection of OTS links.
- Perform bulk protection operations on those circuits

The information is available in the Link Maintenance Report.

You can launch the Link Maintenance Report only from the network map by right clicking the multiple links selection.

Table 3-13 Field Descriptions for the Link Maintenance Report

Field	Description
Circuit Name	Displays the name of the selected circuit. **Note** If there are multiple circuits with the same name displayed in the Circuit table, the label Duplicate appears in this column.
Circuit Type	Displays the type of circuit selected. SONET circuit types are STS, VT, VT Aggregation, VT Tunnel, VT VCAT (shown as VT-v), STS VCAT (shown as STS-v), DWDM optical channel network connection (OCHNC), DWDM optical channel client connection (OCHCC), optical channel trail (OCHTRAIL), and OCHNC DCN. SDH circuit types are HOP, LOP, LOPA, LOPT, HOV (HO VCAT), LOV (LO VCAT), OCHNC, OCHCC, OCHTRAIL, and OCHNC DCN.
Customer ID	Optional text field that displays the customer ID of the circuit.
Service ID	Optional text field that displays the service ID of the selected circuit.
Operation on Source	The current operation on the protection group on circuit source.
Operation on Destination	The current operation on the protection group on circuit destination.
Link on Active Path	Displays the link on the active path. Values are: • Yes—If the links are on the active path of the protection group • No—If the links are on the standby path of the protection group • N/A—If no protection group is available
Protection Group Type	Displays the type of protection group.
Circuit Source NE	Circuit source Network Element
Circuit Destination NE	Circuit destination Network Element

Performing Switch Operations

You can perform protection operations on single and multiple circuits only if the following conditions are met:

- A protection group is present.
- Current protection operations on sources and destinations are the same.

From the Link Maintenance Report, click the **Perform Protection Switch Operations** button. An Operations dialog box containing the protection operations available for Y-Cable and Splitter protection groups is displayed.

Table 3-14 Field Descriptions for Operations Dialog Box

Field	Descriptions
Switch Commands	
Clear	Clears a traffic switch on the card or port highlighted under Selected Group
Manual	(1+1, splitter, and Y-cable protection groups only) Initiates a manual switch on the selected port. This command switches traffic only if the path has an error rate less than the signal degrade (SD) bit error rate threshold.
Force	(1+1, splitter, and Y-cable protection groups only) Initiates a forced switch on the selected port. This command switches traffic even if the path has SD or signal fail (SF) conditions. A Force switch has a higher priority than a Manual switch.
Lockout Commands	
Unlock	Clears a lockout.
Lock Out	Prevents traffic from being switched to the card. Lockouts can only be applied to protect cards (in 1+1, splitter, and Y-cable configurations) and prevent traffic from switching to the protect port under any circumstance. Lockouts have the highest priority.
Lock On	Locks traffic on to the working card, that is, prevents a traffic switch from occurring. In a 1+1 configuration you can also apply a lock-on to the working port. A working port with a lock-on applied cannot switch traffic to the protect port in the protection group (pair). For splitter and Y-cable protection groups, Prime Optical allows Lock On for a protect port if other switch conditions (Manual, Force) exist. Lock On is not available if the protect port already has a Lock Out or Lock On present.

Once the operation is completed, a protection operation report with the result is displayed.

Viewing Link Utilization

The Link Utilization table displays utilization information for the selected links. Link utilization, shown as a percentage, displays the overall consumption of bandwidth. All bandwidths are in megabits per second (Mb/s).

% Link utilization = ([Bandwidth consumed] / [Total bandwidth of link]) x 100

Example: In SONET, for an OC12 link, the total bandwidth is (12 x 51.84) Mb/s, where STS-1/OC12 = 51.84 Mb/s.

Depending on the number of provisioned circuits, the consumed bandwidth is totaled. Circuits such as VAP/LAP and virtual tributary (VT) tunnel are preprovisioned and are not included in the calculation. This is applicable to SONET and SDH.

Example: In SDH, for an STM4 link, the total bandwidth is (4 x 155) Mb/s, where STM-1 = 155 Mb/s.

Note

- Link utilization does not apply to server trails. An error message is displayed if you attempt to launch the Link Utilization table from a server trail.
- The customize table view function is not available for the Link Utilization table.

To view the Link Utilization table:

Step 1 In the Domain Explorer window, choose **Configuration > Link Table**. The Link table opens.

Step 2 In the Link table, choose **Configuration > Link Utilization Table** (or click the **Open Link Utilization Table** tool). The following table provides descriptions.

Note You can launch the Circuit Trace window from a selected circuit in the Link Utilization table. Select a circuit in the Link Utilization table and then choose **View > Circuit Trace**. See Tracing Circuits, page 7-152.

Table 3-15 Field Descriptions for the Link Utilization Table

Column	Description
STS ID (SONET only)	Displays the STS ID.
VT1.5 ID (SONET only)	Displays the VT 1.5 ID.
VT2 ID (SONET only)	Displays the VT2 ID.
VC4 ID (SDH only)	Displays the VC4 ID.
VC3/TUG3 ID (SDH only)	Displays the VC3/TUG3 ID.
TUG2 ID (SDH only)	Displays the TUG2 ID.
VC12 ID (SDH only)	Displays the VC12 ID.
VC11 ID (SDH only)	Displays the VC11 ID.
Circuit Name	Displays the name of any circuits passing through the link. When *Unused* appears in the Circuit Name field there is unused bandwidth available, and the Circuit Type, Circuit Protection Type, Customer ID, and Service ID fields are blank.
Circuit Alias	Displays a unique alias name for the new circuit. The alias name can contain alphanumeric characters. It also supports international character sets.
Circuit Type	Displays the circuit type.
Circuit Protection Type	Displays the circuit protection type.

Table 3-15 Field Descriptions for the Link Utilization Table (continued)

Column	Description
Switch State	Displays the switch state for UPSR protected circuits only. Values are: • CLEAR—Removes a previously set switch command. • MANUAL—A manual switch is active on the span. • FORCE—A force switch is active on the span. • LOCKOUT_OF_PROTECTION—A protection lockout is active on the span; traffic cannot be switched to the span. **Note** A force switch always overrides a manual switch. A protection lockout always overrides both a force switch and a manual switch. To configure the span switch state, see Configuring the Span Switch State on a UPSR Protected Circuit, page 3-45. **Note** *N/A* is displayed for non-UPSR-protected circuits.
Customer ID	Displays the user-defined customer ID.
Service ID	Displays the user-defined service ID number.

Launching the Link Utilization Table for SONET/SDH or OTS Links from the Network Map

Step 1 In the Domain Explorer or Subnetwork Explorer tree, click a node and choose **File > Network Map** (or click the **Open Network Map** tool).

Step 2 Right-click a SONET/SDH or OTS link in the Network Map and choose **Link Utilization** from the right-click menu.

Configuring the Span Switch State on a UPSR Protected Circuit

Note The span switch is applicable to all UPSR circuits in the Link Utilization table. The selection context has no impact on the switching. When you perform protection switching after selecting an unprotected circuit, the protection switch applies to only UPSR-protected circuits.

Step 1 In the Domain Explorer window, choose **Configuration > Link Table**. The Link table opens.

Step 2 In the Link table, choose **Configuration > Link Utilization Table** (or click the **Open Link Utilization Table** tool).

Step 3 In the Link Utilization table, choose **Configuration > Span Switch > CLEAR, MANUAL, FORCE**, or **LOCKOUT_OF_PROTECTION**.

Note Switch states that cannot be applied are dimmed.

The possible switch state that can be applied to the circuits in the Link Utilization table is decided by switch priority. The switch priority order is:

1. MANUAL
2. FORCE
3. LOCKOUT_OF_PROTECTION
4. CLEAR

Note The CLEAR switch state overrides all other switch states.

Example 3-1 Unprotected OC-48 Link

```
1 - In Use
2 - In Use
3 - In Use
4 - VT Mapped (VTs 1-4 in use)
5 - Available
...
48 - Available


STS Utilization = 4/48 = 8.3%
VT Utilization = (3x28 + 4)/(28 x 48) = 6.5%
STS PCA Utilization = N/A
VT1.5 PCA Utilization = N/A
```

Example 3-2 2-Fiber BLSR OC-48 Link

```
1 - In Use
2 - In Use
3 - In Use
4 - VT Mapped (VTs 1-4 in use)
5 - Available
...
24 - Available
25 - STS PCA Circuit In Use
26 - 8 VT1.5 PCA circuits In Use
27 - Protection
...
48 - Protection

STS Utilization = 4/24 = 16.7%
VT-1.5 Utilization = (3x28 + 4)/(28 x 24) = 13.1%
STS PCA Utilization = 2/24 = 8.2%
VT-1.5 PCA Utilization = (1x28 + 8)/(28 x 24) = 5.4%
```

Filtering the Link Utilization Table

Step 1 In the Link Utilization table, choose **File > Filter** (or click the **Filter Data** tool). The Filter dialog box opens.

Step 2 Specify the filter parameters described in the following table.

Step 3 Click **OK** to run the filter.

Table 3-16 Field Descriptions for the Link Utilization Table Filter Dialog Box

Payload Type	Description
SONET	You can filter on the STS ID to see circuits going through that STS only. Select **All** to see all the tributaries on that link.
SDH	You can filter on specific VC4, VC3/TUG3, and TUG2 IDs. The ALL option shows all tributaries. The None option is available on VC3/TUG3 and TUG2. Using None, you can select VC4 circuits (including VC LO Path Tunnel and LAP).

Setting OTS Link Capacity

You can set the maximum number of wavelengths on one or more OTS links.

Step 1 In the Link table, select a single OTS link or multiple OTS links, and choose **Configuration > Set OTS Link Capacity** (or click the **OTS Link Capacity** window icon).

Step 2 Enter the maximum number of wavelengths for the selected OTS links.

Step 3 Click **Apply**. A Link Capacity Set Result window appears and summarizes the number of links that were configured or have failed.

Note A warning message appears when you select links of different layers.

Step 4 Click on the OTS success link to launch the report. The results can be printed in a text report.

Viewing OTS Link Utilization and Circuits

The OTS Link Utilization Report displays utilization information for the selected OTS links. OTS link utilization, shown as a percentage, displays the resources used. You can also view associated circuit names, types and wavelengths.

To view the Link Utilization and Circuit reports:

Step 1 In the Domain Explorer window, choose **Configuration > Link Table**. The Link table opens.

Step 2 Select the OTS links that you want to view utilization for.

Step 3 In the Link table, choose **Configuration > OTS Link Utilization Report** (or click the **Open Link Utilization Report** icon).

Step 4 From the OTS Link Utilization Report, select the link that you want to view associated circuit names, types, and wavelengths for.

Step 5 Click the **Open Circuit Report** icon.

If the Auto-Refresh check box is checked in the OTS Link Utilization Report window, the respective rows are automatically highlighted when a circuit undergoes a change. When the Auto-Refresh check box is not unchecked, a notification bar appears at the top of the window, stating that the reported data has changed. To refresh the report, click the **Refresh** tool.

If the report consists of more than one page, the Previous Page and Next Page arrows at the top-right corner of the Circuit Report window are enabled. The Pagination Settings tool allows you to select the number of records per page to display.

The status bar at the bottom of the OTS Link Utilization Report window displays:

- Current page number
- Total number of pages in the report
- Number of records displayed
- Number of records selected

To move to a specific page, enter the page number in the Page text box and press **Enter**.

Exporting the OTS Link Utilization Report

To export the OTS Link Utilization Report, complete the following steps:

Step 1 In the OTS Link Utilization Report window, choose **File > Export to CSV** (or click the **Export to CSV** tool). The Export to CSV dialog box appears.

Step 2 Specify the filter parameters described in the following table.

Step 3 Click **OK** to export.

Table 3-17 Field Descriptions for the Export to CSV Dialog Box

Field	Description
Separator Character	Allows you to select a separator character. Values are Comma, Tab, and Other. **Note** If you select Other, enter a value in the text box next to the Separator Character drop-down list.
Data to Export	Allows you to define the rows to be exported. Values are: • All {0} Selected Records • All Records at Page {0} • Entire Table **Note** The first option is available only if at least one record is selected. The second option is available only if there is more than one page.
Export File	Click **Browse** to select the location to which you want to export the file.

How Do I Build Server Trails?

A server trail is a subnetwork connection within a network that interconnects ONS 15xxx edge connection termination points (CTPs). Some limitations of server trails are:

- A server trail connection should not cross the port boundary. For an NxVC4 server trail connection, all N-VC4 terminations must be on the same port.
- Users with permissions to manage links can also manage server trails. Link preferences and not circuit preferences are applied for server trail operations, even though the server trails terminate on CTPs. A user might therefore be allowed to create an STS-1 server trail but not able to create STS-1 circuits (if that circuit size is not allowed for the user).
- Server trail connections cannot be provisioned on DCC-enabled ports. If DCC is enabled on a port, you cannot use the port as the source or destination for the server trail.
- You cannot change the size of an existing server trail.
- Multiple server trails can start from the same PTP. On a given PTP, the server trail can be of different connection types.
- Only one server trail can start from a CTP. CTPs of multiple server trail connections should be of the same type.
- Server trails connections cannot overlap each other.
- The sum of server trail sizes for an existing port cannot exceed the size of the port.
- Any alarm on a physical port affects all links that have an endpoint on that port, including all server trail links. For example, an alarm that has a port as its physical location affects all server trails, even if the affected object is a specific VC within that port.

Following are the differences between manual links and server trails:

- Manual links occupy an entire port while server trails occupy parts of a port. This means that a single port can terminate only one link but several server trails.
- Manual links can terminate on optical cards. Server trails can terminate on optical and electrical cards.
- Manual links can be created on DCC-enabled ports, while you cannot create server trails using DCC-enabled ports.
- The endpoints of manual links should be the same size. The endpoints of server trails can be different sizes and types.

Creating Server Trails

Step 1 Select the source NE in the Domain Explorer or Subnetwork Explorer and choose **Configuration > Create Server Trail** (or right-click the NE and choose **Create Server Trail**). The pointer changes to a plus (+) symbol; select the destination NE. The Create Server Trail wizard opens.

Step 2 In the Server Trail Attributes pane, specify the following:

- Type—Select the type of server trail to create.
- Size—Select the size of the server trail. The options displayed depend on the type selected.
- Protection—Select the server trail protection type.
- Number of Trails—Enter the number of trails.

- Shared Risk Link Groups—Enter a free-format string that represents the shared risk link group or a group of links that share a common risk.
- Cost—Specify the numeric cost associated with the server trail.

Step 3 Click **Next**.

Step 4 In the Source pane, set the server trail source. The options displayed depend on the server trail type selected in the Server Trail Attributes pane.

Step 5 Click **Next**.

Step 6 In the Destination pane, set the server trail destination. The options displayed depend on the server trail type selected in the Server Trail Attributes pane.

Step 7 Click **Finish**. The server trail is listed in the Link table. You can also view the server trail in the Network Map.

Note Server trails that were created in Prime Optical or CTC are listed in the Link table. Open the Link table, and you will see that the value of the Link Provision Type field for server trails is *Server Trail*. See Viewing the Link Table, page 3-31 for more information.

Modifying Server Trails

Step 1 Open the Modify Link wizard using one of the following methods:

- In the Link table, select a server trail and choose **Edit > Modify Link** (or click the **Modify Selected Link** tool).
- In the Network Map, select a server trail and choose **Configuration > Modify Link** (or click the **Modify Selected Link** tool).

Step 2 In the Link Attributes panel, modify the following information, as needed:

- Name
- Alias
- Description
- Cost
- Shared risk link groups

Note If you modify the SRLG value, you receive the warning popup "There might be circuits routed with diverse SRLG constraints on this link. Changing risk link groups might affect the diversity constraint." Click **OK**; then, verify the SRLG value that you entered.

Step 3 Click **Next**.

Step 4 Verify the link summary and click **Finish**.

Deleting Server Trails

Step 1 In the Link table, select a server trail and choose **Edit > Delete Link** (or click the **Delete Selected Link** tool). In the Network Map, select a server trail and choose **Configuration > Delete Link**.

Step 2 Click **OK** in the confirmation dialog box.

How Do I Use Network Maps?

The Network Map is organized into a multilevel hierarchy that corresponds to the structure of the Domain Explorer tree. The Network Map hierarchy consists of management domains, groups, and NEs that are displayed graphically.

Network Map backgrounds are provided by default as part of Prime Optical and are used to display a geographical layout of the network.

By default, the Network Map consists of the following areas:

- Center pane—Displays the map with individual groups, NEs, and link icons.
- Explorer pane—Displays a Search text box and Domain Explorer tree.
- Overview pane—Shows the position of the displayed map with respect to a larger world map.
- Properties pane—Displays the domain or group properties, including the number of alarms and the ID. It also displays the properties of selected links.

The Explorer pane in the Network Map contains a Search text box and the Domain Explorer tree. The Search text box allows you to search for NEs based on one or all of the following parameters:

- NE ID
- NE Alias ID
- NE IP Address
- NE Version
- NE Description
- NE Location Name
- Group Name
- NE Operational State
- NE Communication State
- NE Model

From the Search drop-down list, choose the parameter to search by, and enter appropriate data in the text box.

You can select one node or multiple nodes from the Domain Explorer tree in the Topology pane.

Tip Hold down the **Shift** key to select more than one node sequentially, or hold down the **Ctrl** key to select more than one node nonsequentially.

When you right-click a node in the Topology pane or on the map, a popup menu is displayed, from which you can select one of the following options:

- NE Explorer—Displays the NE Explorer for the selected node.
- Equipment Inventory Table—Displays the Equipment Inventory Table of the NE.
- Alarm Browser—Displays the Alarm Browser for the NE.
- Alarm Log—Displays the Alarm Log for the NE.
- Delete Map Element—Allows you to delete the selected node from the map.
- Create Link—Allows you to create a link between NEs.
- Create Server Trail—Allows you to create a server trail for the selected NE.
- Create Circuit—Allows you to create a circuit.
- Search Circuits—Displays the Circuit Search window.
- Circuit Report—Displays the Circuit Table for the NE.
- Link Table—Displays the Link Table for the NE.
- Test NE Connectivity—Tests connectivity to the NE.
- Change State—Allows you to change the state of the NE by selecting one of the following options:
  - Mark In Service
  - Mark Out of Service
  - Mark Under Maintenance
- Network—Allows you to view details of the NE selected on the map.

Note The popup menu is also displayed when you select and right-click multiple nodes of the same type. However, the following options are disabled: NE Explorer, Equipment Inventory Table, and Test NE Connectivity.

Unplaced NEs, or NEs for which the coordinates on the related Network Map are initially null, are represented in italics in the Domain Explorer tree of the Explorer pane. Checking the **Unplaced** check box in the Explorer pane filters the tree view to show only the unplaced NEs.

The Properties pane in the Network Map window displays domain or group properties and allows you to perform certain actions.

The following links are available at the bottom of the Properties pane:

- NE Explorer—Displays the NE Explorer for the selected node.
- Equipment Inventory Table—Displays the Equipment Inventory Table of the NE.
- Alarm Browser—Displays the Alarm Browser for the NE.
- Test NE Connectivity—Tests connectivity to the NE.
- Circuit Table—Displays the Circuit Table for the NE.
- Link Table—Displays the Link Table for the NE.

In the Overview pane, you can view the position of the displayed Network Map with respect to a larger world map and adjust the pan position of the Network Map.

Note The Explorer, Properties, and Overview panes can be docked, floated, or auto-hidden. These panes can also be grouped into a single tabbed pane by dragging and dropping one pane into another. In this case, each pane appears as a tab within a panel. From the Customize icon at the top-right corner, you can also select which of these panes to display.

Customizing a Network Map

Use the Edit menu and toolbar buttons to customize your network map.

Step 1 In the Domain Explorer tree, click a node and choose **File > Network Map** (or click the **Open Network Map** tool).

Note There is no Network Map for the Discovered Network Elements or Deleted Network Elements groups.

Step 2 Use the Edit menu in the Network Map window to customize the Network Map. Edit menu options include:

- Filter—Filters the network map by NEs, groups, or links.
- Set Background—Allows you to set the map background.
- Zoom Magnify—Magnifies the area on the map where the pointer is placed when the left mouse button is held down.
- Zoom In—Zooms in on an object in the map view.
- Zoom Out—Zooms out on the map view.
- Zoom to Fit—Adjusts the view of the map to fit the window.
- Zoom Area—Lets you pan and zoom the view to a different region of the map.
- Zoom Magnify—Magnifies the area under the lens.
- Expand/Collapse Group—Shows or hides NEs contained in a group selected on the map.

Note A group on the map can be expanded if all of its nodes have a coordinate set at the given level. When a group is expanded, all nodes and subgroups are displayed around the expanded group.

- Collapse All Groups—Hides NEs contained in all groups on the map.
- Expand All Links—Shows links contained in an aggregate link.
- Collapse All Links—Hides links contained in an aggregate link.
- Grid Layout—Arranges nodes in a grid pattern.
- Explorer Mesh Layout—Arranges nodes in planar or nonplanar cyclic patterns.
- Uniform Length Edges Layout—Arranges nodes in patterns with edges of uniform length.
- User Preferences—Opens the User Preferences dialog box to set user preferences for options such as event notification and time.

Note Users with SuperUser privileges can configure labels for various nodes and device icons.

Viewing a Node on the Network Map

Icons on the Network Map are displayed based on the nodes you select in the Domain Explorer. Nodes on the Network Map do not have a default position unless one has been configured in a Network Partition Map or a SuperUser has configured one in the current map.

Launching the Network Map from the following nodes displays varying results:

- From the Prime Optical domain in the Domain Explorer—Displays all the groups and individual nodes in the Prime Optical domain.
- From a specific group in the Domain Explorer—Displays all NEs that belong to that group.
- From a specific NE in the Domain Explorer—Displays the parent group that the selected NE belongs to.
- From a specific network partition in the Subnetwork Explorer—Displays all the NEs in that network partition.

Adjusting the Zoom Level or Pan Position

When the Network Map is launched from the Prime Optical domain, it displays a world map with the individual groups, network partitions, and NE icons. To view a particular region or icon, you adjust the zoom level or pan position.

Step 1 In the Domain Explorer or Subnetwork Explorer tree, click a node and choose **File > Network Map** (or click the **Open Network Map** tool). The Network Map opens with the node preselected.

Step 2 Do any of the following:

- To adjust the zoom level, do either of the following:
  - On the Network Map, choose **Edit > Zoom In**, **Zoom Out**, **Zoom to Fit**, or **Zoom Area**.
  - Click the **Zoom In**, **Zoom Out**, **Zoom to Fit**, or **Zoom Area** tool.
- To adjust the pan position, use the mouse to pan across the desired region on the map.
- View or hide the links contained in each link bundle (aggregate link):
  - To view links, click a link bundle and choose **Edit > Expand All Links** (or double-click a link bundle to show all the links)
  - To hide links from view in the Network Map, click a link bundle and choose **Edit > Collapse All Links**.

The following table describes how the zoom tools at the right of the Network Map work.

Table 3-18 Field Description for Zoom Level

Zoom Tool	Description
Zoom In	Zoom in on an object in the map view. This tool increases the size of all of the graphic objects on the map.
Zoom Out	Zoom out on the map view. This tool decreases the size of all of the graphic objects on the map.
Zoom Slider	Adjust the zoom level of the map by moving the slider up or down between the Zoom In and Zoom Out icons.
Zoom Area	Pan and zoom the view to a different region of the map. Hold down the left mouse button and use the Zoom Area box to highlight an area on the map. When you release the left mouse button, the zoom is applied to the selected area of the map.
Zoom to Fit	Click to adjust the view of the map to fit the window.
Zoom Magnify	Magnify the area under the lens. Click the zoom magnify icon, point to the map region that you want to magnify, and hold down the left mouse button. The area is magnified until the left mouse button is held down.

Note When the network map is zoomed in to show the entire node icon, the related device icons and labels are displayed. When the zoom level is low, only the Alarm Severity icon for each node is displayed. When zoom magnify is applied to the Alarm Severity icon, the entire node icon is visible, along with the related device icons and labels.

Configuring the Icon Size of Nodes

The Network Maps enables you to set the background and icon size separately and allows them to stick on to each other. The Node Icons are displayed from normal to high level representation along with the Alarm Severity icon. Using the slider, you can zoom in or zoom out the icon size of your choice.

To zoom in the background and increase the icon size, do the following:

Step 1 In the Domain Explorer or Subnetwork Explorer tree, click a node and choose **File > Network Map.** The Network Map opens with the node preselected.

Step 2 Click **Gear** in the zoom toolbar.

The Icon Size Configuration dialog box is displayed.

Step 3 Move the slider on the left or right to adjust the zoom level to increase the icon size. See Table 3-18 for more information.

The zoom level and icon size percentage are displayed above the slider.

Step 4 Click **Apply**.

Step 5 Choose **File > Save Map Coordinates** to save the icon size configuration.

Modifying a Map Background Image

Network map backgrounds are provided by default as part of Prime Optical, and are used to display a geographical layout of the network. The icons in the Network Map can be customized. See Appendix A, "Icons and Menus Displayed in Prime Optical" for details of all the icons displayed in the Network Map window.

Prime Optical supports nonanimated GIF, JPG/JPEG, PNG, and shapefile format icons and maps. Shapefile is a universal standard for data files and allows users to zoom in and zoom out without losing details.

To modify a map background:

Step 1 In the Domain Explorer tree, click a node and choose **File > Network Map** (or click the **Open Network Map** tool).

Step 2 In the Network Map window, choose **Edit > Select Background**. The Select Background dialog box opens.

Step 3 Select a background image from the list of existing background images. The selected image appears in the Preview area.

Note If you want to add a new background image to the list, click the **Add** tool at the top of the list, browse, and select the file to be added. In the Data area on the right, you can provide the name, description, and additional files if any, for the newly added background image. Clicking the **Save** tool in the Data area will save the attributes you entered for the background image.

Step 4 After choosing a map background, click **Apply**. The new map background appears in the network map.

Step 5 Select the **No Background** check box if you do not want a background image displayed for the network map.

Step 6 Choose **File > Save Map Settings** to save your settings.

Note You can edit the name and description, and change or upload new files for an existing background image, by selecting the row and editing the fields in the Data area. You can delete files for a selected background image by clicking the **Remove** tool in the Data area.

You can also delete an existing background image by selecting it from the list and clicking the **Remove** tool at the top of the list.

Table 3-19 Field Descriptions for the Select Background Dialog Box

Field	Description
Current Background	Read-only. Displays the name of the current map background.
Name	Read-only. Lists the names of the map background images.
Type	Read-only. Displays the format of the corresponding map background image. Values include jpeg, shape, gif, and png.
Size	Read-only. Displays the size of the map background image in KB or MB.
Added By	Read-only. Displays the name of the user who added the image, and the time stamp.
No Background	Check this check box if you do not want a background image for the network map.
Data Area	
Name	Enter the name of the map background image that you are uploading.
Description	Enter a description for the map background image that you are uploading.
Files	Displays the files added for the selected background image.

Configuring the Network Map View

Prime Optical allows you to configure the appearance of the graphical components on the network map. You can set how nodes, groups, and links appear.

To configure the network map view:

Step 1 In the Network Map window, choose **Edit > Global Network Map Configuration**.

Step 2 On the Node tab:

- In the Badges area, from the list of badges, drag and drop the badges to be displayed on the nodes in the map. The badges available are:
  - Multishelf
  - WSON State
  - Node Role
  - Admin State
  - Alarm
  - Discovery State
  - Connection State
- From the Labels area, drag and drop the labels to be displayed for each node. The labels to choose from include:
  - Alias
  - Model Type
  - IP Address
  - Software Version
- If you want the alarm to be highlighted on the map, check the **Highlight on Alarm** check box.

Step 3 On the Group tab, check one or both check boxes (**Alarm** or **Connection State**) to display the Alarm or Connection State badge for the group on the network map.

Step 4 On the Link tab:

- Enter the desired values for the following:
  - Width of the link
  - Distance between links
  - Width of the links for a bundle
  - Minimum number of links for a bundle
- If you want to hide all links in a bundle on the network map, select the **Bundle Collapsed by Default** check box.
- If you want the DWDM side for the links displayed on the map, select the **Show DWDM Side** check box in the Link Attributes section.
- Specify how frequently you want the links refreshed on the map, by selecting the **Refresh Interval** in the Link Refresh Interval section.

Note The default value for the Refresh Interval is 15 minutes.

Step 5 Click **OK**.

Saving Changes to the Network Map

Step 1 In the Domain Explorer or Subnetwork Explorer tree, click a node and choose **File > Network Map** (or click the **Open Network Map** tool).

Step 2 After making the necessary changes to the map background, map position, zoom level, node icon, or node coordinates in the Network Map window, Choose **File > Save Map Settings** to save your settings.

Depending on the user type and the settings saved, one of the following happens:

- SuperUser saves background and coordinates for:
  - Network partition map—Settings are saved as Absolute settings for the map.
  - Domain map—Settings are saved as System settings for the map.
- Operator or Provisioner saves settings for domain map—Settings are saved as Custom settings for the user.

Searching for Circuits

Prime Optical 9.8 allows you to search for circuits from the Network Map window by selecting one or multiple NEs.

You can search for circuits using the Network Map in the following ways:

- Right-click an NE on the map and choose **Circuit Search**.

- Right-click a link on the map and choose **Circuit Search**.
- Use the **Enter Search Query** text box available at the top of the network map.

The circuits associated with the selected NEs are displayed in a dockable Circuit Search window at the bottom of the Network Map window. If you select another NE in the network map, and want to refresh search results, click the Sync tool at the top of the Circuit Search window.

The Circuit Search window allows you to view the links on the map for a selected circuit. When you click the **Toggle Path Trace** tool at the top of the Circuit Search window, the links that contain the selected circuits are highlighted in yellow on the map.

You can launch the Circuit Report from the Circuit Search window, by clicking the Circuit Report tool at the top. You can also filter, and export the search results by choosing the appropriate tools.

Note See Appendix A, "Icons and Menus Displayed in Prime Optical" for an explanation of the icons in the Circuit Search window.

The **Enter Search Query** text box in the Network Map window allows you to search for circuits by the following attributes:

- Alias
- Customer
- Description
- Name
- Service
- Type

Press **Ctrl-Space** to display attributes and select from the list; then type a keyword to search by. You can use multiple keywords for the same attribute, and also select more than one attribute. All circuits with either of the attributes mentioned are displayed in the search results.

Note Clicking the Help icon within the Enter Search Query field displays hints and examples to help you search for circuits effectively.

How Do I Discover the Network for Optical Devices?

The Prime Optical discovery service collects information from individual CTC-based NEs; discovers new NEs added to the network; updates network-level information (such as physical topology, logical circuits, and discrepancies); and updates device-level information (such as inventory and alarms).

When you add a new NE to Prime Optical, the discovery process starts. When the process finishes, all of the NE information (such as inventory, configuration, physical topology, and discrepancies) is collected and Prime Optical is updated.

Note The Discovered Network Elements group can be viewed only by users who have all NEs assigned to them. Therefore, in the Add New NE wizard, the grouping option "Group discovered NEs in the Discovered Network Elements Group" is not available.

Discovering CTC-Based NEs

When a CTC-based NE is added as a GNE, the following NEs are discovered automatically:

- All NEs that are DCC-connected to the GNE
- All NEs that are connected to the GNE by any link other than a manual link

The discovered NEs are added automatically to Prime Optical. The location of new NEs depends on the location you specified in the discovery wizard.

Alternatively, for CTC-based NEs, you can choose to manually discover NEs and add them to a specific network partition. You can disable discovery when the NEs are being added to the network partition. To choose the discovery mode:

Step 1 Choose **Administration > Control Panel**.

Step 2 From the left panel, expand the CTC-based SDH or CTC-based SONET service and choose a network service instance. The property sheet is displayed.

Step 3 Choose a discovery mode (Manual or Automatic).

Viewing Manually Discovered NEs

Use the Orchestration Service pane to view the details of a discovery service and manage discovery processes. This page displays the status of a discovery service, which can be Running or Not Running. To view the Orchestration Service pane, choose **Administration > Control Panel > Orchestration Service**.

Table 3-20 Field Descriptions for the Orchestration Service Pane

Field	Description
Status Tab	
Service Status	Displays the status of the process associated with the discovery service. The status can be Running or Not Running. The Not Running status occurs only in the case of an unexpected system error.
Discovery Properties Area	
Select link types to evaluate during discovery of adjacent nodes	To complete the discovery process, you must select at least one of the following link types: • Physical Links (including virtual links)—During the discovery process, all nodes that are connected by physical links are discovered. However, if the nodes are connected by virtual links, only the immediately adjacent node is discovered. • Server Trails. If you try to proceed without selecting a link type, the following message appears: `You must select at least one link type for evaluation during the discovery.`

Table 3-20 Field Descriptions for the Orchestration Service Pane (continued)

Field	Description
Select details to retrieve	Check the details of the node you wish to retrieve during the discovery process. The details which you can retrieve are: • NE model • Software version • NE role The NE Model option is selected by default. If you deselect the option, the node is marked as Undefined NE in the Discovery Overview area (**Domain Explorer > Undiscovered Network Elements**). If you choose to discover additional details (Software Version and Connection Type), the discovery process will be slower. The following message appears: `The selected option(s) will slow down the discovery process.` By default, the node's IP address is retrieved.
Maximum Timeout in Seconds	Enter a maximum timeout, after which the discovery is interrupted. The minimum timeout you can define is 30 seconds.
Debug Tab	
Overall Logging	Enable—Choose the Enable radio button to enable logging. When you choose the Enable radio button, the debug modules in the Available list become selectable. Disable—Choose the Disable radio button to disable logging. When you choose the Disable radio button, the debug modules in the Available list become dimmed and you cannot make any selections.
Debug Modules	Available—Select one or more debug modules in the Available list and click **Add** to move them to the Selected list. **Tip** Hold down the Shift key to select more than one debug module sequentially. To select multiple debug modules nonsequentially, hold down the Ctrl key on your keyboard while using your mouse to select multiple debug modules. Selected—Select one or more debug modules in the Selected list and click **Remove** to move them to the Available list.
Save button	After making your selections, click **Save**. Changes take effect immediately.

Resetting the Resync Interval

The Resync Interval setting displays the frequency at which the configuration is rediscovered, retrieved, and processed for the NEs. The following information is retrieved:

- General system information including node name, system time zone, SNTP configuration, and power monitoring information
- NE's network information including IP address, static routes, OSPF, and RIP configuration
- Card provisioning data
- DCC configuration

- Timing synchronization
- Protection group configuration
- Ethernet Spanning Tree configuration
- Alarm profiles
- Security configuration
- NE defaults
- Routing table and protocol information

Complete the following steps to reset the resync interval:

Step 1 In the Domain Explorer window, choose **Administration > Control Panel**.

Step 2 Expand **NE Service**.

Step 3 Select an NE and change the Resync Interval field in the Resync Scheduling area.

Step 4 Click **Save**.

Discovering CRS-1 and CRS-3, NEs

Using Prime Optical, you can discover CRS-1, CRS-3 R4.2.3 and CRS-3 R4.3.0 NEs that are connected to a DWDM ONS 15454 NE using a virtual transponder. You can also manage the IP traffic that is exchanged in the CRS-1 and CRS-3 networks using the optical DWDM transport network. This is possible because of the presence of virtual transponders and DWDM colorless cards. Prime Optical does the following:

- Discovers the links that connect the ONS 15454 cards to the CRS-1 and CRS-3 virtual transponder cards.
- Discovers and manages CRS-1 and CRS-3 NEs.
- Discovers and manages OCH trail circuits between the CRS-1 and CRS-3 virtual transponder cards and the DWDM optical network. The following cards support OCH trail circuits:
  - Cisco CRS-1 1 x OC768 DPSK+ (C-band) DWDM PLIM
  - Cisco CRS-1 1 x OC768 (C-band) DWDM PLIM
  - Cisco CRS-1 4 x 10GE (C-band) DWDM PLIM
  - DWDM PLIM LINE card 10 GE
  - DWDM PLIM LINE card 100 GE

Note A virtual transponder is a virtual entity of the transponder cards. Prime Optical does not manage this type of equipment.

You cannot add a CRS-1 or CRS-3 NE directly to Prime Optical. For a CRS-1 or CRS-3 NE to be discovered and managed, it must be connected to Prime Optical through one of the following channels:

- An ONS 15454 DWDM NE through a link management protocol (LMP) link
- An ONS 15454 SDH DWDM NE through a link management protocol (LMP) link

Using the APIs available in the CTC library, Prime Optical discovers CRS-1 or CRS-3 NEs using the ONS 15454 or the ONS 15454 SDH NE service.

In the Domain Explorer window, select the CRS-1 or CRS-3 NE that you want to view. The property sheet is displayed. To discover a CRS-1 NE, you must log in with the credentials of the ONS 15454 NE to which it is connected; the NE Authentication tab, therefore, is unavailable for CRS-1 NEs.

Note In order to manage the CRS-1 and CRS-3 nodes, you must be logged in as a root user.

The following limitations apply to the discovery of CRS-1 or CRS-3 NEs:

- A CRS-1 or CRS-3 NE cannot be directly added to Prime Optical as can other NEs. It is discovered only if it is connected to an ONS 15454 NE.
- To discover a CRS-1 or CRS-3 NE, you must log in with the credentials of the ONS 15454 NE to which it is connected.
- You must use CTC to set up the physical connection between the ONS 15454 NE and CRS-1 NE or CRS-3.
- You cannot create an LMP link between the CRS-1 or CRS-3 NEs and 15454 ONS NEs using Prime Optical. Prime Optical automatically discovers CRS-1 or CRS-3 NEs through an existing LMP link. Also, you cannot manually discover CRS-1 or CRS-3 NEs. For information on creating LMP links through CTC, see NTP-G164 Configure Link Management Protocol.
- The NE Explorer is not supported on CRS-1 or CRS-3 NEs.

Once discovered, the Link table represents the CRS-1 or CRS-3 NE as autodiscovered; for more information, see Viewing the Link Table, page 3-31. The type of link is Unidirectional.

You can use CTC to create OCH trail circuits between two PLIM cards on CRS-1 or CRS-3 NEs. For more information, see NTP-G178 Create, Delete, and Manage Optical Channel Trails. To use Prime Optical to enable the OCH trail circuit, you must enable a specific trunk protection called proactive protection, which applies to all supported cards involved in circuit routing. To define the proactive protection parameters, choose **Create Circuit Wizard > Trunk Filtering**. For more information on populating the Proactive Protection panel, see Table 7-6.

How Do I Manually Discover NEs and Add Them to Specific Network Partitions?

Using the manual mode of discovery of NEs, you can decide the NEs and the adjacencies you want Prime Optical to discover; once enabled, the respective NE service no longer discovers and manages NEs automatically. This feature lets you take more control over the method in which the network partitions are populated. The following are the advantages of enabling this feature:

- You can decide which NE needs to be added to which network partition. This is particularly useful if the partition reaches its threshold limit.
- You can partition a managed network into several network partitions without having to turn off the physical links connecting two NEs.
- You can effectively delete the NEs that you choose to not be managed. Unless you explicitly add it to a network partition, the NEs remain unmanaged by the network service, even after subsequent discoveries.

Prime Optical discovers NEs through the manual mode in two phases:

1. Enabling the manual mode of discovery at the NE service level—Once you enable the manual mode of discovery at the service level, all nodes that are connected to a managed NE are not automatically added to the service unless specifically added by the user.
2. Managing the discovered nodes—Once the unmanaged NEs are discovered through the manual mode of discovery, you can specify the network partition to manage the discovered NEs.

Limitations of Manual Mode of Discovery

- This feature lets you choose the network partition that will be manage the specified NE. Because of this, the NEs that are not managed yet are identified as missing. These missing NEs can lead to incomplete discovery of services such as links, circuits, BLSR, and L2 topologies.
- If you added NEs belonging to the same physical network (such as a DCN domain) to different network partitions, you have one of the following consequences:
  - The links between the NEs that belong to different network partitions are not discovered.
  - The services topologies (such as circuits, BLSR, L2, VLAN, and SVLAN—which consist of NEs that belong to different partitions) are partially discovered. Also, some of them might remain undiscovered.
  - L1 circuits that are partially discovered are labeled **Split** in the Circuits table. This occurs when the source and destination nodes of the circuit belong to different partitions. In such a scenario, the circuit is marked Split, and is present in the partition to which its source is attached to.

Note Services that are split are supported and provisioned only in case of manual mode of discovery.

Frequently Asked Questions

Mode of Discovery

Q. Can I change the mode of discovery for an existing service?

A. Yes. If you are a user with administrative privileges, you can change the mode of discovery of a CTC-based NE at any time. See Discovering CTC-Based NEs, page 3-60.

Q. Can I change the mode of discovery from manual to automatic?

A. Yes; however, this is not recommended. Prime Optical considers the changed mode of discovery of NEs only during the first network topology change, such as change of a link state. If you need to change the mode, you must force the change by restarting the discovery of NEs, particularly those that are connected to devices that are not currently managed by the NE service.

Q. Can I change the mode of discovery from automatic to manual?

A. Yes. By changing the mode of discovery to Manual, you stop the automatic discovery of NEs, thus limiting the number of devices managed by an NE service. This is particularly useful when the NE service is about to reach its threshold. This allows you to selectively discover and manage the NEs.

Q. Can I define the mode of discovery while adding a new NE?

A. Defining the mode of discovery applies more at the NE service level than at the NE level. You can set the mode of discovery while adding the first NE to an NE service. You cannot set the mode of discovery for NE services that have already been initiated. For more information, see Adding NEs, page 3-11.

Note You cannot set the mode of discovery to manual for CRS-1 NEs. All connected CRS-1 NEs are added automatically to the partition to which the peer ONS 15454 NE belongs.

Administrative Options

Q. What is the recommended link type setting for manual discovery?

A. Using the **Control Panel > Orchestration Service** pane, you can configure the initial set of options to be considered for the discovery process, one of which is the link type between the NEs. You can choose either Physical Links or Server Trails. Physical links include virtual links. With physical and virtual links, the information is cached locally. The information can be retrieved by querying a limited set of NEs. With server trails, the information is retrieved by contacting each NE.

Choosing Server Trails as the link type has an inherent risk of high response time. Therefore, this is not recommended as the default setting. However, if server trail links are present in your network, you must select this link type to be able to complete the discovery process. For more information, see Viewing Manually Discovered NEs, page 3-60.

Q. How do I set a default mode of discovery for all network partitions?

A. Using the **Control Panel > UI Properties** pane, you can choose a default option to be applied for all network partitions.

- To set a default mode of discovery, and to disallow a change of the mode later, choose **Control Panel > UI Properties**. Uncheck the **Allow Provisioning** check box, and select a mode of discovery from the **Default Discovery Mode** drop-down list.
- To set a default mode of discovery, and to also allow a change of the mode later, check the **Allow Provisioning** check box. Select a mode of discovery from the **Default Discovery Mode** drop-down list. This lets you change the mode of discovery while creating a new NE service.

Discovery of Nodes

Q. How does the discovery of nodes work?

A. Once you set the parameters to be considered for the discovery process in the Orchestration Service pane, the NE service starts discovering NEs in its managed network based on the parameters specified. For more information on setting the parameters for mode of discovery, see Viewing Manually Discovered NEs, page 3-60. The following events occur during the discovery process:

1. The NE service begins to analyze the network topology without actually communicating with NEs. Following the physical links and the server trails existing between the nodes, it determines the NEs that are currently not discovered and managed. Only NEs that are either in In Service state or in In Service - Initializing state are considered for discovery.
2. Once the undiscovered NEs are identified, the Orchestration Service starts retrieving from the remote devices the additional information that you specified.
3. After retrieving the required information, the Orchestration Service makes the data available to all the GUIs.

Q. How can I track the status and execution of discovery?

A. The main stages of discovery are tracked in the Audit Log. You can filter the messages from the log table based on an NE service.

To view the status of a discovery process, choose **Domain Explorer > Undiscovered Network Elements**. For information on undiscovered NEs, see Undiscovered Network Elements, page 1-20.

Q. Can I limit the scope of discovery to reduce the waiting time?

A. When more than one NE service is configured in manual mode of discovery, you can choose the service for which you want the discovery process to begin first. Choose **Domain Explorer > Undiscovered Network Elements**; then, click **Start Discovery**. A table listing the available network partitions appears. Select the desired partitions.

Q. Should I wait for the discovery process to finish before I initiate the process for other nodes?

A. You can initiate the discovery process at any time. However, for a successful discovery, ensure that the following conditions are met:

- At least one NE present in the OSPF topology area must have been discovered—either in In Service state or in In Service - Initializing state.
- If you set the link type as Server Trails, all the NEs connected through server trails must have been fully discovered.

TMF CORBA Interface

Q. Is TMF CORBA supported?

A. The discovery mode does not support TMF CORBA. This feature is available only for GUI users. TMF CORBA users must interact with the Prime Optical GUI to define the discovery mode.

How Do I Test Connectivity for Optical and Routing Devices?

The following sections describe how to test server connectivity to an NE. The following table explains the difference between pinging an NE and testing NE connectivity.

Table 3-21 Testing NE Connectivity

Method	Description
Ping NE	Pinging the NE uses the standard UNIX **ping** command to verify IP connectivity between the Prime Optical server and an NE. If successful, the ping results include the NE's IP address, round-trip time, and packet loss statistics. A response of "Request timed out" means there was no response to the ping attempt. If the ping is unsuccessful, verify that the NE's IP address and SNMP settings are configured correctly.
Test NE connectivity	The Test NE Connectivity operation uses the appropriate management protocol (SNMP, TL1, or CORBA) to run the **ping** command to verify the server's IP connectivity to an NE. If the ping is successful, the Test NE Connectivity operation verifies that the management protocol is configured correctly. The results show whether the connection state of the NE is Available or Unavailable. If Available, the connection state of an NE is updated to Available in the Prime Optical database. If the connection state of an NE is listed as Unavailable, a connectivity or configuration problem exists. Complete the steps in NE Connection State Is Listed as Unavailable, page G-11 to resolve the problem and retest NE connectivity.

Pinging an NE

Step 1 In the Domain Explorer tree, select the NE to ping.

Step 2 Choose **Fault > Ping NE**. The ping results include round-trip time and packet loss statistics.

Step 3 Click **OK** in the dialog box.

Note This function is enabled if the operational state of the NE is In Service or Under Maintenance. It is disabled if the operational state of the NE is Out of Service or Preprovisioned.

Note A link to the ping utility must be present in your PATH variable on the Prime Optical server. The default location is /usr/sbin/ping. If a link to the ping utility is not present in your PATH variable, configure your PATH settings to include it.

Testing NE Connectivity

Step 1 In the Domain Explorer tree, select an NE.

Step 2 Choose **Fault > Test NE Connectivity**. The Test NE Connectivity operation runs the **ping** command to check the NE communication state. The results show whether the NE is available or unavailable:

- Available—If the Prime Optical client can reach the NE through its management protocol, the communication state of the NE in the database is checked. If the NE communication state is Unavailable, it is changed to Available and an event is sent to the Prime Optical client, stating that the communication state was changed. If the NE communication state is Available, there are no changes.
- Unavailable—If the Prime Optical client cannot reach the NE through its management protocol, the communication state of the NE in the database is checked. If the NE communication state is Available, it is changed to Unavailable and an event is sent to the Prime Optical client, stating that the communication state was changed. If the NE communication state is Unavailable, there are no changes.

Step 3 Click **OK** in the dialog box.