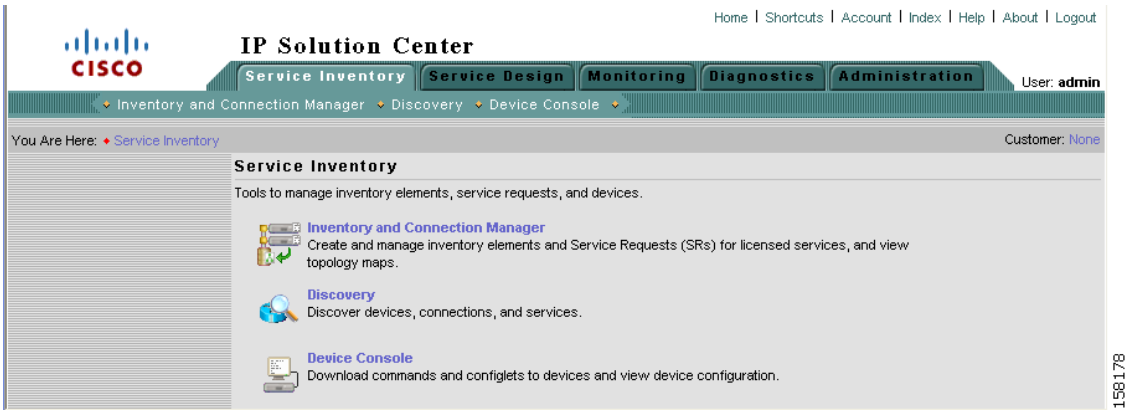
CHAPTER 3

# Service Inventory — Inventory and Connection Manager

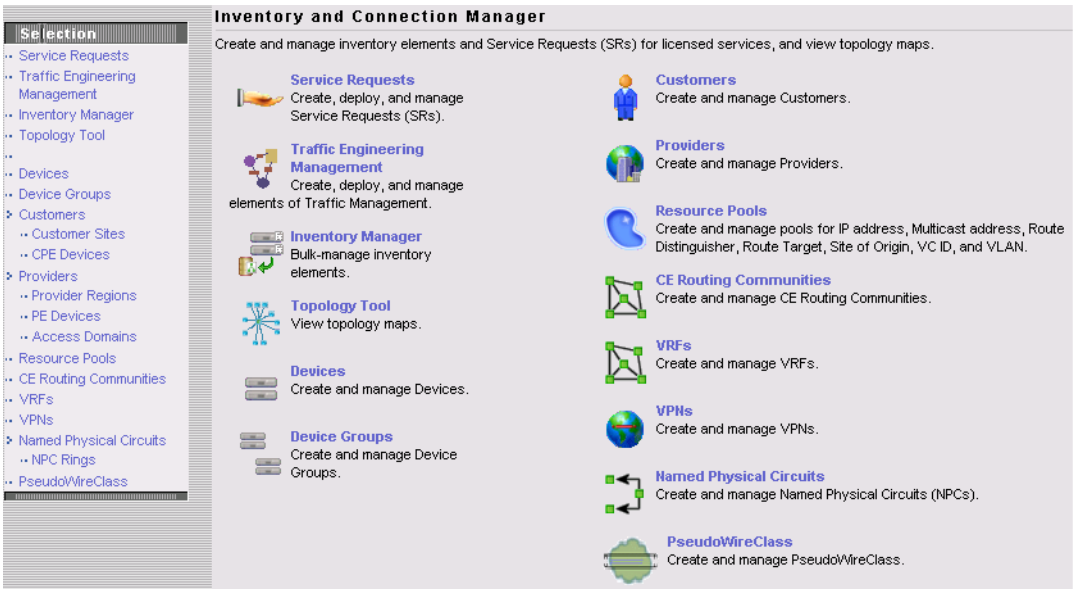
From the Home window of Cisco IP Solution Center (ISC), which appears upon logging in, click the **Service Inventory** tab and a window as shown in Figure 3-1, "Service Inventory Selections Window," appears.

***Figure 3-1 Service Inventory Selections Window***




Click on **Inventory and Connection Manager** and a window as shown in Figure 3-2, "Inventory and Connection Manager Selections Window," appears.

*Figure 3-2 Inventory and Connection Manager Selections Window*




From the **Inventory and Connection Manager** window, you can choose any of the following functions:

- **Service Requests, page 3-2**—Create, deploy, and manage Service Requests (SRs).
- **Traffic Engineering Management, page 3-5**—Create, deploy, and manage elements of Traffic Engineering Management.
- **Inventory Manager, page 3-5**—Bulk-manage inventory elements.
- **Topology Tool, page 3-38**—View topology maps.
- **Devices, page 3-70**—Create and manage Devices.
- **Device Groups, page 3-104**—Create and manage Device Groups.
- **Customers, page 3-110**—Create and manage Customers.
- **Providers, page 3-118**—Create and manage Providers.
- **Resource Pools, page 3-125**—Create and manage pools for IP address, Multicast address, Route Distinguisher, Route Target, Site of Origin, VC ID, and VLAN.
- **CE Routing Communities, page 3-135**—Create and manage CE Routing Communities.
- **VRFs, page 3-138**—Create and manage VRFs.
- **VPNs, page 3-145**—Create and manager VPNs.
- **Named Physical Circuits, page 3-150**—Create and manage Named Physical Circuits (NPCs).
- **PseudoWire Class, page 3-160**—Create and manager PseudoWire Class.

# Service Requests

Service Requests are explained in each of the *User Guides* for each of the applicable licensed services.

Figure 3-3, "Service Request States Transition Diagram," shows a high-level diagram of the relationships and movement among ISC service request states.

**Note** ISC service requests are processed in parallel, except when multiple service requests attempt to configure the same device. In this case, the service requests are processed sequentially (that is, only one write to the device can happen at a time).

*Figure 3-3 Service Request States Transition Diagram*

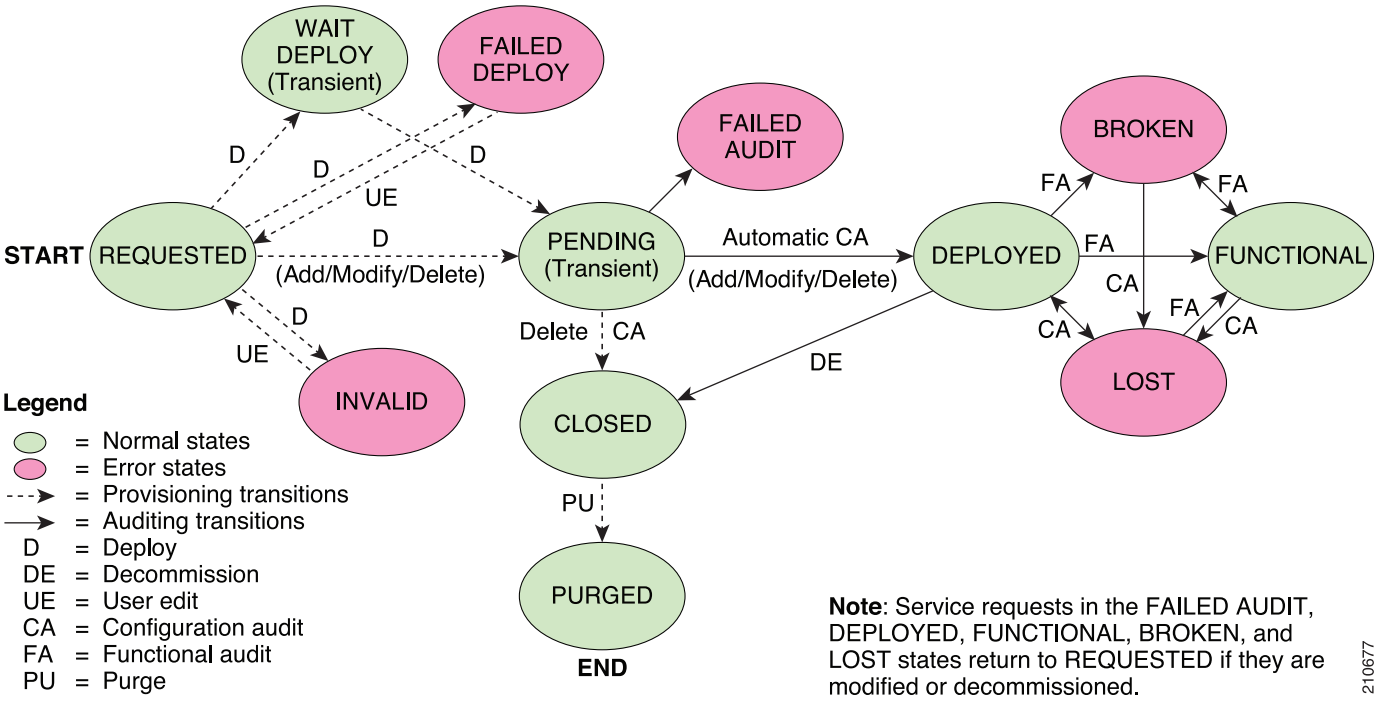



Table 3-1, "Summary of Cisco IP Solution Center Service Request States," describes the functions of each ISC service request state. They are listed in alphabetical order.

*Table 3-1 Summary of Cisco IP Solution Center Service Request States*

| Service Request State | Description |
|---|---|
| **Broken**<br>(valid only for L2TPv3 and MPLS services) | The router is correctly configured but the service is unavailable (due to a broken cable or Layer 2 problem, for example).<br>An MPLS service request moves to **Broken** if the auditor finds the routing and forwarding tables for this service, but they do not match the service intent. |
| **Closed** | A service request moves to **Closed** if the service request should no longer be used during the provisioning or auditing process. A service request moves to the **Closed** state only upon successful audit of a decommission service request. ISC does not remove a service request from the database to allow for extended auditing. Only a specific administrator purge action results in service requests being removed. |

*Table 3-1 Summary of Cisco IP Solution Center Service Request States (continued)*

| Service Request State | Description |
|---|---|
| **Deployed** | A service request moves to **Deployed** if the intention of the service request is found in the router configuration file. **Deployed** indicates that the configuration file has been downloaded to the router, and the intent of the request has been verified at the configuration level. That is, ISC downloaded the configlets to the routers and the service request passed the audit process. |
| **Failed Audit** | This state indicates that ISC downloaded the configlet to the router successfully, but the service request did not pass the audit. Therefore, the service did not move to the **Deployed** state. The **Failed Audit** state is initiated from the **Pending** state. After a service request is deployed successfully, it cannot re-enter the **Failed Audit** state (except if the service request is redeployed). |
| **Failed Deploy** | The cause for a **Failed Deploy** status is that DCS reports that either the upload of the initial configuration file from the routers failed or the download of the configuration update to the routers failed (due to lost connection, faulty password, and so on). |
| **Functional**<br>(valid only for L2TPv3 and MPLS services) | An MPLS service request moves to **Functional** when the auditor finds the VPN routing and forwarding tables (VRF) for this service and they match with the service intent. This state requires that both the configuration file audit and the routing audit are successful. |
| **Invalid** | **Invalid** indicates that the service request information is incorrect in some way. A service request moves to **Invalid** if the request was either internally inconsistent or not consistent with the rest of the existing network/router configurations (for example, no more interfaces were available on the router). The Provisioning Driver cannot generate configuration updates to service this request. |
| **Lost** | A service request moves to **Lost** when the Auditor cannot find a configuration-level verification of intent in the router configuration files. The service request was in the **Deployed** state, but now some or all router configuration information is missing. A service request can move to the **Lost** state *only* when the service request had been **Deployed**. |
| **Pending** | A service request moves to **Pending** when the Provisioning Driver determines that the request looks consistent and was able to generate the required configuration updates for this request. **Pending** indicates that the service request has generated the configuration updates and the configuration updates are successfully downloaded to the routers.<br>The Auditor regards pending service requests as new requests and begins the audit. If the service has been freshly provisioned and not yet audited, it is not an error (pending audit). However, if an audit is performed and the service is still pending, it is in an error state. |

*Table 3-1 Summary of Cisco IP Solution Center Service Request States (continued)*

| Service Request State | Description |
|---|---|
| **Requested** | If the service is newly entered and not yet deployed, it is not an error. However, if a Deploy is done and it remains **Requested**, the service is in an error state. |
| **Wait Deploy** | This service request state pertains only when downloading configlets using Cisco Configuration Engine. **Wait Deploy** indicates that the configlet has been generated, but it has not been downloaded because the device is not currently online. The configlet is staged in the repository until such time as the Cisco Configuration Engine notifies ISC that the device is up. Configlets in the **Wait Deploy** state are then downloaded to the device. |

Table 3-2, "User Operations on ISC Service Requests," describes user operations and their impact on ISC service requests.

*Table 3-2 User Operations on ISC Service Requests*

| User Operations | Description |
|---|---|
| **Decommission** | This user operation removes the service from all devices in the service request. |
| **Force Deploy** | This user operation allows you to **Deploy** a service request from any state except **Closed**. This is equivalent to restarting the state diagram. The service request can move from its current state to any other possible state. However, it does not move to the **Requested** state. |
| **Force Purge** | This user operation removes a service request from the database irrespective of its state. If you **Force Purge** a service request from the ISC repository before first decommissioning the service request, the service remains running on the network (specifically, the configuration remains on the devices on which the service was provisioned), but all record of the service request that created the service is removed from ISC. |
| **Purged** | When a service request is **Purged,** it is removed from the ISC database. |

# Traffic Engineering Management

Traffic Engineering Management allows you to create, deploy, and manage elements of Traffic Engineering Management. This is explained in detail in the *Cisco IP Solution Center Traffic Engineering Management User Guide, 5.2.*

# Inventory Manager

Inventory Manager provides a method of managing mass changes to inventory and service model data in the ISC provisioning process. In this process, Inventory Manager enables an operator to import network-specific data into the ISC Repository (Repository) in bulk mode.

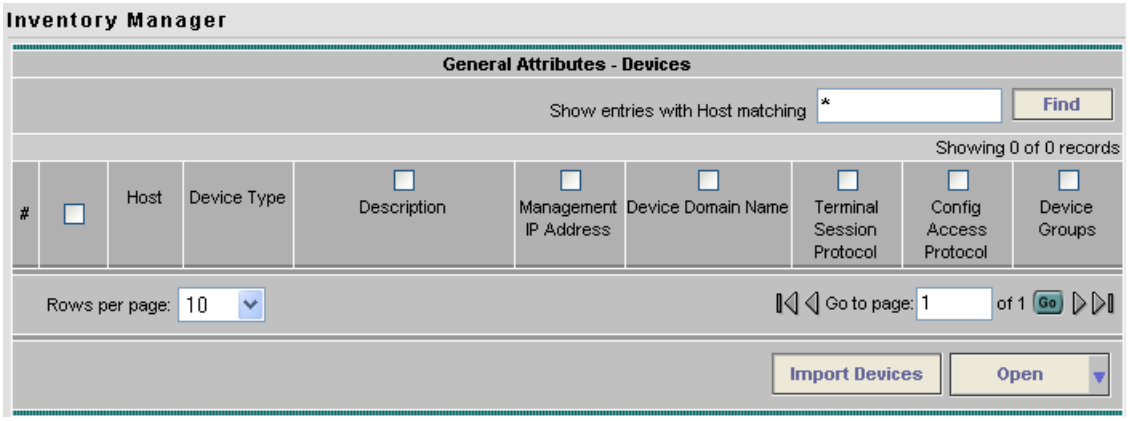
Inventory Manager performs three primary functions:

- Imports devices from configuration files and configures CPEs and PEs by associating devices with a Customer or Provider.
- Edits devices, CPEs or PEs stored in the ISC repository.
- Assigns a device to a provider or customer.

# Accessing the Inventory Manager Window

To access the Inventory Manager, choose **Service Inventory > Inventory and Connection Manager > Inventory Manager** to access the Inventory Manager window shown in Figure 3-4.

***Figure 3-4 Inventory Manager Window***




From the Inventory Manager window you can import devices or open a list of devices, providers, or customers.

# Importing Devices

To import a device, it must be in an existing directory on the same server that is running ISC. After a device is imported into the ISC repository, you can assign it to a customer or provider, if desired.

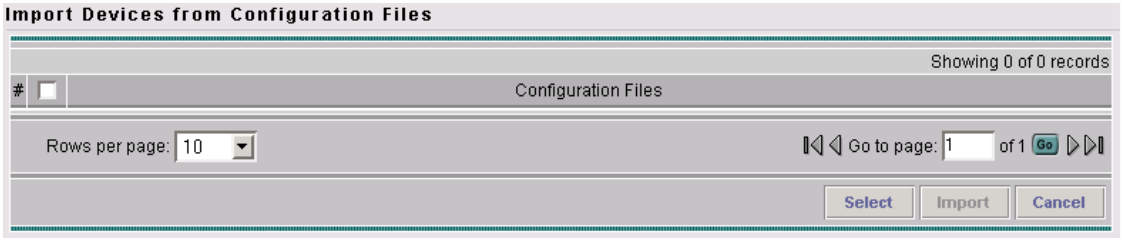
To import devices with configuration files, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Inventory Manager**.

**Step 2** Click the **Import Devices** button.

The Import Devices from Configuration Files window appears, as shown in Figure 3-5.

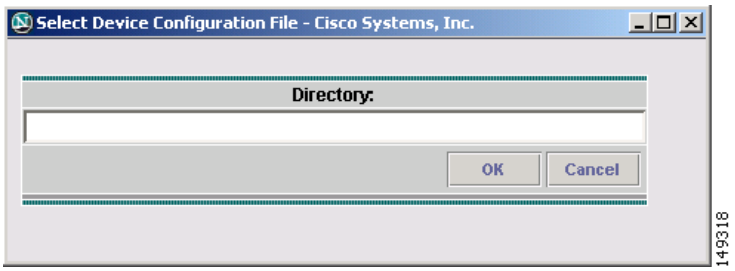
*Figure 3-5 Import Devices from Configuration Files Window*




**Step 3** Click the **Select** button.

The Select Device Configuration File window appears, as shown in Figure 3-6.

*Figure 3-6 Select Device Configuration File Window*




**Step 4** At the **Select Device Configuration File** window, enter the directory on the ISC server where the configuration files reside, and the **Import Devices from Configuration Files** window appears.

**Step 5** Select as many of the configuration files as you want to import by checking the box to the left of the Configuration File name.

**Step 6** If you want to import devices from more than one directory, you can repeat Steps 3 through 6.

**Step 7** Click **Import**.

The **General Attributes** window appears with the added information.

**Step 8** Click **Save**.

# Opening and Editing Devices

To open device configuration files to bulk edit, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Inventory Manager**.

**Step 2** Click the **Open** button.

The **Open** drop-down list appears. The **Open** options include the following:

- **Devices**—Every network element that ISC manages.

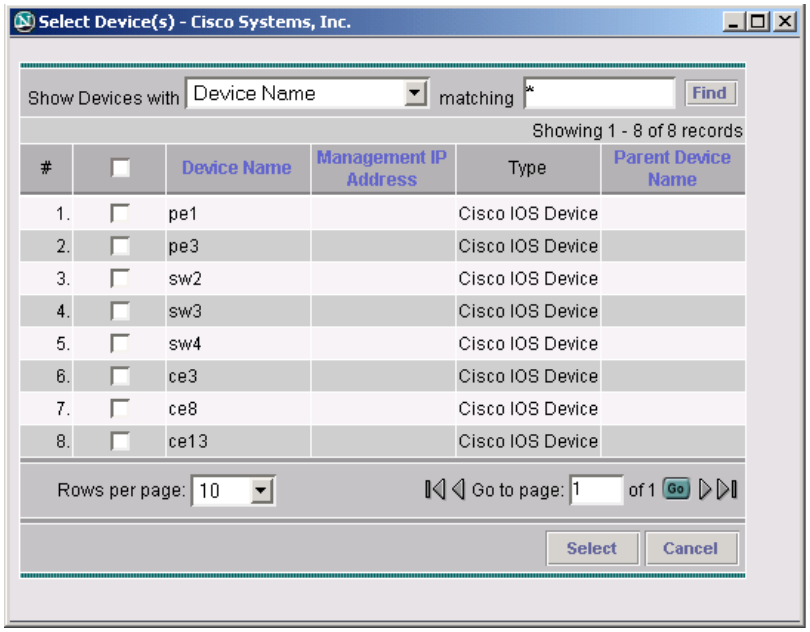
**Note** To edit a PE, **Open Provider**, *not* **Open Devices**.

- **Provider**—PEs belonging to a specific provider.
- **Customer**—CEs belonging to a specific customer.

**Step 3** Select **Devices**.

The Select Device window appears, as shown in Figure 3-7.

***Figure 3-7 Select Devices Window***

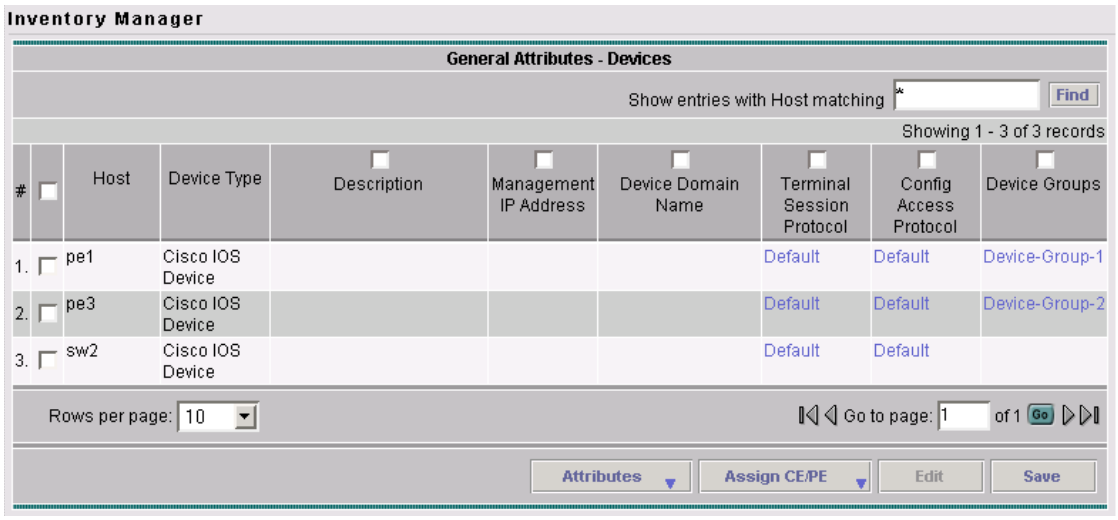



**Step 4** Select a device to open by checking the check box to the left of the Device Name. You can select more than one device to open.

**Step 5** Click the **Select** button.

The General Attributes window appears containing information on the selected devices, as shown in Figure 3-8.

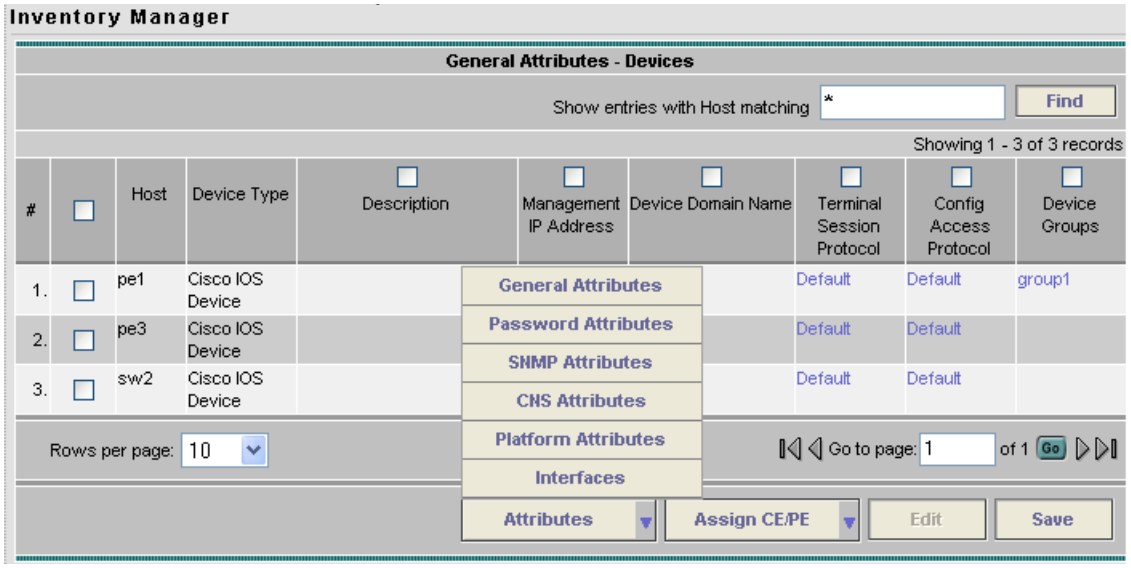
*Figure 3-8 General Attributes Devices Window*




**Step 6** To view specific attributes click the **Attributes** button.

The Attributes options appear, as shown in Figure 3-9.

*Figure 3-9 Attributes Options Window*




**Step 7** Select the type of attribute to display.

See the following sections for descriptions of these attribute fields.

- General Attributes Devices, page 3-10
- Password Attributes Devices, page 3-11
- SNMP Attributes Devices, page 3-12
- CNS Attributes Devices, page 3-13

- Platform Attributes Devices, page 3-14
- Interfaces Devices, page 3-14

**Step 8** To bulk edit an attribute, do the following:

**a.** Check the one or more boxes to the left of the Device Name.

**b.** Check the check box above the attribute name column.

**c.** Click the **Edit** button.

**Step 9** Enter the changes you want to make.

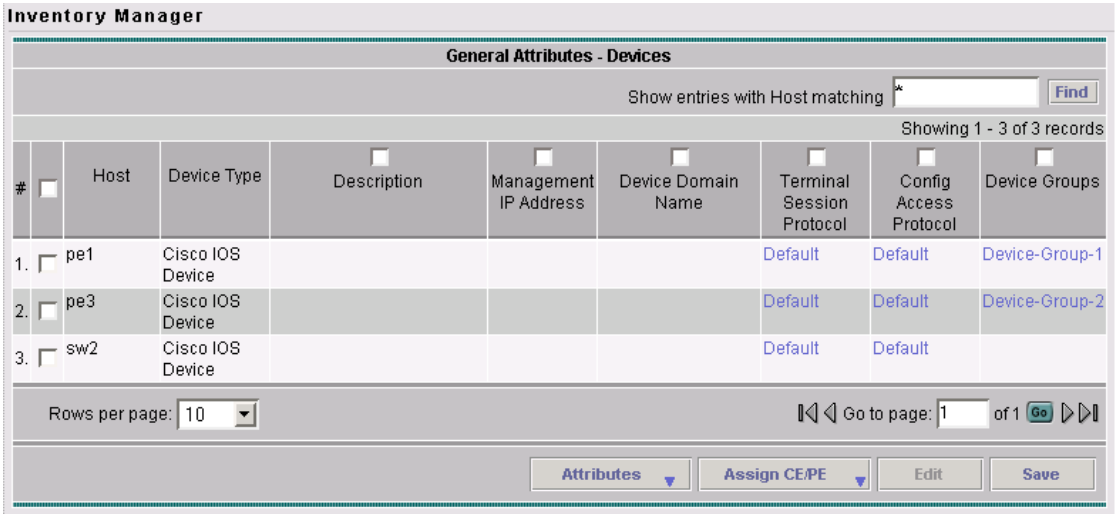
**Step 10** Click **Save**.

The changes are saved.

## General Attributes Devices

The General Attributes Devices window appears, as shown in Figure 3-10.

***Figure 3-10 General Attributes Devices Window***




The General Attributes Devices window contains the following:

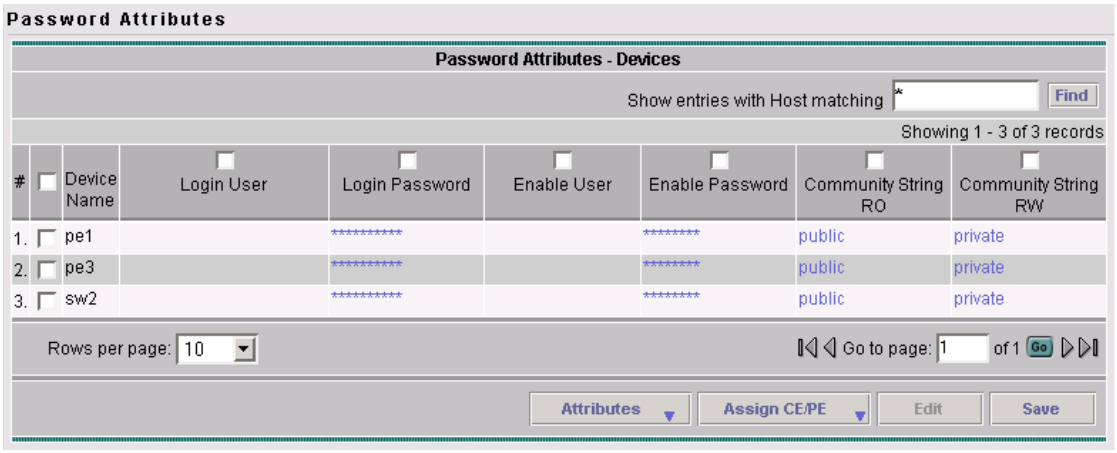
- **Host** —Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Device Type**—The device type includes the following devices:
  - Cisco Router
  - Catalyst OS device
  - Terminal server
  - IE2100 (Cisco Configuration Engine server)

- **Description**—Can contain any pertinent information about the device, such as the type of device, its location, or other information that might be helpful to service provider operators. Limited to 80 characters.
- **Management IP Address**—Valid IP address of the device that ISC uses to configure the target router device. This IP address must be reachable from the ISC host.
- **Device Domain Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. The name must match the domain name on the target router device.
- **Terminal Session Protocol**—Configures the method of communication between ISC and the device. Choices include: Telnet, Secure Shell (SSH), SSH version 2 (SSHv2), CNS, and RSH. Default: Telnet.
- **Config Access Protocol**—Administers the access protocol for config upload and download. Choices include: Terminal, TFTP, FTP, and RCP. Default: Terminal
- **Device Groups**—Lists the names of the Device Groups. You can add and modify Device Groups in this column.

## Password Attributes Devices

The Password Attributes Devices window appears, as shown in Figure 3-11.

***Figure 3-11 Password Attributes Devices Window***




The Password Attributes Devices window contains the following:

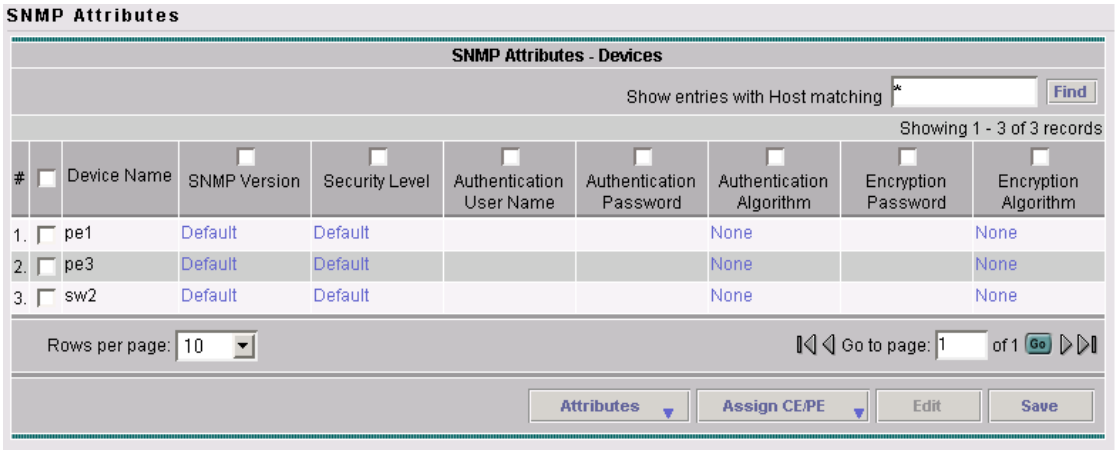
- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Login User**—Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password, as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Login Password**—Displayed as stars (*). Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password, as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.

- **Enable User**—Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Enable Password**—Displayed as stars (*). Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Community String RO** —Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.
- **Community String RW**— Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.

## SNMP Attributes Devices

The SNMP Attributes Devices window appears, as shown in Figure 3-12.

*Figure 3-12 SNMP Attributes Devices Window*




The SNMP Attributes Devices window contains the following:

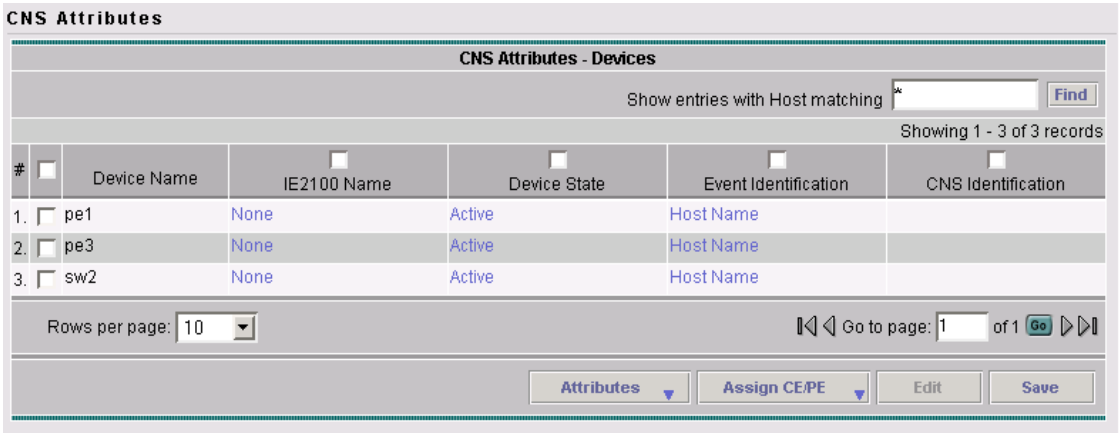
- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **SNMP Version**—Choices include: SNMP v1/v2c, and SNMP v3. The default value is determined by the setting in the DCPL property SnmpService\defaultSNMPVersion. (See Appendix C, "Property Settings" for more details.)
- **Security Level**—Choices include: No Authentication/No Encryption, Authentication/No Encryption, and Authentication/Encryption. Default: No Authentication/No Encryption.
- **Authentication User Name**—User name configured on the specified device router. User must have permission to the object identification numbers (OIDs) specified in the security request (that is, write permission for a set request, and read permission for a get request). Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Limited to 80 characters.

- **Authentication Password**—Displayed as stars (*). Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Should match what is configured on the target router device. Limited to 80 characters.
- **Authentication Algorithm**—Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Choices include: None, MD5, and SHA. Default: None.
- **Encryption Password**—Displayed as stars (*). In previous versions, this field was called Privacy Password. Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Limited to 80 characters.
- **Encryption Algorithm**—In previous versions, this field was called Privacy Protocol. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Choices include: None and DES 56. Default: None.

## CNS Attributes Devices

The CNS Attributes Devices window appears, as shown in Figure 3-13.

*Figure 3-13 CNS Attributes Devices Window*



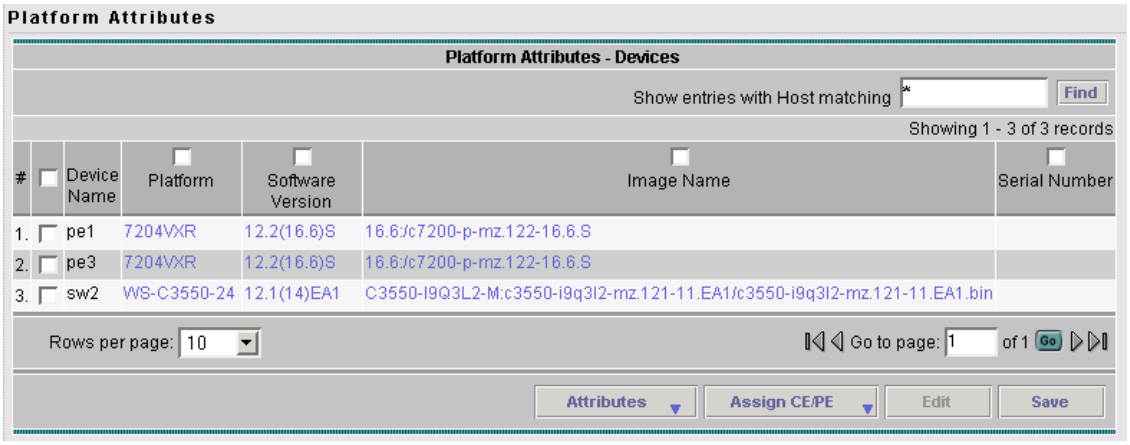

The CNS Attributes Devices window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **IE2100 Name**—Disabled unless the Device-State field is Inactive or the Terminal Session Protocol field is CNS. A valid Cisco Configuration Enginer server must be selected if the Terminal Session Protocol is CNS. Choices include: None and the list of existing Cisco Configuration Engine server names. Default: None.
- **Device State**—Choices include: Active and Inactive. Active indicates that the router has been plugged on the network and can be part of ISC tasks such as collect config and provisioning. Inactive indicates the router has not been plugged-in. Default: Active.
- **Event Identification**—Indicates whether the CNS Identification field contains a HOST NAME or CNS ID. Default: HOST NAME.
- **CNS Identification**—Required if the Event Identification field is set to CNS ID. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash.

## Platform Attributes Devices

The Platform Attributes Devices window appears, as shown in Figure 3-14.

*Figure 3-14 Platform Attributes Devices Window*



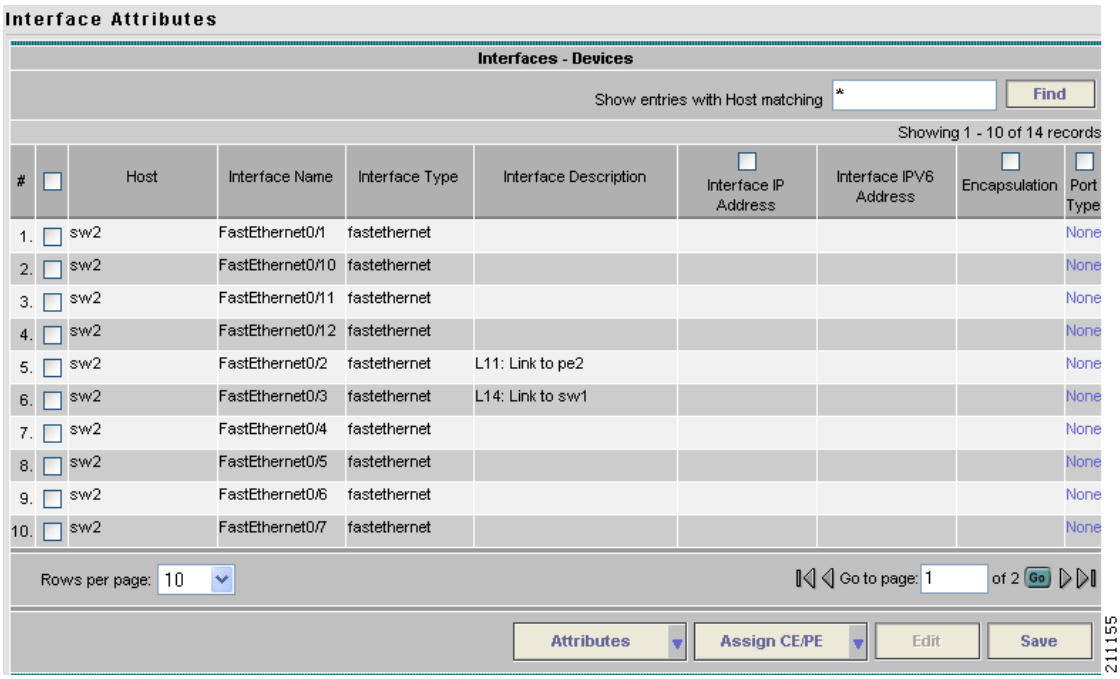

The Platform Attributes Devices window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Platform**—Should match what is configured on the target router device. Limited to 80 characters.
- **Software Version**—Should match what is configured on the target router device. Limited to 80 characters.
- **Image Name**—Should match what is configured on the target router device. Limited to 80 characters.
- **Serial Number**—Should match what is configured on the target router device. Limited to 80 characters.

## Interfaces Devices

The Interfaces Devices window appears, as shown in Figure 3-15.

*Figure 3-15 Interfaces Devices Window*




The Interfaces Devices window contains the following:

- **Host** —Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Interface Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required. Limited to 256 characters.
- **Interface Type**—Specifies the type of interface. It is a display-only field.
- **Interface Description**—Description of the interface. This field is display-only. Field is populated by importing a configuration file.
- **Interface IP Address**—IPv4 address associated with this interface.
- **Interface IPv6 Address**—IPv6 address associated with this interface.
- **Encapsulation**—The Layer 2 Encapsulation for this device. It is a display-only field. Possible values are:
  - DEFAULT
  - DOT1Q
  - ETHERNET
  - ISL
  - FRAME_RELAY
  - FRAME_RELAY_IETF
  - HDLC
  - PPP

  - ATM
  - AAL5SNAP
  - AAL0
  - AAL5
  - AAL5MUX
  - AAL5NLPID
  - AAL2
  - ENCAP_QinQ
  - GRE
- **Port Type**—Choices include: Access, Trunk, Routed, and None.

# Opening and Editing PEs

To open PE files to bulk edit, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Inventory Manager**.

**Step 2** Click the **Open** button.

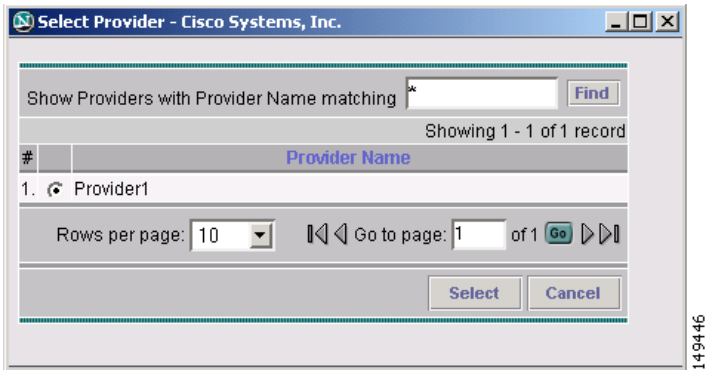
The **Open** drop-down list appears. The **Open** options include the following:

- **Devices**—Every network element that ISC manages.
- **Provider**—PEs belonging to a specific provider.
- **Customer**—CEs belonging to a specific customer.

**Step 3** Select **Provider**.

The Select Provider window appears, as shown in Figure 3-16.

***Figure 3-16 Select Provider Window***

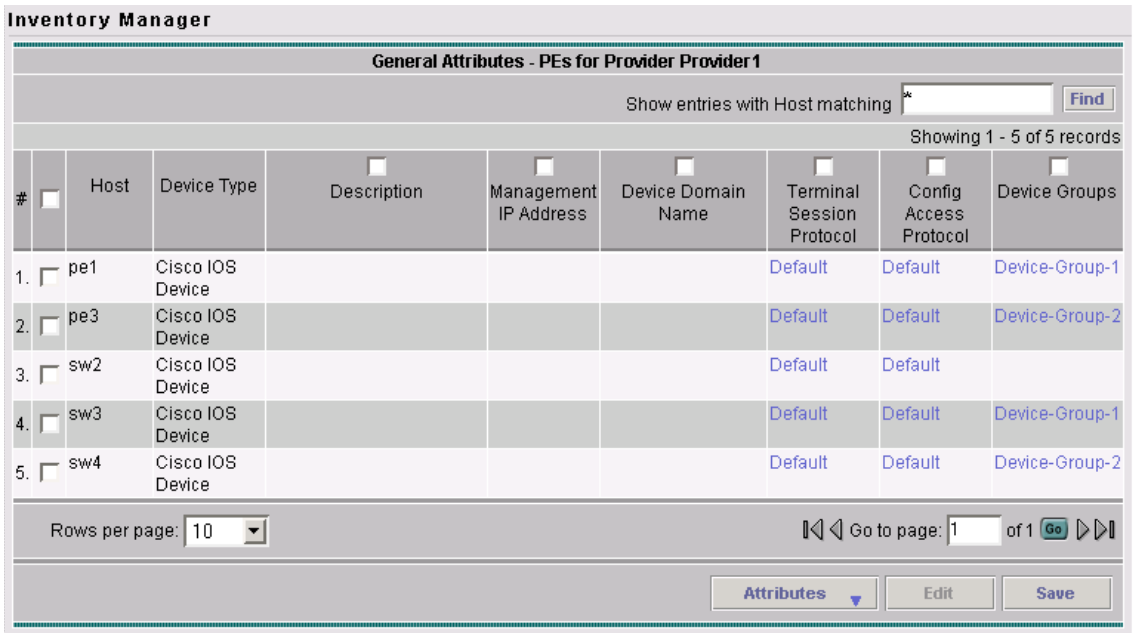



**Step 4** Select a provider by clicking the radio button to the left of the Provider Name.

**Step 5** Click the **Select** button.

The General Attributes Provider window appears showing the PEs assigned to the selected provider, as shown in Figure 3-17.

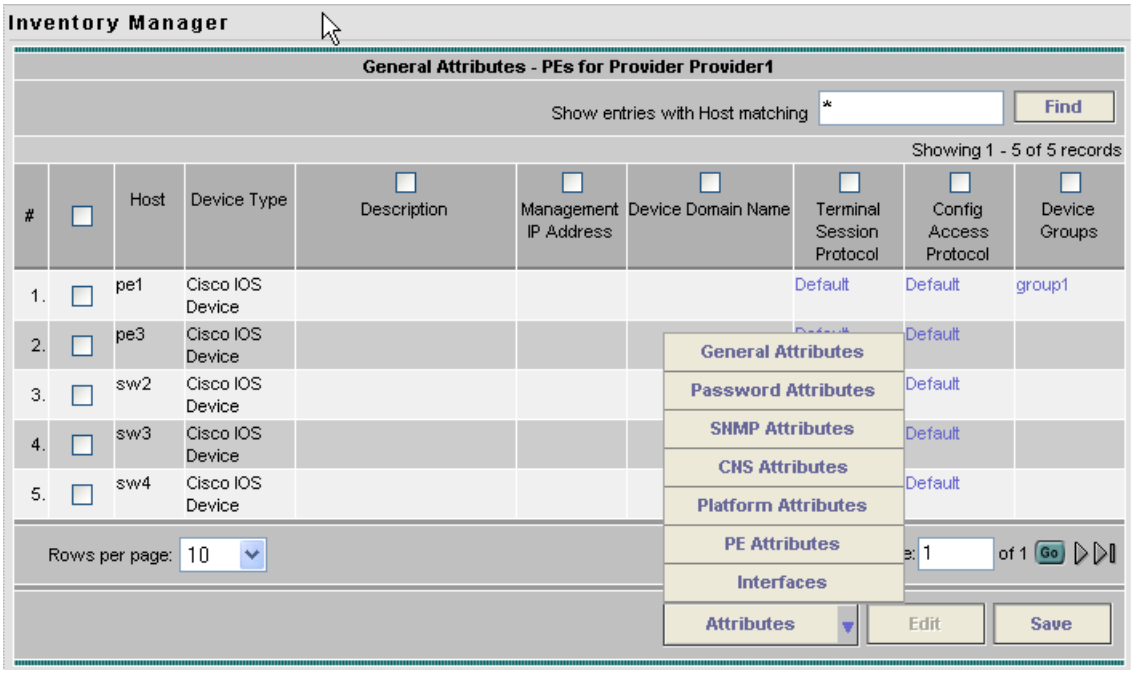
*Figure 3-17 General Attributes Provider Window*




**Step 6** To view specific attributes click the **Attributes** button.

The Attributes options appear, as shown in Figure 3-18.

*Figure 3-18 Attributes Options Window*



**Step 7** Select the type of attribute to display.

See the following sections for descriptions of these attribute fields.

- General Attributes Provider, page 3-18
- Password Attributes Provider, page 3-19
- SNMP Attributes Provider, page 3-21
- CNS Attributes Provider, page 3-22
- Platform Attributes Provider, page 3-23
- PE Attributes Provider, page 3-24
- Interfaces Provider, page 3-25

**Step 8** To bulk edit an attribute, do the following:

a. Check the one or more boxes to the left of the Host or Device Name.

b. Check the check box above the attribute name column.

c. Click the **Edit** button.

**Step 9** Enter the changes you want to make.

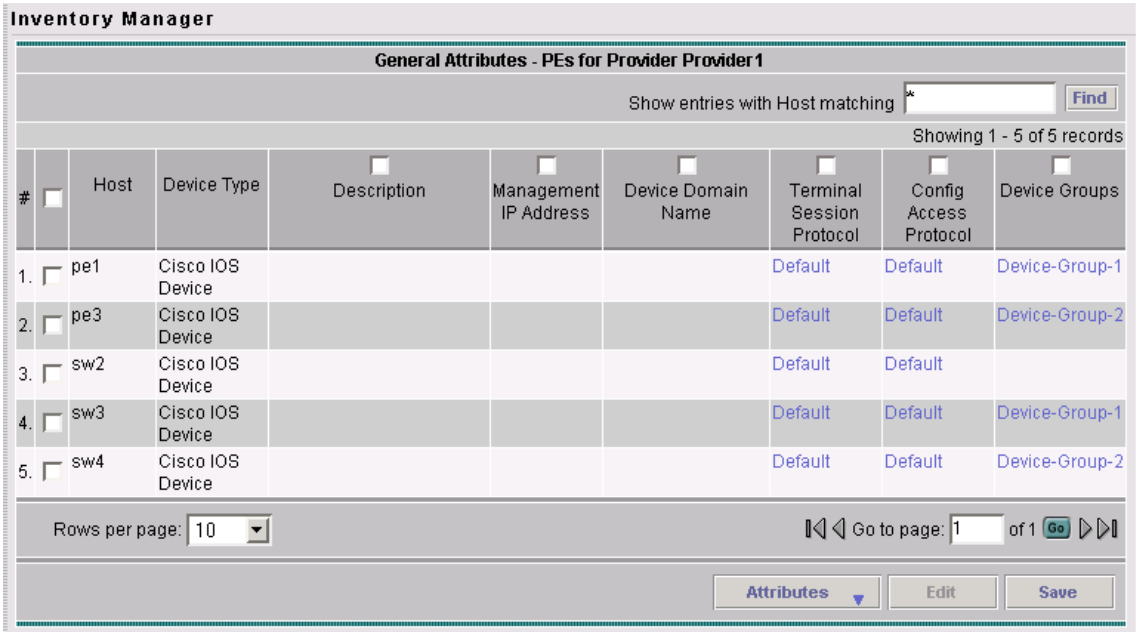
**Step 10** Click **Save**.

The changes are saved.

## General Attributes Provider

The General Attributes Provider window appears, as shown in Figure 3-19.

***Figure 3-19 General Attributes Provider Window***



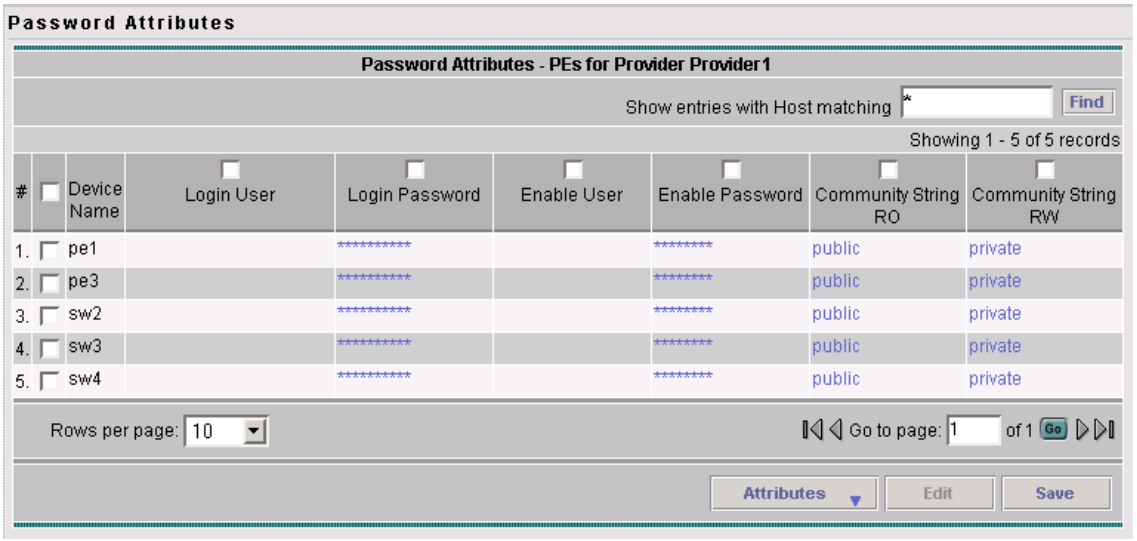
The General Attributes Provider window contains the following:

- **Host** —Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Device Type**—The device type includes the following devices:
  - Cisco Router
  - Catalyst OS device
  - Terminal server
  - IE2100 (Cisco Configuration Engine server)
- **Description**—Can contain any pertinent information about the device, such as the type of device, its location, or other information that might be helpful to service provider operators. Limited to 80 characters.
- **Management IP Address**—Valid IP address of the device that ISC uses to configure the target router device. This IP address must be reachable from the ISC host.
- **Device Domain Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. The name must match the domain name on the target router device.
- **Terminal Session Protocol**—Configures the method of communication between ISC and the device. Choices include: Telnet, Secure Shell (SSH), SSH version 2 (SSHv2), CNS, and RSH. Default: Telnet.
- **Config Access Protocol**—Administers the access protocol for config upload and download. Choices include: Terminal, TFTP, FTP, and RCP. Default: Terminal
- **Device Groups**—Lists the names of the Device Groups. You can add and modify Device Groups in this column.

## Password Attributes Provider

The Password Attributes Provider window appears, as shown in Figure 3-20.

*Figure 3-20 Password Attributes Provider Window*



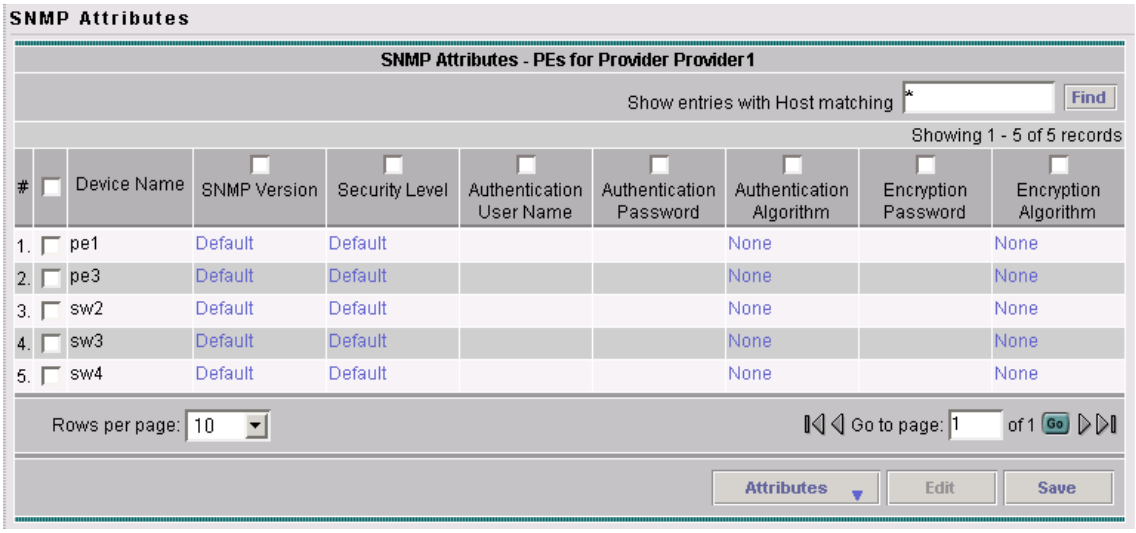

The Password Attributes Provider window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Login User**—Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password, as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Login Password**—Displayed as stars (*). Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password, as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Enable User**—Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Enable Password**—Displayed as stars (*). Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Community String RO** —Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.
- **Community String RW**— Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.

## SNMP Attributes Provider

The SNMP Attributes Provider window appears, as shown in Figure 3-21.

*Figure 3-21 SNMP Attributes Provider Window*



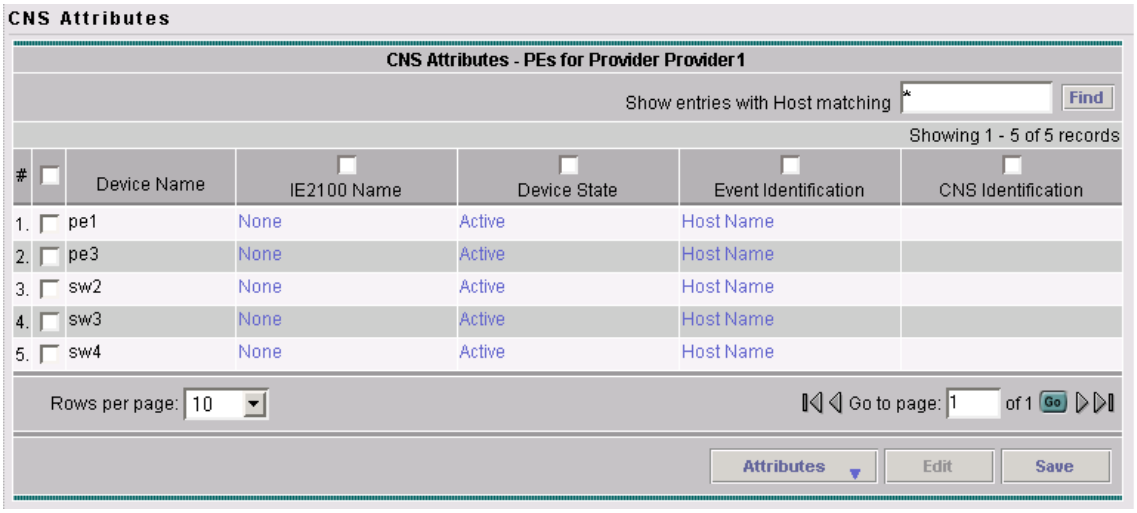

The SNMP Attributes Provider window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **SNMP Version**—Choices include: SNMP v1/v2c, and SNMP v3. The default value is determined by the setting in the DCPL property SnmpService\defaultSNMPVersion. (See Appendix C, "Property Settings" for more details.)
- **Security Level**—Choices include: No Authentication/No Encryption, Authentication/No Encryption, and Authentication/Encryption. Default: No Authentication/No Encryption.
- **Authentication User Name**—User name configured on the specified device router. User must have permission to the object identification numbers (OIDs) specified in the security request (that is, write permission for a set request, and read permission for a get request). Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Limited to 80 characters.
- **Authentication Password**—Displayed as stars (*). Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Should match what is configured on the target router device. Limited to 80 characters.
- **Authentication Algorithm**—Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Choices include: None, MD5, and SHA. Default: None.
- **Encryption Password**—Displayed as stars (*). In previous versions, this field was called Privacy Password. Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Limited to 80 characters.
- **Encryption Algorithm**—In previous versions, this field was called Privacy Protocol. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Choices include: None and DES 56. Default: None.

# CNS Attributes Provider

The CNS Attributes Provider window appears, as shown in Figure 3-22.

***Figure 3-22 CNS Attributes Provider Window***



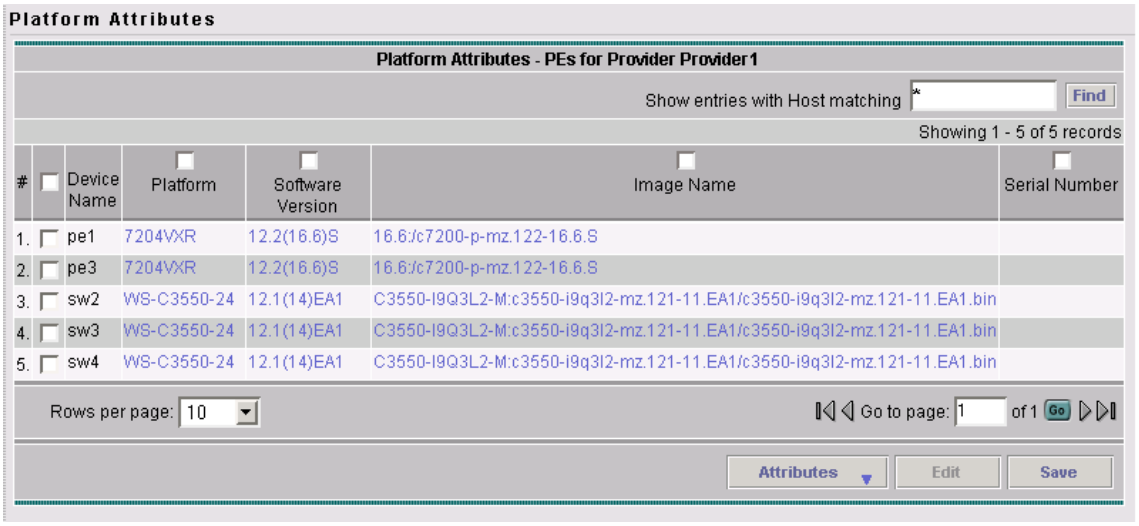

The CNS Attributes Provider window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **IE2100 Name**—Disabled unless the Device-State field is Inactive or the Terminal Session Protocol field is CNS. A valid Cisco Configuration Enginer server must be selected if the Terminal Session Protocol is CNS. Choices include: None and the list of existing Cisco Configuration Enginer server names. Default: None.
- **Device State**—Choices include: Active and Inactive. Active indicates that the router has been plugged on the network and can be part of ISC tasks such as collect config and provisioning. Inactive indicates the router has not been plugged-in. Default: Active.
- **Event Identification**—Indicates whether the CNS Identification field contains a HOST NAME or CNS ID. Default: HOST NAME.
- **CNS Identification**—Required if the Event Identification field is set to CNS ID. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash.

## Platform Attributes Provider

The Platform Attributes Provider window appears, as shown in Figure 3-23.

*Figure 3-23 Platform Attributes Provider Window*



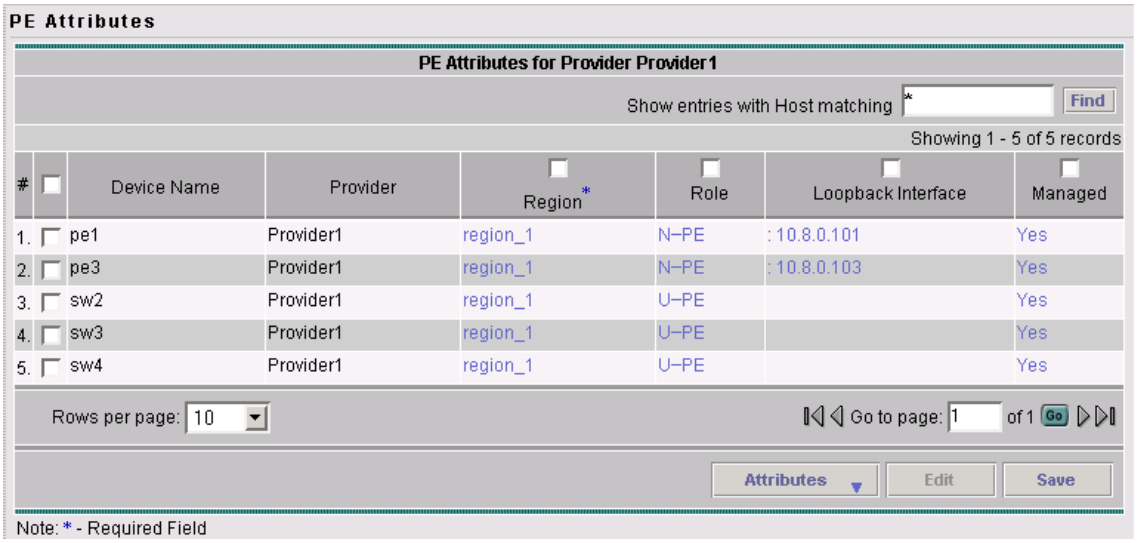

The Platform Provider window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Platform**—Should match what is configured on the target router device. Limited to 80 characters.
- **Software Version**—Should match what is configured on the target router device. Limited to 80 characters.
- **Image Name**—Should match what is configured on the target router device. Limited to 80 characters.
- **Serial Number**—Should match what is configured on the target router device. Limited to 80 characters.

# PE Attributes Provider

The PE Attributes Provider window appears, as shown in Figure 3-24.

***Figure 3-24 PE Attributes Provider Window***



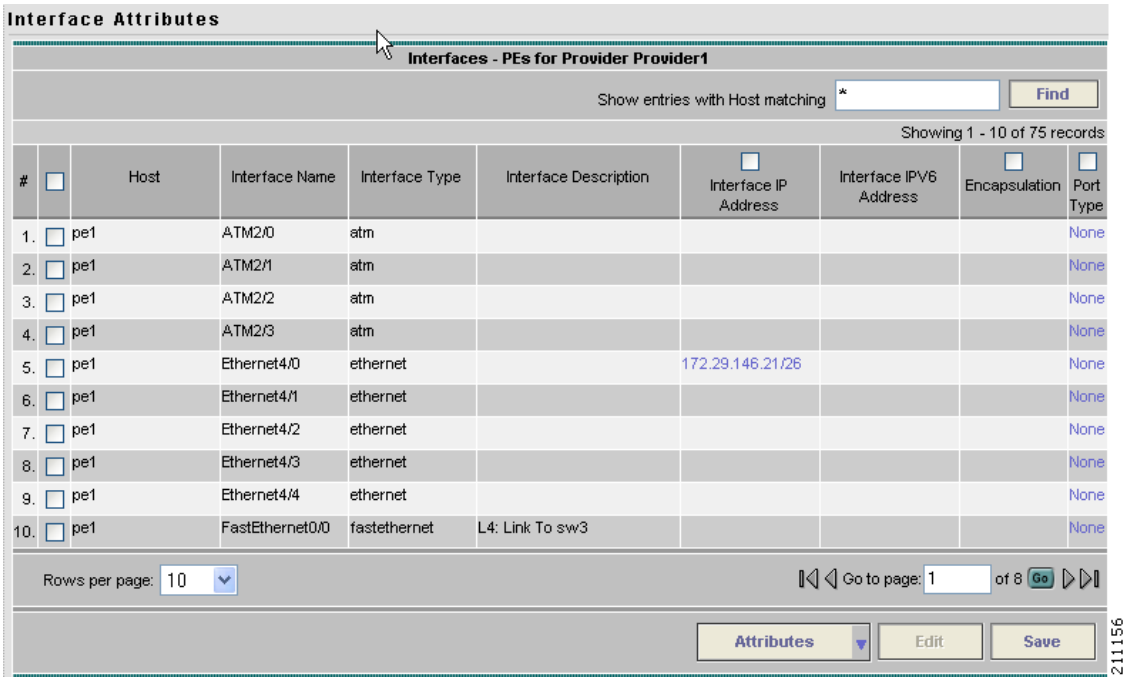

The PE Attributes Provider window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Provider**—Lists the names of providers. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by provider name.
- **Region**—Lists the names of regions. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by region name.
- **Role**—Choices include: N-PE, U-PE, P, PE_AGG.
- **Loopback Interface**—Loopback address is the IP address of any loopback interface on the device. You can select one of the loopback interfaces for this field and use the IP address on that loopback interface.
- **Managed**—Provisioned by ISC. Check the check box for yes. Default is no.

# Interfaces Provider

The Interfaces Provider window appears, as shown in Figure 3-25.

***Figure 3-25 Interfaces Provider Window***




The Interfaces Provider window contains the following:

- **Host** —Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Interface Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required. Limited to 256 characters.
- **Interface Type**—Specifies the type of interface. It is a display-only field.
- **Interface Description**—Description of the interface. This field is display-only. Field is populated by importing a configuration file.
- **Interface IP Address**—IPv4 address associated with this interface.
- **Interface IPv6 Address**—IPv6 address associated with this interface.
- **Encapsulation**—The Layer 2 Encapsulation for this device. It is a display-only field. Possible values are:
  - DEFAULT
  - DOT1Q
  - ETHERNET
  - ISL
  - FRAME_RELAY

  - FRAME_RELAY_IETF
  - HDLC
  - PPP
  - ATM
  - AAL5SNAP
  - AAL0
  - AAL5
  - AAL5MUX
  - AAL5NLPID
  - AAL2
  - ENCAP_QinQ
  - GRE
- **Port Type**—Choices include: Access, Trunk, Routed, and None.

# Opening and Editing CEs

To open CE files to bulk edit, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Inventory Manager**.

**Step 2** Click the **Open** button.

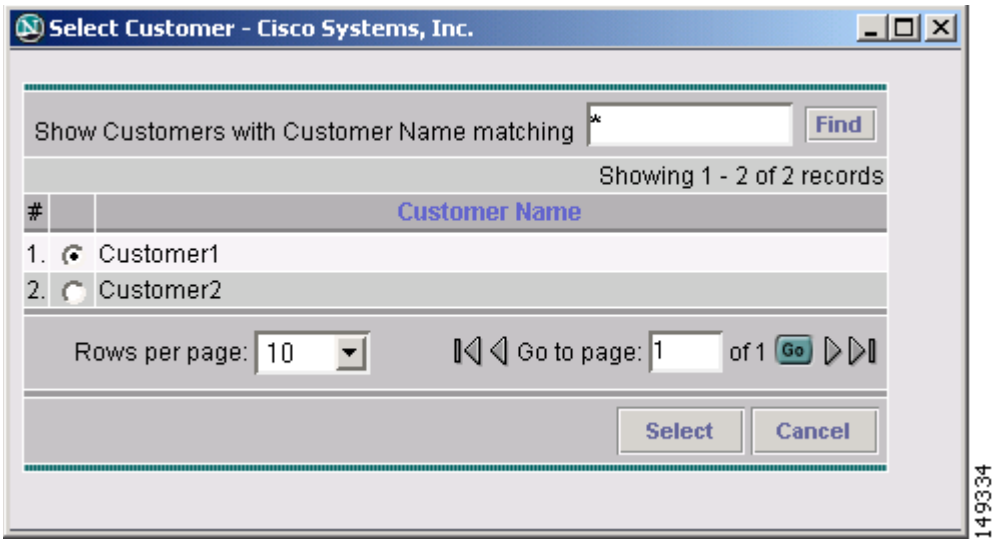
The **Open** drop-down list appears. The **Open** options include the following:

- **Devices**—Every network element that ISC manages.
- **Provider**—PEs belonging to a specific provider.
- **Customer**—CEs belonging to a specific customer.

**Step 3** Select **Customer**.

The Select Customer window appears, as shown in Figure 3-26.

*Figure 3-26 Select Customer Window*

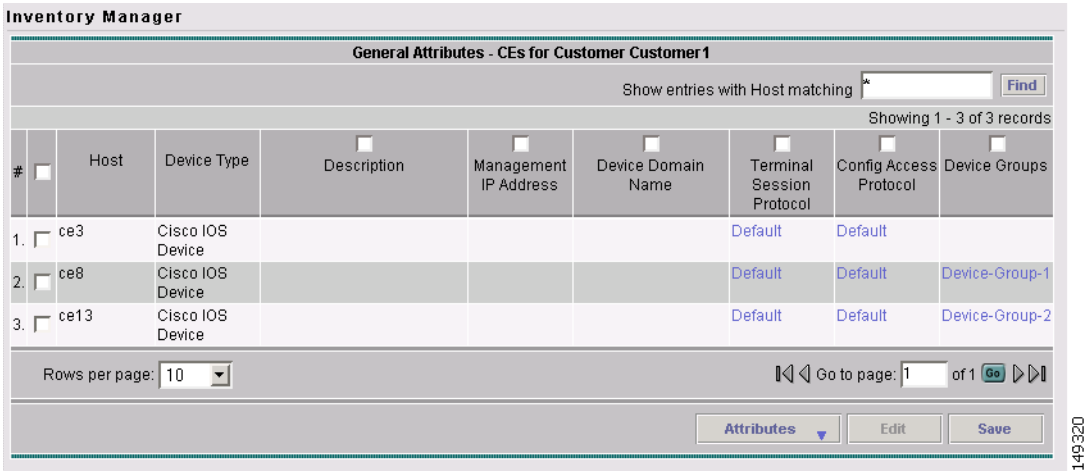



**Step 4** Select a customer by clicking the radio button to the left of the Customer Name.

**Step 5** Click the **Select** button.

The General Attributes Customer window appears showing the CEs assigned to the selected customer, as shown in Figure 3-27.

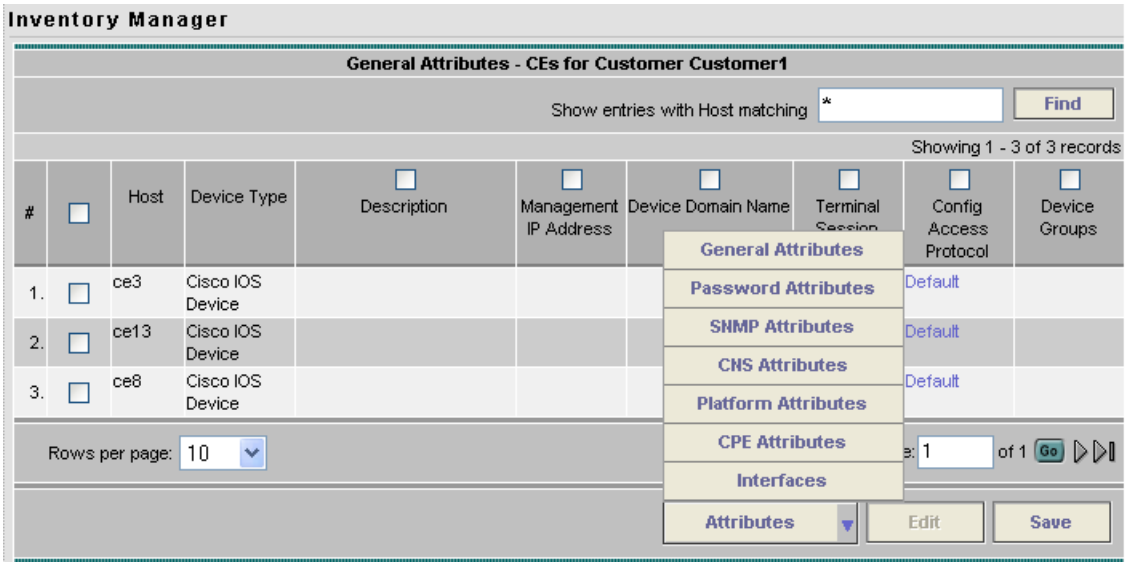
*Figure 3-27 General Attributes Customer Window*




**Step 6** To view specific attributes click the **Attributes** button.

The Attributes options appear, as shown in Figure 3-28.

*Figure 3-28 Attributes Options Window*




**Step 7** Select the type of attribute to display.

See the following sections for descriptions of these attribute fields.

- General Attributes Customer, page 3-29
- Password Attributes Customer, page 3-30
- SNMP Attributes Customer, page 3-31
- CNS Attributes Customer, page 3-32
- Platform Attributes Customer, page 3-33
- CPE Attributes Customer, page 3-34
- Interfaces Customer, page 3-35

**Step 8** To bulk edit an attribute, do the following:

**a.** Check the one or more boxes to the left of the Host or Device Name.

**b.** Check the check box above the attribute name column.

**c.** Click the **Edit** button.

**Step 9** Enter the changes you want to make.

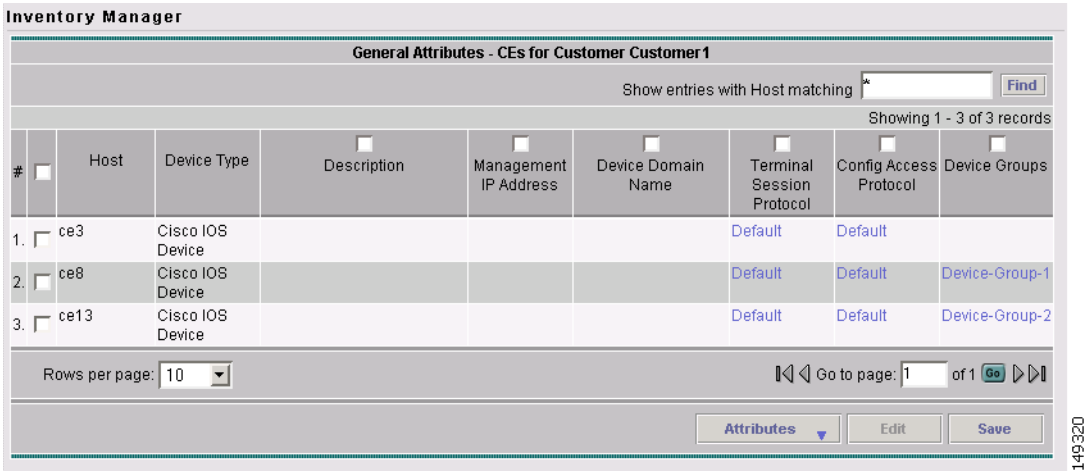
**Step 10** Click **Save**.

The changes are saved.

## General Attributes Customer

The General Attributes Customer window appears, as shown in Figure 3-29.

*Figure 3-29 General Attributes Customer Window*



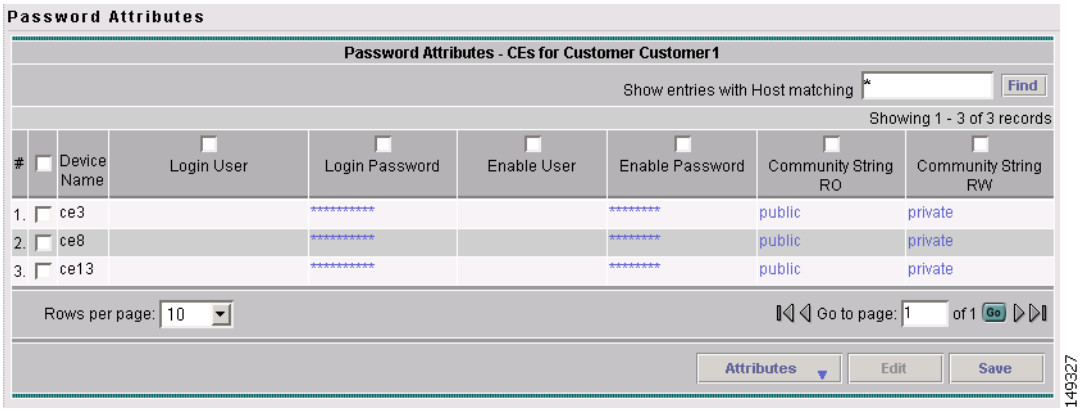

The General Attributes Customer window contains the following:

- **Host** —Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Device Type**—The device type includes the following devices:
  - Cisco Router
  - Catalyst OS device
  - Terminal server
  - IE2100 (Cisco Configuration Engine server)
- **Description**—Can contain any pertinent information about the device, such as the type of device, its location, or other information that might be helpful to service provider operators. Limited to 80 characters.
- **Management IP Address**—Valid IP address of the device that ISC uses to configure the target router device. This IP address must be reachable from the ISC host.
- **Device Domain Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. The name must match the domain name on the target router device.
- **Terminal Session Protocol**—Configures the method of communication between ISC and the device. Choices include: Telnet, Secure Shell (SSH), SSH version 2 (SSHv2), CNS, and RSH. Default: Telnet.
- **Config Access Protocol**—Administers the access protocol for config upload and download. Choices include: Terminal, TFTP, FTP, and RCP. Default: Terminal
- **Device Groups**—Lists the names of the Device Groups. You can add and modify Device Groups in this column.

# Password Attributes Customer

The Password Attributes Customer window appears, as shown in Figure 3-30.

***Figure 3-30 Password Attributes Customer Window***



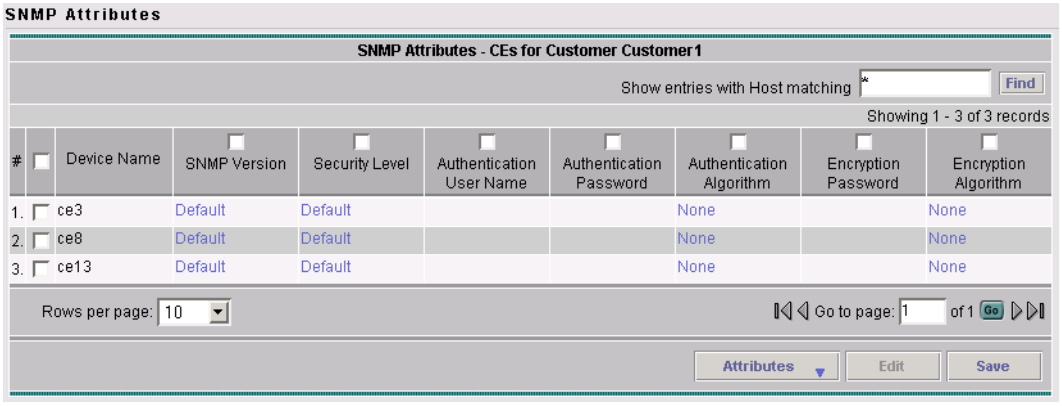

The Password Attributes Customer window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Login User**—Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password, as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Login Password**—Displayed as stars (*). Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password, as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Enable User**—Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Enable Password**—Displayed as stars (*). Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Community String RO** —Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.
- **Community String RW**— Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.

## SNMP Attributes Customer

The SNMP Attributes Customer window appears, as shown in Figure 3-31.

*Figure 3-31 SNMP Attributes Customer Window*



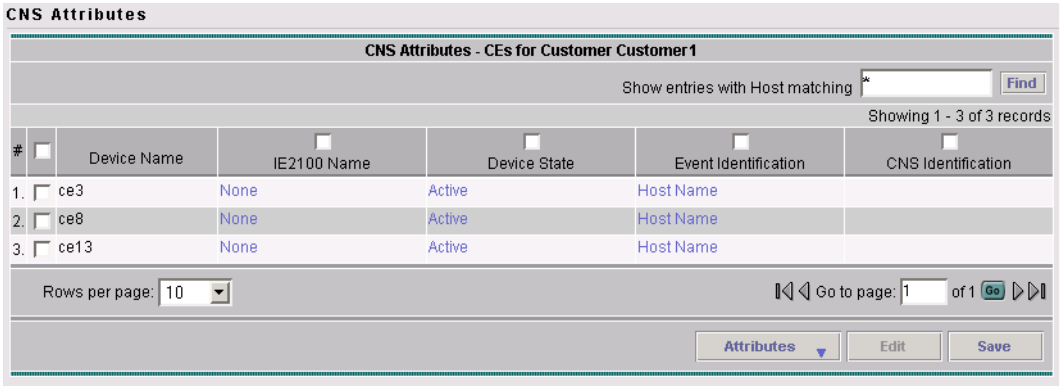

The SNMP Attributes Customer window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **SNMP Version**—Choices include: SNMP v1/v2c, and SNMP v3. The default value is determined by the setting in the DCPL property SnmpService\defaultSNMPVersion. (See Appendix C, "Property Settings" for more details.)
- **Security Level**—Choices include: No Authentication/No Encryption, Authentication/No Encryption, and Authentication/Encryption. Default: No Authentication/No Encryption.
- **Authentication User Name**—User name configured on the specified device router. User must have permission to the object identification numbers (OIDs) specified in the security request (that is, write permission for a set request, and read permission for a get request). Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Limited to 80 characters.
- **Authentication Password**—Displayed as stars (*). Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Should match what is configured on the target router device. Limited to 80 characters.
- **Authentication Algorithm**—Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Choices include: None, MD5, and SHA. Default: None.
- **Encryption Password**—Displayed as stars (*). In previous versions, this field was called Privacy Password. Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Limited to 80 characters.
- **Encryption Algorithm**—In previous versions, this field was called Privacy Protocol. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Choices include: None and DES 56. Default: None.

# CNS Attributes Customer

The CNS Attributes Customer window appears, as shown in Figure 3-32.

*Figure 3-32 CNS Attributes Customer Window*



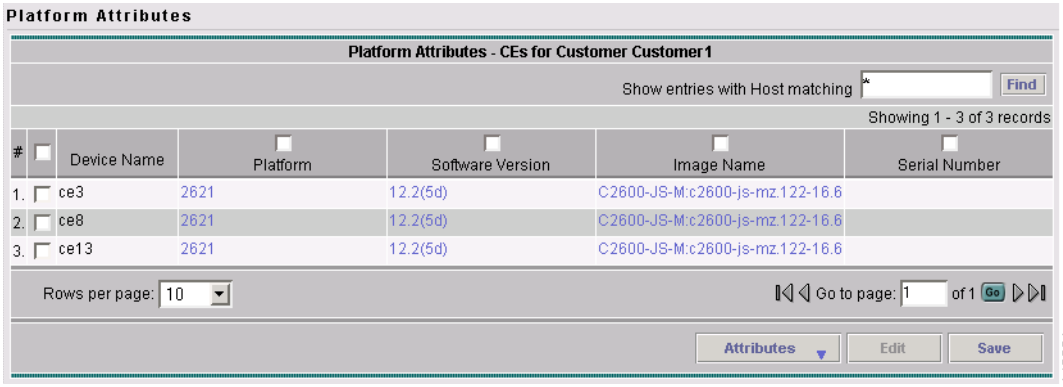

The CNS Attributes Customer window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **IE2100 Name**—Disabled unless the Device-State field is Inactive or the Terminal Session Protocol field is CNS. A valid Cisco Configuration Enginer server must be selected if the Terminal Session Protocol is CNS. Choices include: None and the list of existing Cisco Configuration Enginer server names. Default: None.
- **Device State**—Choices include: Active and Inactive. Active indicates that the router has been plugged on the network and can be part of ISC tasks such as collect config and provisioning. Inactive indicates the router has not been plugged-in. Default: Active.
- **Event Identification**—Indicates whether the CNS Identification field contains a HOST NAME or CNS ID. Default: HOST NAME.
- **CNS Identification**—Required if the Event Identification field is set to CNS ID. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash.

## Platform Attributes Customer

The Platform Attributes Customer window appears, as shown in Figure 3-33.

*Figure 3-33 Platform Attributes Customer Window*



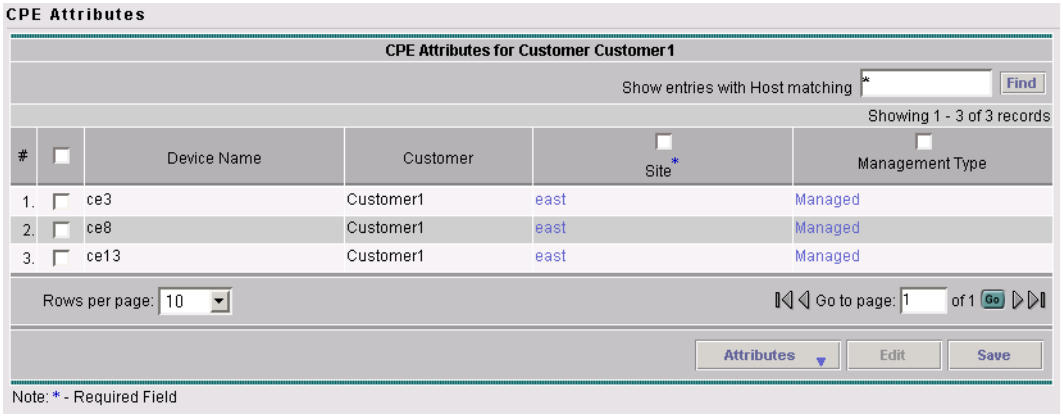

The Platform Customer window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Platform**—Should match what is configured on the target router device. Limited to 80 characters.
- **Software Version**—Should match what is configured on the target router device. Limited to 80 characters.
- **Image Name**—Should match what is configured on the target router device. Limited to 80 characters.
- **Serial Number**—Should match what is configured on the target router device. Limited to 80 characters.

# CPE Attributes Customer

The CPE Attributes Customer window appears, as shown in Figure 3-34.

***Figure 3-34 CPE Attributes Customer Window***



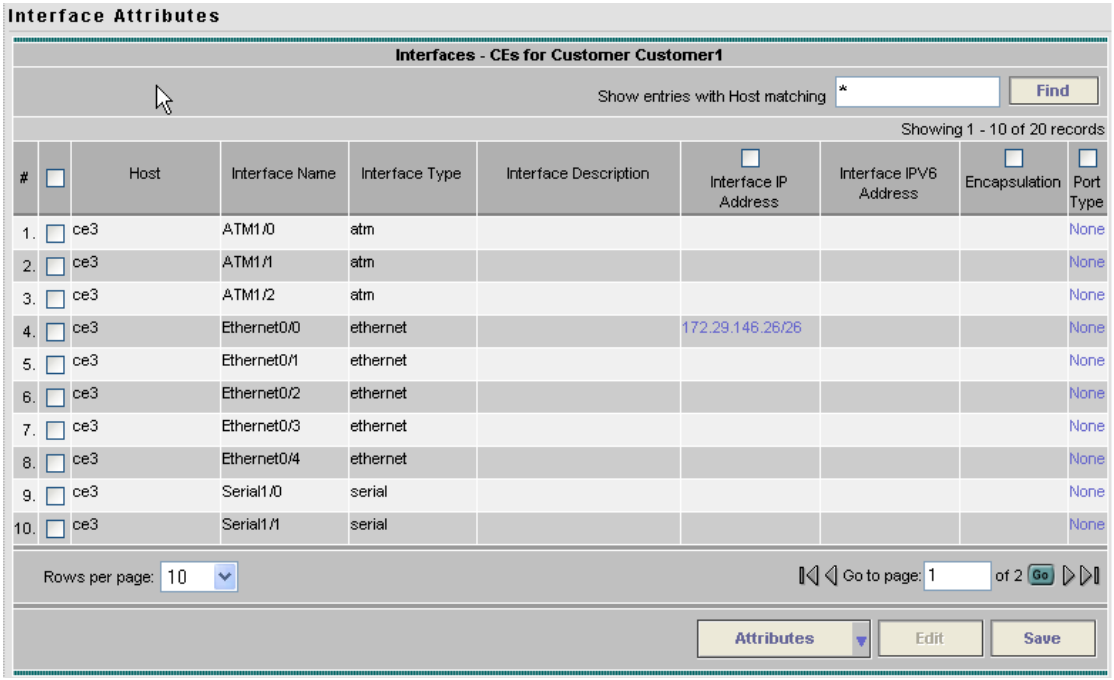

The CPE Attributes Customer window contains the following:

- **Device Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Customer**—Lists the names of customers. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by customer name.
- **Site**—Lists the names of sites. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by site name.
- **Management Type**—Choices include: Managed, Unmanaged, Managed - Management LAN, Unmanaged - Management LAN, Directly Connected, Directly Connected Management Host, Multi-VRF, and Unmanaged Multi-VRF.

# Interfaces Customer

The Interfaces Customer window appears, as shown in Figure 3-35.

***Figure 3-35 Interfaces Customer Window***




The Interfaces Customer window contains the following:

- **Host** —Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Interface Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required. Limited to 256 characters.
- **Interface Type**—Specifies the type of interface. It is a display-only field.
- **Interface Description**—Description of the interface. This field is display-only. Field is populated by importing a configuration file.
- **Interface IP Address**—IPv4 address associated with this interface.
- **Interface IPv6 Address**—IPv6 address associated with this interface.
- **Encapsulation**—The Layer 2 Encapsulation for this device. It is a display-only field. Possible values are:DEFAULT
  - DOT1Q
  - ETHERNET
  - ISL
  - FRAME_RELAY
  - FRAME_RELAY_IETF

  - HDLC
  - PPP
  - ATM
  - AAL5SNAP
  - AAL0
  - AAL5
  - AAL5MUX
  - AAL5NLPID
  - AAL2
  - ENCAP_QinQ
  - GRE
- **Port Type**—Choices include: Access, Trunk, Routed, and None.

# Assigning Devices

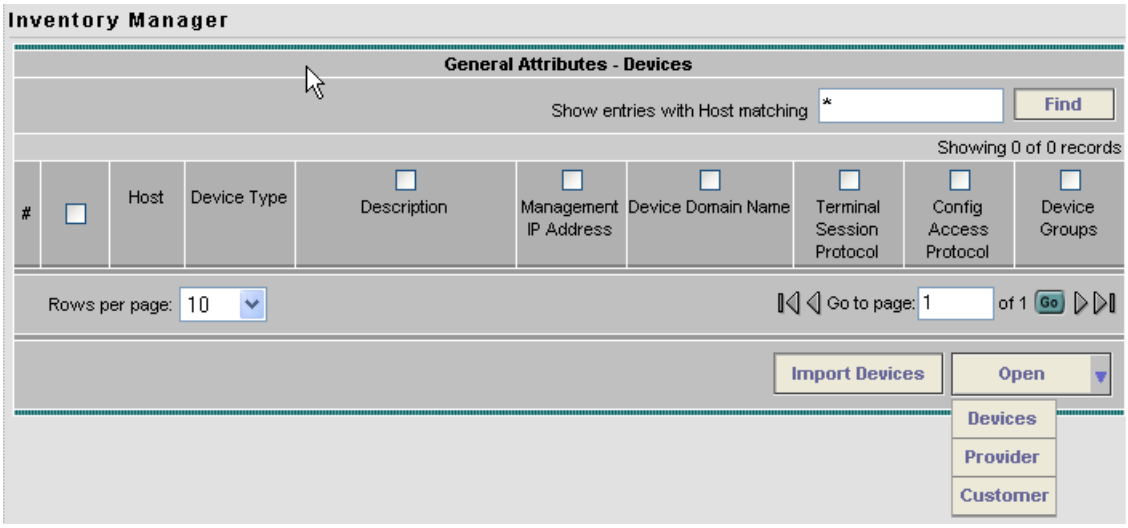
To assign a device to a provider or customer, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Inventory Manager**.

**Step 2** Click the **Open** button.

The **Open** drop-down list appears, as shown in Figure 3-37.

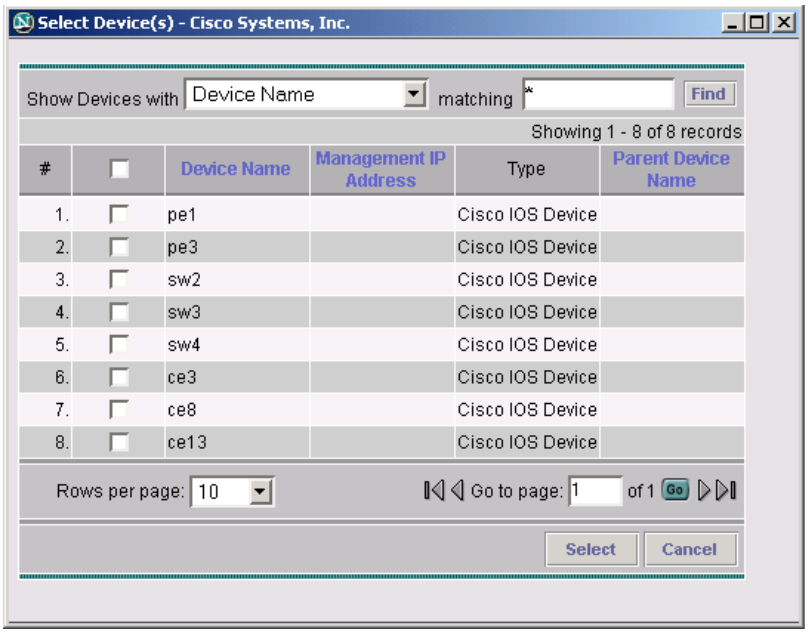
***Figure 3-36 Open Options Window***




**Step 3** Select **Devices**.

The Select Device window appears, as shown in Figure 3-37.

*Figure 3-37 Select Devices Window*

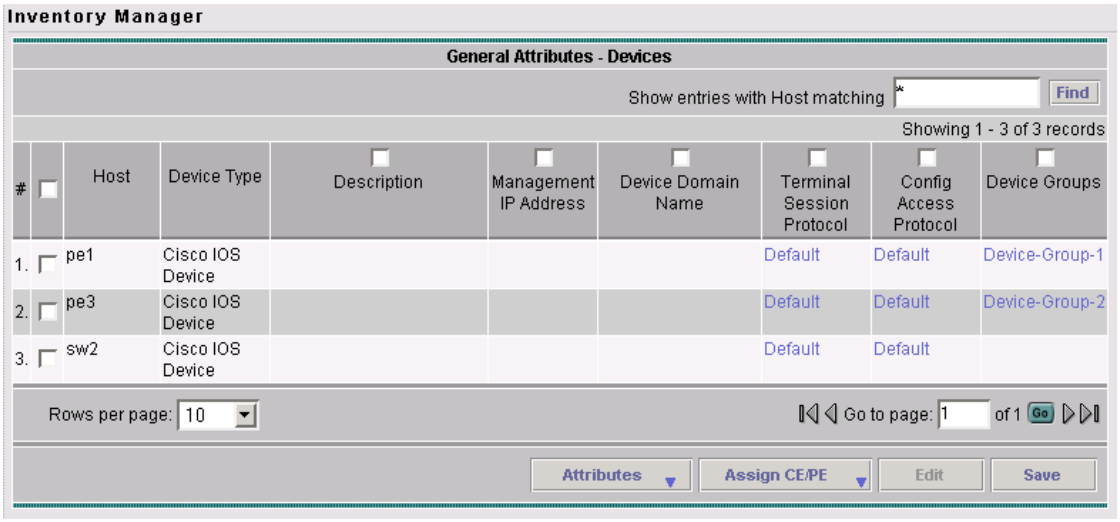



**Step 4** Select a device to open by checking the box to the left of the Device Name. You can select more than one device to open.

**Step 5** Click the **Select** button.

The General Attributes Devices window appears containing information on the selected devices, as shown in Figure 3-38.

*Figure 3-38 General Attributes Devices Window*

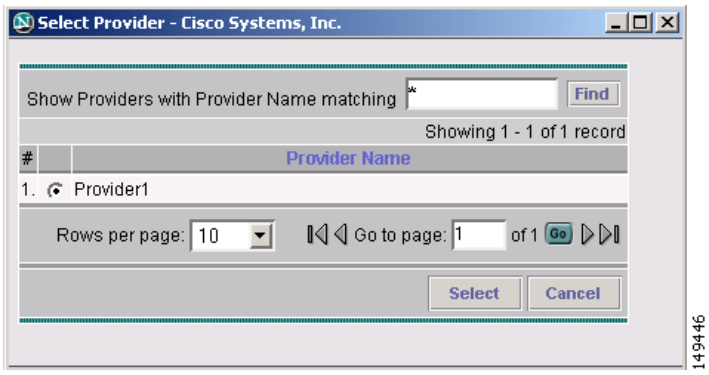



**Step 6** Click the **Assign CE/PE** button.

**Step 7** Select **Customer** or **Provider**.

The corresponding **Select Customer** or **Select Provider** window appears, as shown in Figure 3-39.

*Figure 3-39 Select Provider Window*




**Step 8** Select the customer or provider to which you want to assign the device by checking the box to the left of the Customer or Provider Name.

**Step 9** Click the **Select** button.

If you assigned the device to a provider, the PE Attributes window appears. If you assigned the device to a customer, the CPE Attributes window appears.

**Step 10** In order to save the assigned devices to the ISC repository, you must specify the Site in the CPE Attributes window or the Region in the PE Attributes window. Do the following:

a. Check the one or more boxes to the left of the Device Name.

b. Check the check box above the **Site** or **Region** column.

c. Click the **Edit** button. The **Edit Attributes** window appears.

d. Click **Select**. The **Select Site** or **Select Region** window appears.

e. Select a site or region by checking the box to the left of the Site Name or Region Name.

f. Click **Save**.

**Step 11** You can choose to edit attributes as desired. Enter any changes you want to make.

**Step 12** Click **Save**.

The PE or CPE is saved to the ISC repository.

# Topology Tool

The topology tool provides a graphical view of networks set up through the ISC web client. It gives a graphical representation of the various physical and logical parts of the network, both devices and links.

# Introduction

The topology tool includes three types of views:

- VPN view—shows connectivity between customer devices. The VPN view also gives an aggregate view of all services and individual logical and physical views of each of the services.
- Logical view—shows logical connections set up in a selected provider region
- Physical view—displays connectivity of named physical circuits in a provider region.

In addition, this chapter describes the following features:

- Filtering and Searching—filter out unnecessary detail in large graphs or jump straight to a particular device using the search tool
- Using Maps—associate maps with the individual views.

Please note that some details, such as window decorations, are system specific and might appear differently in different environments. However, the functionality should remain consistent.

# Launching Topology Tool

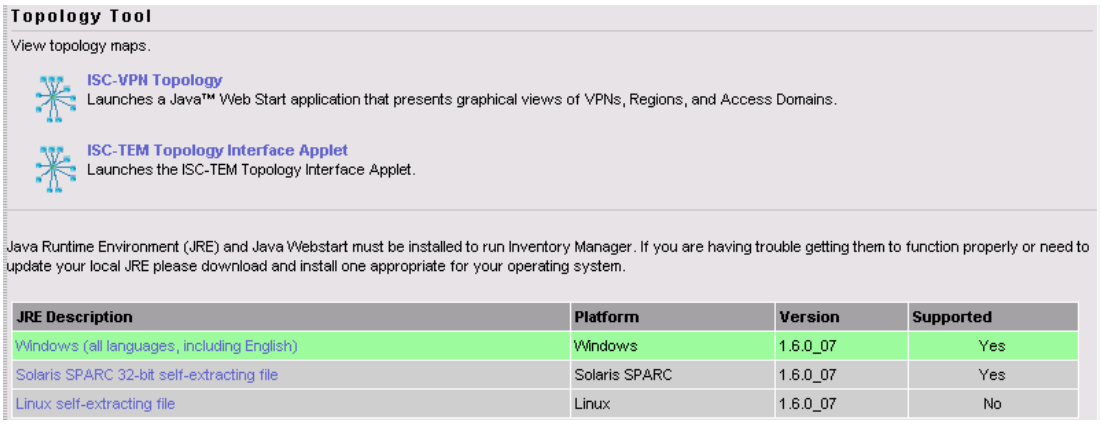
To launch the Topology Tool, follow these steps:

**Step 1** Log in to ISC.

**Step 2** Choose **Service Inventory > Inventory and Connection Manager > Topology Tool** and a window appears, as shown in Figure 3-40, "Topology Launch Window."

If you do not have the proper Java Runtime Environment (JRE) as specified at the bottom of the window, click the corresponding link for your system, follow that path, then quit the browser, log in again, and go back to the Topology Tool page.

*Figure 3-40 Topology Launch Window*




**Step 3** Click **ISC-VPN Topology** in Figure 3-40, "Topology Launch Window" to launch the Topology Tool application on the web client.

This starts up the Java Web Start application.

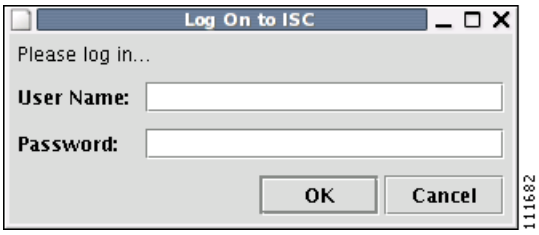
**Note** Name resolution is required. The ISC HTTP server host must be in the Domain Name System (DNS) that the web client is using or the name and address of the ISC server must be in the client host file.

**Step 4** The first time Inventory Manager is activated, a Security Warning window appears. Click **Start** to proceed or **Details** to verify the security certificate, and the Desktop Integration window appears.

**Step 5** Click **Yes** to integrate into your desktop environment, click **No** to decline, click **Ask Later** to be prompted the next time VPN Topology is invoked, or click **Configure ...** to customize the desktop integration.

The Login window in Figure 3-41, "Log In to ISC Window." appears whether or not a selection has been made in the Desktop Integration window.

*Figure 3-41 Log In to ISC Window*




**Step 6** Enter your **User Name** and **Password** and click **OK**.

The Topology Tool launches and connects to the Master ISC server.

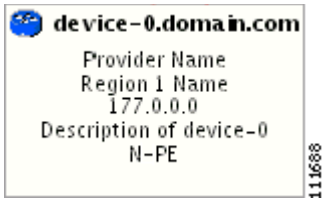
# Conventions

Topology software uses several conventions to visually communicate information about displayed objects. The shape and color of a node representing a device depends on the role of the device, as shown in Table 3-3.

*Table 3-3 Device Role Icons*

| Shape | Description |
|---|---|
|  | Green icon for a CAT OS customer device followed by the following information:<br>- Device name<br>- Customer Name<br>- Site Name<br>- Management IP Address<br>- Description<br>- Role (SPOKE or HUB of a VPN) |
|  | Green icon for a router customer device followed by the following information:<br>- Device name<br>- Customer Name<br>- Site Name<br>- Management IP Address<br>- Description<br>- Role (SPOKE or HUB of a VPN) |
|  | Green icon for an interface followed by the following information:<br>- Interface name<br>- Management IP Address<br>- Encapsulation Type<br>- Interface Type |
|  | Blue icon for a CAT OS provider device followed by the following information:<br>- Device name<br>- Provider Name<br>- Region Name<br>- Management IP Address<br>- Description<br>- Role |

*Table 3-3 Device Role Icons (continued)*

| Shape | Description |
|---|---|
|  | Blue icon for a router provider device followed by the following information:<br>- Device name<br>- Provider Name<br>- Region Name<br>- Management IP Address<br>- Description<br>- Role |
|  | Blue icon for a region followed by the following information:<br>- Region name<br>- Provider Name |
|  | Green icon for a site followed by the following information:<br>- Site name<br>- Customer Name<br>- Role in which Site's device joined VPN (HUB, SPOKE, or combination of HUB and SPOKE) |
|  | Green icon for a site followed by the following information:<br>- Site name<br>- Customer Name<br>- Role in which Site's device joined VPN (HUB, SPOKE, or combination of HUB and SPOKE) |

A distinct color scheme is used to highlight the link type as shown in Table 3-4:

*Table 3-4 Link Type Color Scheme*

| Color | Connection Type |
|---|---|
| (green) | End-to-end wire |

*Table 3-4 Link Type Color Scheme (continued)*

| Color | Connection Type |
|---|---|
| (purple) | Attachment circuit |
| (brown) | MPLS VPN link |

Finally, the four patterns shown in Table 3-5 are used to indicate the service request state:

*Table 3-5 Link State Pattern Scheme*

| Pattern | Service Request State |
|---|---|
| | Deployed, functional, pending |
| | Failed audit, invalid, broken, lost |
| | Wait deploy, requested, failed deploy |
| | Closed |

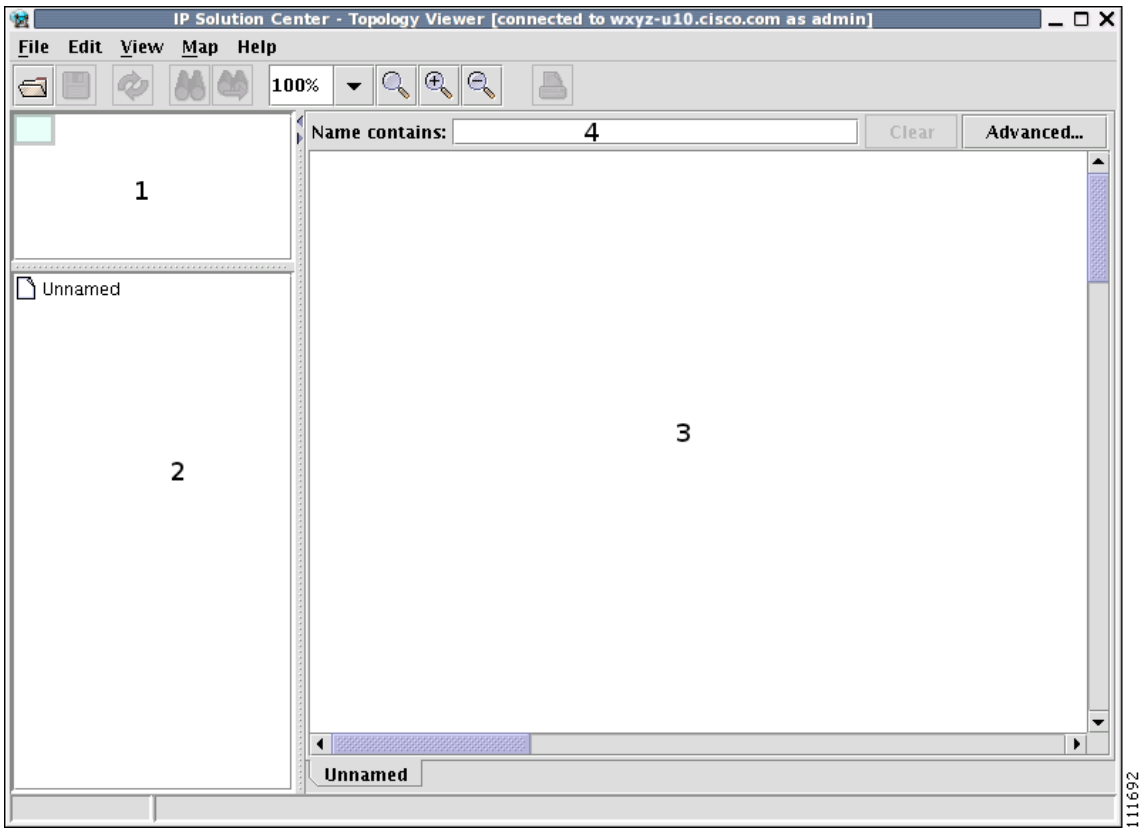
# Accessing the Topology Tool for ISC-VPN Topology

Launch the Topology Tool as explained in Figure 3-40, "Topology Launch Window," in the "Launching Topology Tool" section on page 3-39 and then use the following steps to access the **ISC-VPN Topology** tool.

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Topology Tool > ISC-VPN Topology**.

The Topology window shown in Figure 3-42 appears.

*Figure 3-42 Topology Application Window*



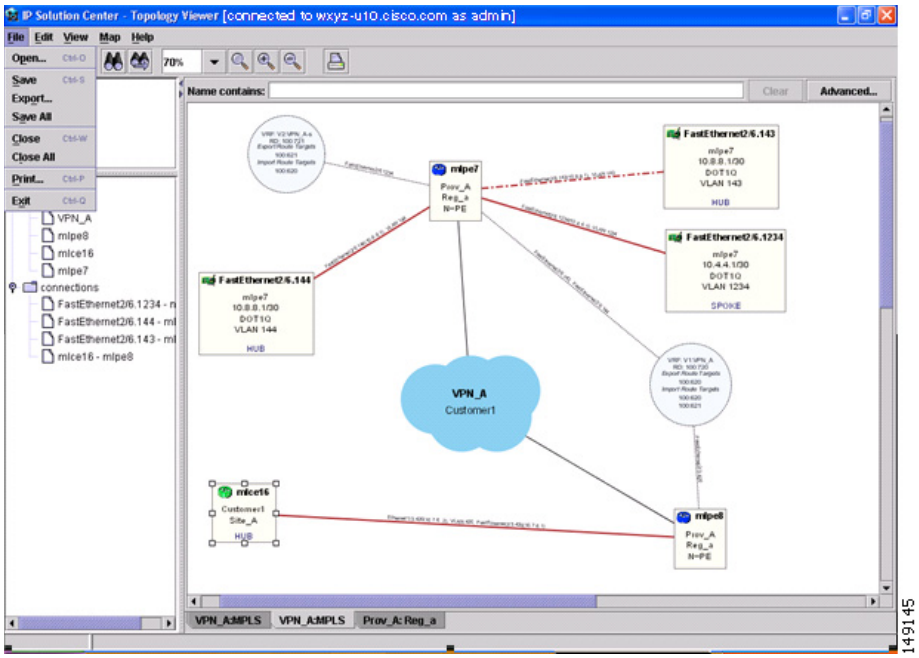

The application window is divided into four areas, as shown in Figure 3-42:

- area (1)—The top left corner shows the Overview area. The colored rectangular panel, called the panner, corresponds to the area currently visible in the main area. Moving the panner around changes the part of the graph showing in the main area. This is particularly useful for large graphs.
- area (2)—The bottom left area shows the Tree View of the graph. When no graph is shown, a single node called **Unnamed** is displayed. When a graph is shown, a tree depicting devices and their possible interfaces and connections is displayed. The tree can be used to quickly locate a device or a connection.
- area (3)—The main area (Main View) of the window shows a graph representing connections between devices. The name of the displayed network is shown at the bottom. When no view is present, the name defaults to **Unnamed**.
- area (4)—Above the main window is the Filter area. It allows you to filter nodes by entering a pattern. Nodes whose name contains the entered pattern maintain the normal level of brightness. All other nodes and edges become dimmed, as shown in Figure 3-64 and the "Filtering" section on page 3-62.

**Note** The bottom bar below all the areas, is a Status bar.

Views are loaded, saved, and closed using the **File** menu, as shown in Figure 3-43.

*Figure 3-43 The File Menu*




The **File** menu contains the following menu items:

- **Open**—Opens a view.
- **Save**—Saves the open and active view with the existing file name, if any.
- **Export**—Exports the active view in either Scalable Vector Graphics (SVG), Joint Photographics Expert Group (JPG), or Portable Network Graphics (PNG) format.
- **Save All**—Saves all open views.
- **Close**—Closes the open and active view.
- **Close All**—Closes all open views.
- **Print**—Prints the open and active view.
- **Exit**— Exits the Topology tool.

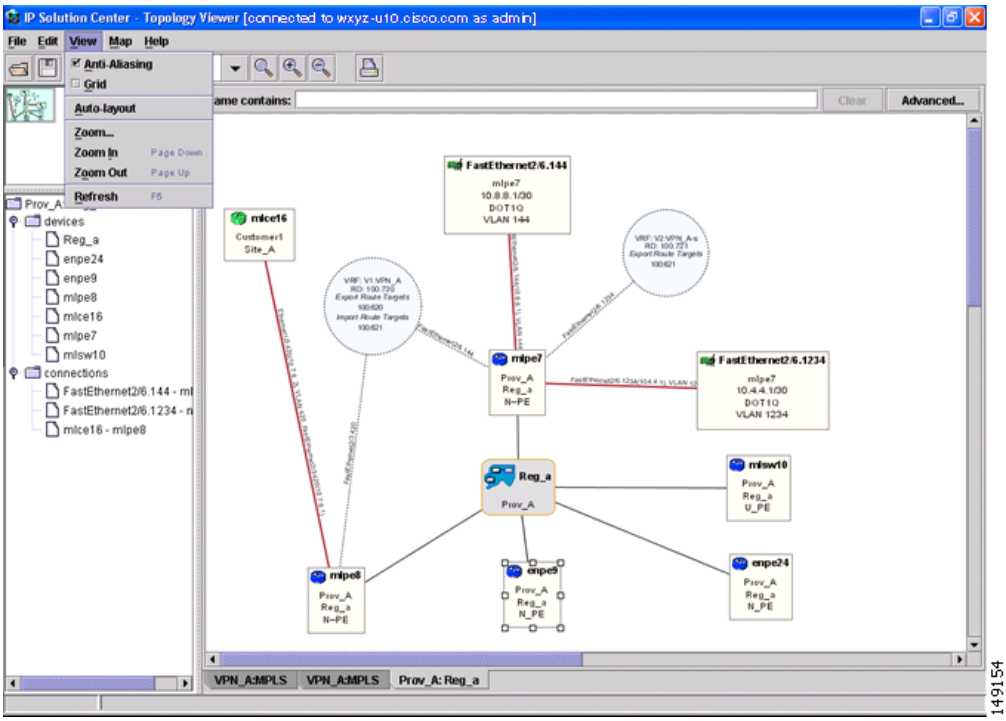
# Types of Views

There are three view panes in the topology application and they are described in the following sections:

- VPN View, page 3-46, shows connectivity between devices in a VPN
- Logical View, page 3-51, shows connectivity between PEs and CPEs in a region
- Physical View, page 3-54, shows physical devices and links for PEs in a region.

The view attributes can be changed using the **View** menu, as shown in Figure 3-44.

*Figure 3-44 The View Menu*




The **View** menu contains the following menu items:

- **Anti-Aliasing**—When drawing a view, this creates smoother lines and a more pleasant appearance at the expense of performance.
- **Grid**—Activates a magnetic grid. The grid has a 10 by 10 spacing and can be used to help align nodes in a view.
- **Auto-Layout**—Generates an automatic layout of nodes in a view. If selected, the program tries to find the most presentable arrangement of nodes.
- **Zoom**—Opens a window where the desired magnification level can be specified.
- **Zoom In**— Increases the magnification level.
- **Zoom Out—**Decreases the magnification level.
- **Refresh**—Regenerates the view. This is especially useful if the data in the repository changes. To see an updated view, select **Refresh** or click the Refresh toolbar button.

## VPN View

The VPN view shows connectivity between devices forming a given VPN. To activate the VPN view, follow these steps:

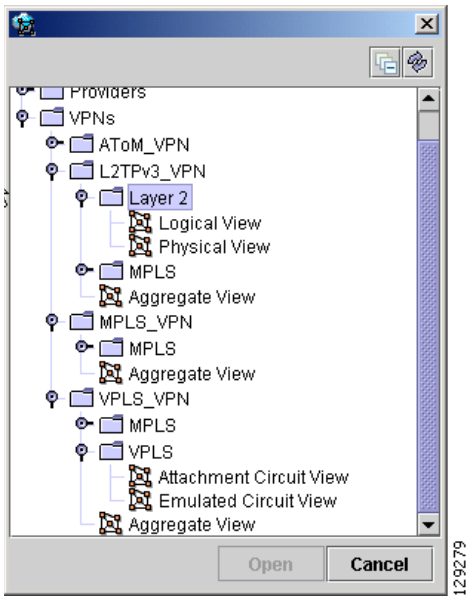
**Step 1** In the menu bar, choose **File** > **Open**.

or

click the **Open** button in the tool bar.

The Folder View window in Figure 3-45 appears displaying a directory tree with available VPNs.

*Figure 3-45 Folder View Window*




**Step 2** Choose the desired VPN's folder, select the folder, and click **Open**.

This opens the desired folder to display any logical and physical views associated with that VPN.

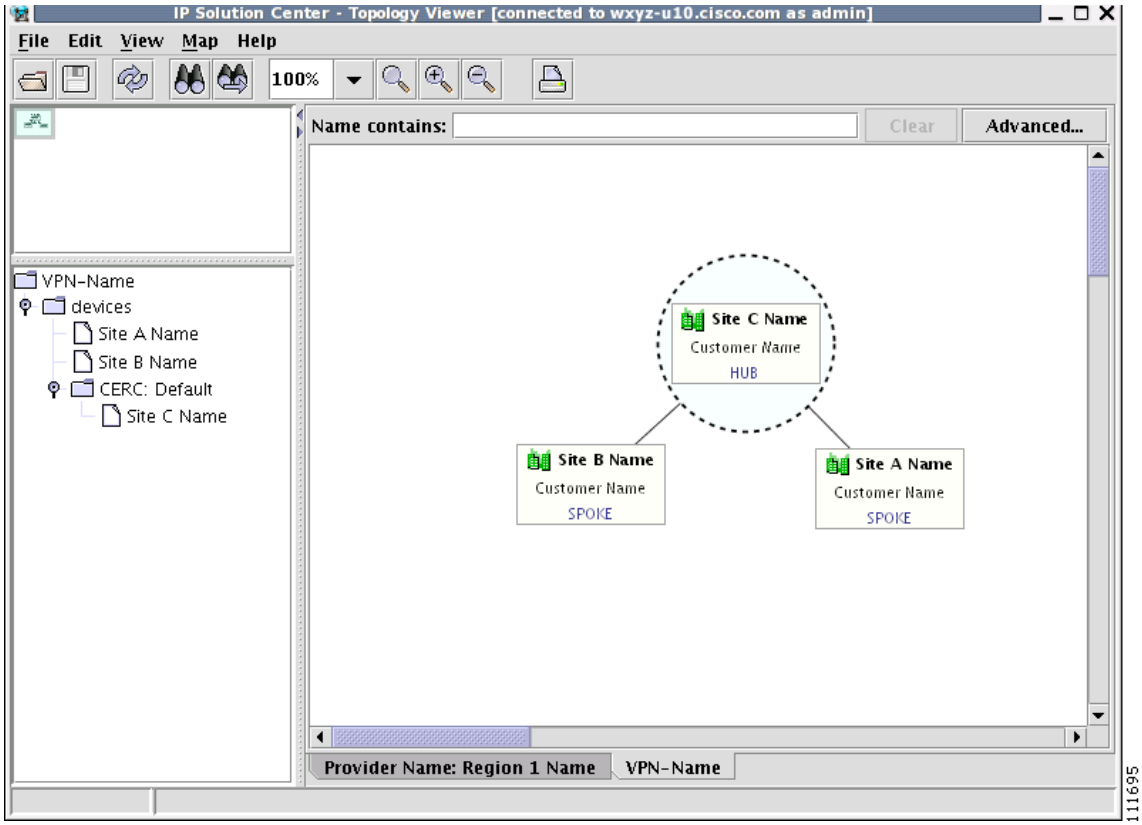
Click a logical or a physical view item in the folder tree. The logical view minimizes the amount of detail and shows connectivity between customer devices. The physical view reveals more about the physical structure of the VPN. For example, for MPLS it shows connectivity between customer and provider devices and the core of the provider.

## Aggregate View

The Aggregate View, as shown in Figure 3-46, "Aggregate View," shows connectivity between all customer devices, regardless of the type of technology used to connect them.

A single view might show a combination of MPLS, Layer 2, and VPLS. For MPLS, only the Customer Premises Equipment devices (CPEs) are shown.

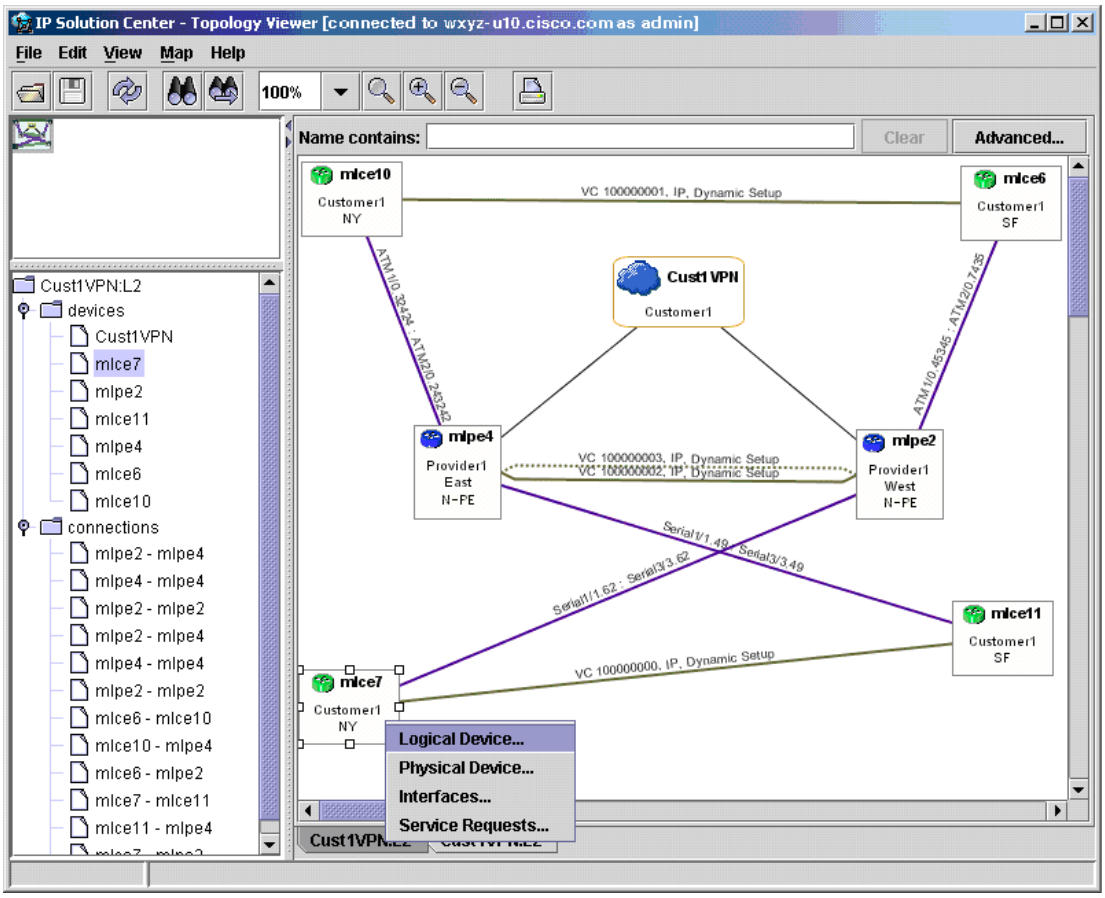
*Figure 3-46 Aggregate View*




The Layer 2 VPN might in addition to CPEs show connectivity between Customer Location Edge devices (CLEs) or Provider Edge devices (PE). For VPLS, you see connectivity between CPEs. For missing CPEs, you see connectivity to PEs.

In MPLS Layer 2 VPN, the topology displays Virtual Circuit (VC) with MPLS core (as MPLS string) but with L2TPv3, the topology will display Virtual Circuit (VC) with IP core (as IP string) as shown in Figure 3-47.

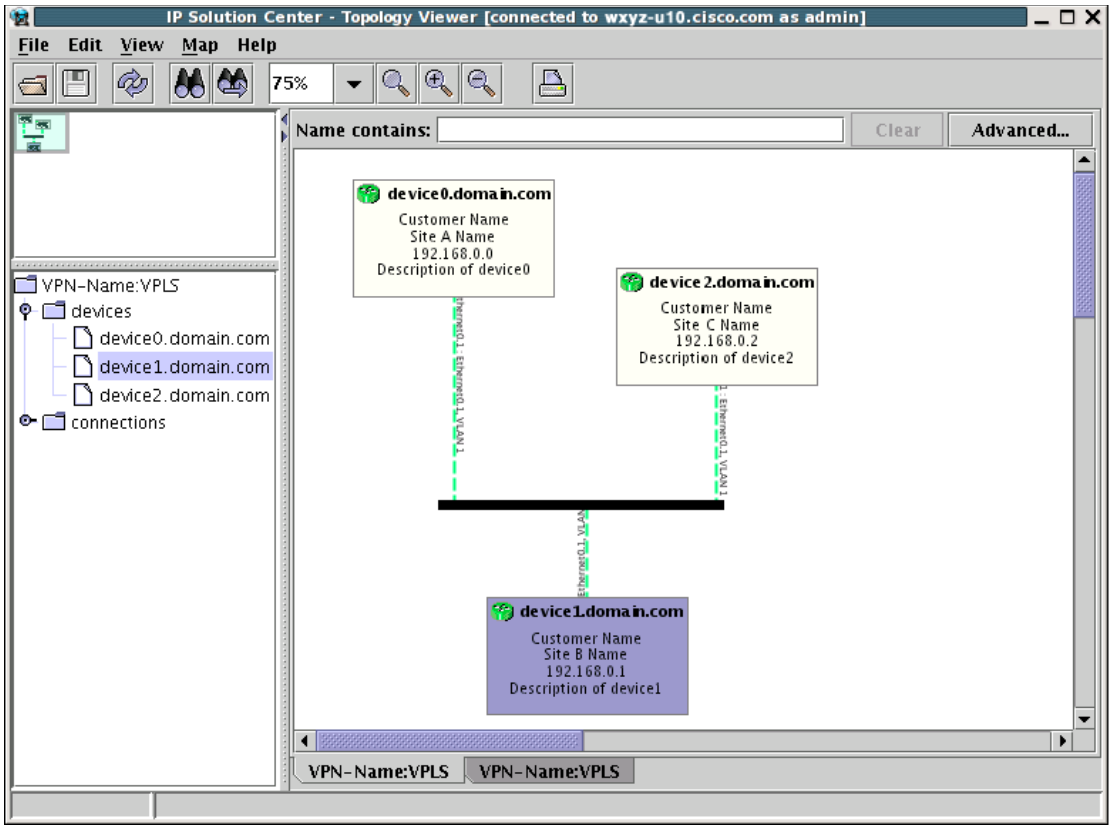
*Figure 3-47 Virtual Circuit with IP Core*




## VPLS Topology

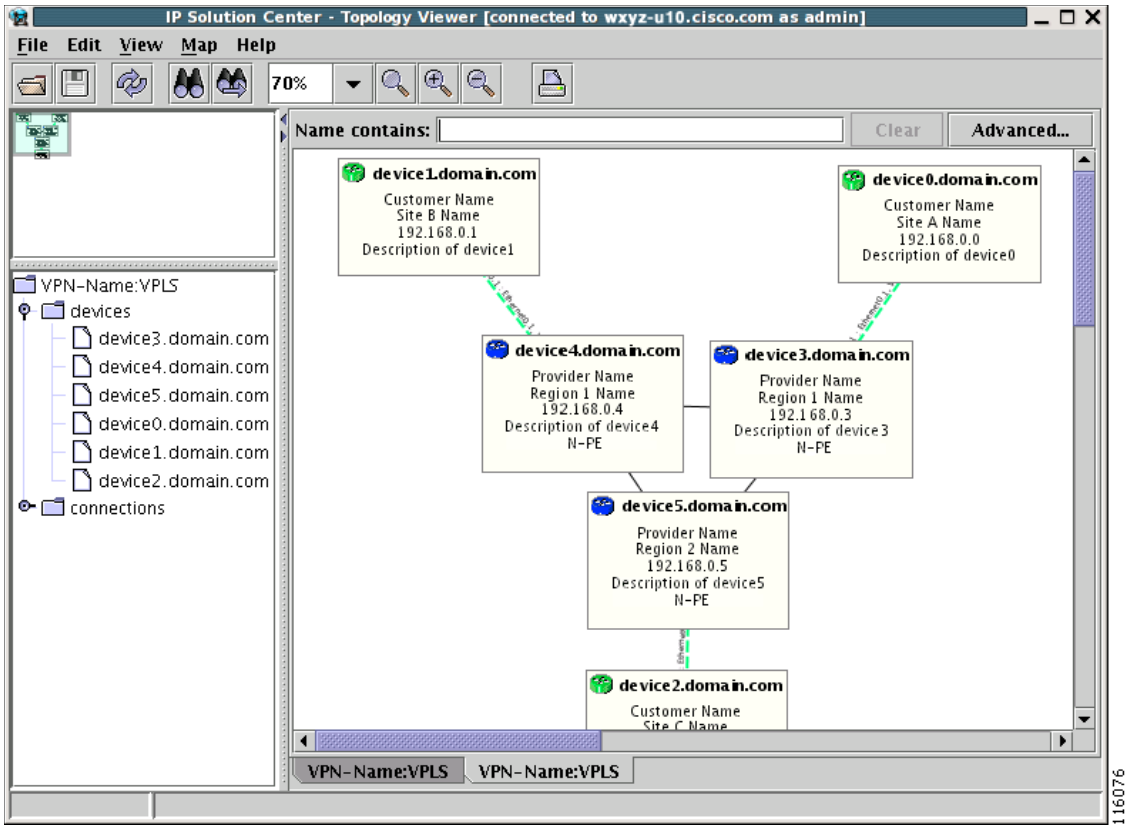
In the case of a VPLS topology, you can access an Attachment Circuit View or an Emulated Circuit View. The Attachment Circuit View corresponds to a logical view in other types of VPNs. It shows customer devices connected to a virtual private LAN, as shown in Figure 3-48, "Attachment Circuit View."

*Figure 3-48 Attachment Circuit View*




The Emulated Circuit View shows the physical connectivity details omitted in the Attachment Circuit View. It shows connectivity between provider devices and customer devices connected to provider devices, as shown in Figure 3-49, "Emulated Circuit View."

*Figure 3-49 Emulated Circuit View*




## Logical View

The logical view shows connectivity, created through service requests, between PEs and CPEs of a given region.

To activate the logical view, follow these steps:

**Step 1** In the menu bar, choose **File > Open**.

or

click the **Open** button in the tool bar.

The Folder View window, as shown in Figure 3-45, appears.

**Step 2** Choose the desired VPN's folder and double-click on the desired folder.

Any logical and physical views associated with that VPN are displayed.

**Step 3** To open the logical view for the selected VPN, do one of the following:

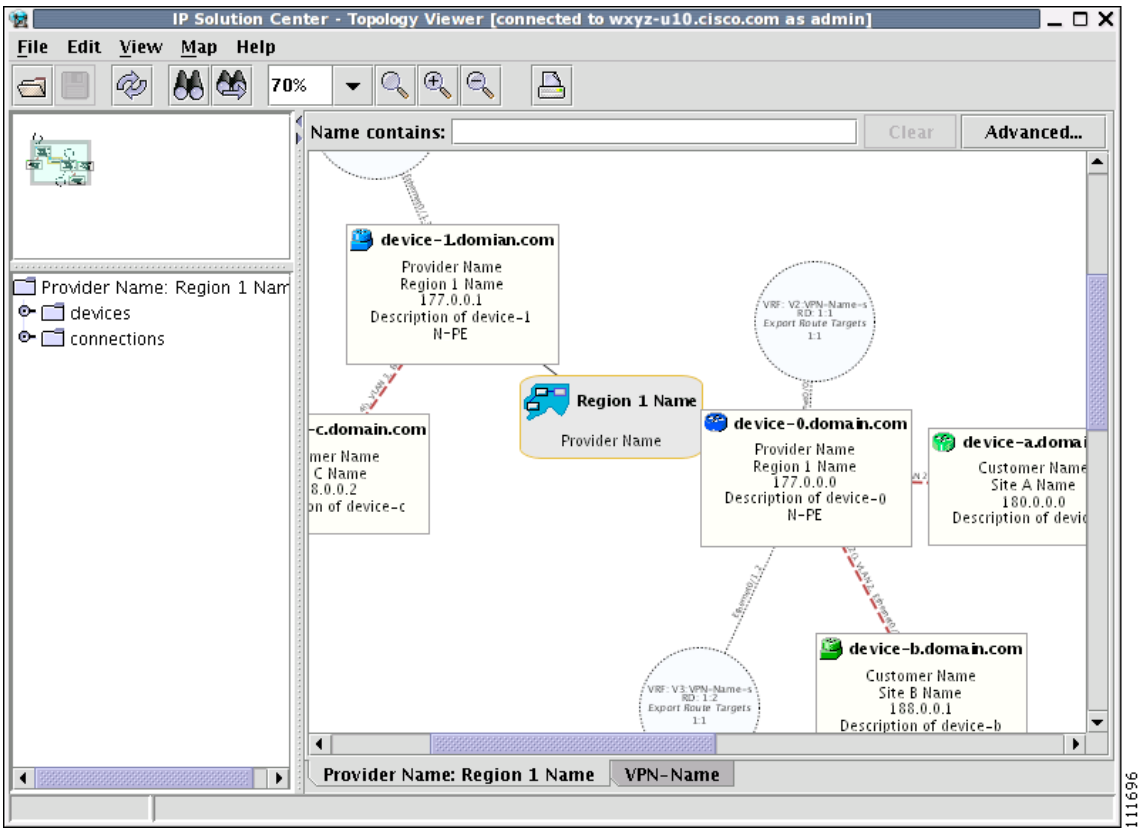
Single-click the **Logical View** icon and click **Open**

or

Double-click the **Logical View** icon.

This creates a logical view for the chosen VPN, as shown in Figure 3-50.

*Figure 3-50 Logical View*

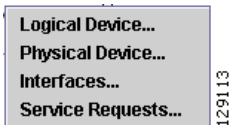



In a created view, the node, usually located in the center of the graph, is the node representing a given region of a provider. The node is annotated with the name of the region and the name of the provider.

Each node directly connected to the regional node represents a PE. The icon of a node depends on the type and the role of the device it represents (see the "Conventions" section on page 3-41).

Each PE is annotated with the fully-qualified device name, provider name, region name, management IP address, description, and role. A right-click on a node displays the details of the logical and physical device, interfaces, and service requests (SR) associated with the node, as shown in Figure 3-51. For the regional node, details are shown in a tabulated form.

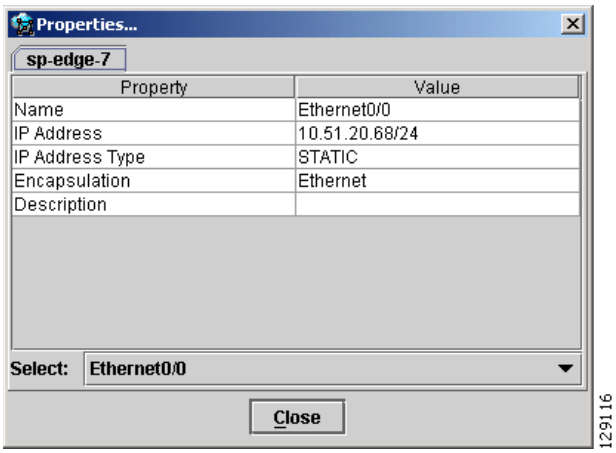
*Figure 3-51 Device Properties*




The various node and link properties are described in detail in Viewing Device and Link Properties, page 3-55.

Likewise, you can right-click on a link to learn about its link properties. For example, when selecting **Interfaces...** for a sample serial link, a Properties window like the one in Figure 3-52 appears.

*Figure 3-52 Interface Properties Window*




Each PE can be logically connected to one or more CPEs. Such connections are created by either MPLS VPN links or Layer 2 Logical Links. Each such connection is represented by an edge linking the given PE to a CPE. If there are more connections between a particular PE and CPE, all of them are shown. Depending on the state of a connection, the edge is drawn using a solid line (for functioning connections), dotted line (for broken connections), or dashed line (for connections yet to be established).

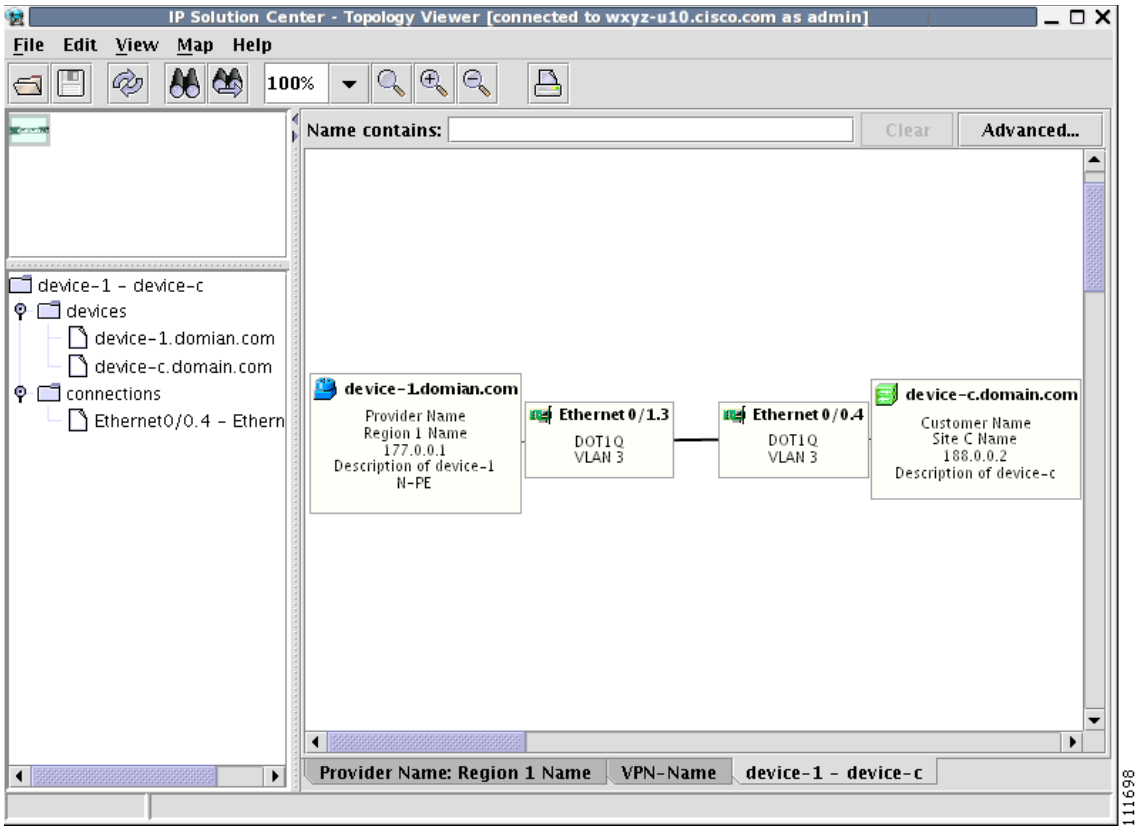
Depending on the connection type, the connection is drawn as described in Table 3-4 and Table 3-5. Each connection is annotated with the PE Interface Name (IP address), VLAN ID number, CPE Interface Name (IP address).

In the Overview area, a direct connection is drawn between a CPE and a PE, even if a number of devices are forming such a connection.

For more about viewing device properties, see Viewing Device and Link Properties, page 3-55.

To view the details of a connection, right-click on it and select the **Expand** option from a pop-up menu. The expanded view, displayed in a new tab, shows all devices and interfaces making a given PE to CPE connection, as shown in Figure 3-53.

*Figure 3-53 Detailed Connection View*




## Physical View

A physical view shows all named physical circuits defined for PEs in a given region. Each named physical circuit is represented as a sequence of connections leading from a PE through its interfaces to interfaces of CLEs or CPEs. All physical links between PEs of a given region and their CLEs or CPEs are shown. Since physical links are assumed to be in a perfect operational order, edges are always drawn with solid lines.

To activate the physical view, follow these steps:

**Step 1** In the menu bar, choose **File > Open**.

or

click the **Open** button in the tool bar.

The Folder View window, as shown in Figure 3-45, appears.

**Step 2** Choose the desired VPN's folder and double-click on the desired folder.

Any logical and physical views associated with that VPN are displayed.

**Step 3** To open the physical view for the selected VPN, do one of the following:

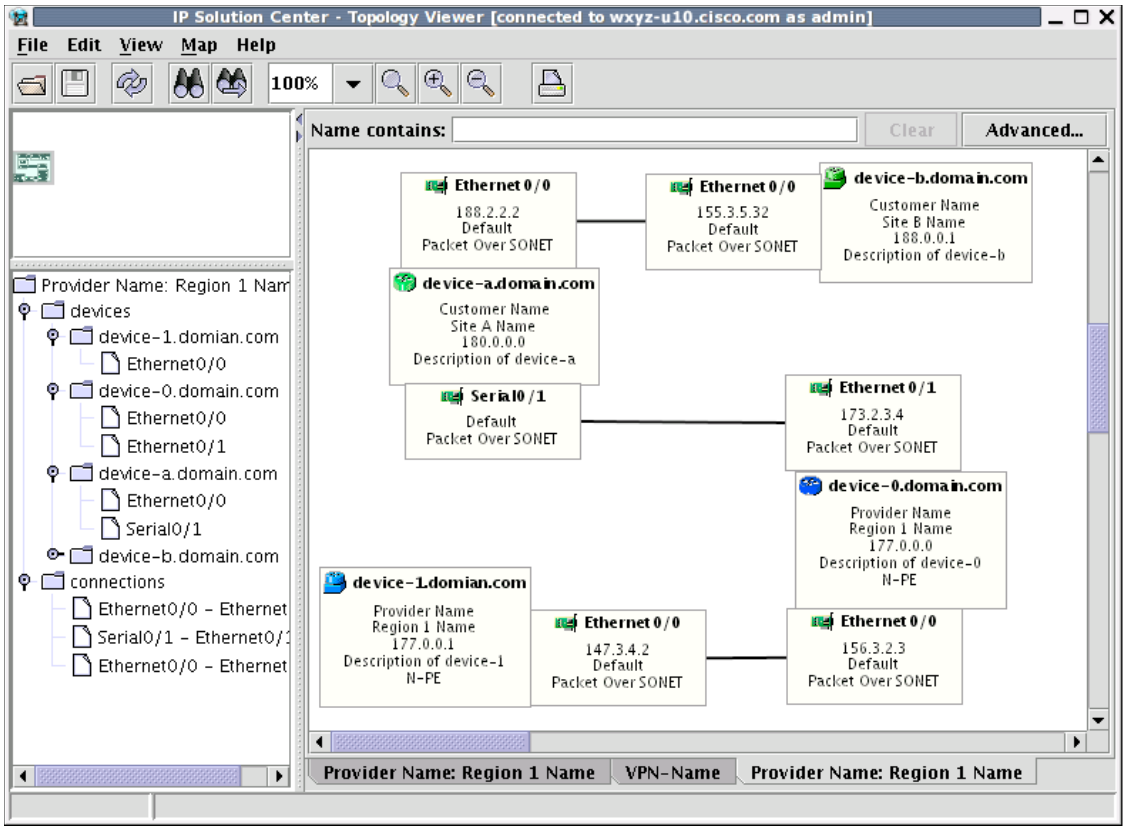
Single-click the **Physical View** icon and click **Open**

or

Double-click the **Physical View** icon.

This creates a physical view for the chosen VPN, as shown in Figure 3-54.

***Figure 3-54 Physical View***




In this view, each device is connected with a thin line to the interfaces it owns. Interfaces are connected to other interfaces with thick lines. If there is more than one connection between two interfaces, they are spaced to show all of them.

The tree shows devices and connections. Each device can be a folder, holding all interfaces connected to it.

# Viewing Device and Link Properties

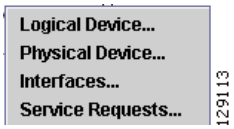
In the logical view, you can view the properties of both devices and links. In the physical view, only properties of physical devices are accessible.

Thus, device properties can be viewed in both the logical and physical views.

# Device Properties

To view the properties of a device, right-click the device. The Device Properties menu in Figure 3-55 appears.

*Figure 3-55 Device Properties*




The following properties are available:

**Logical Device...**—View the logical properties of the device.

**Physical Device...**—View the physical properties of the device.

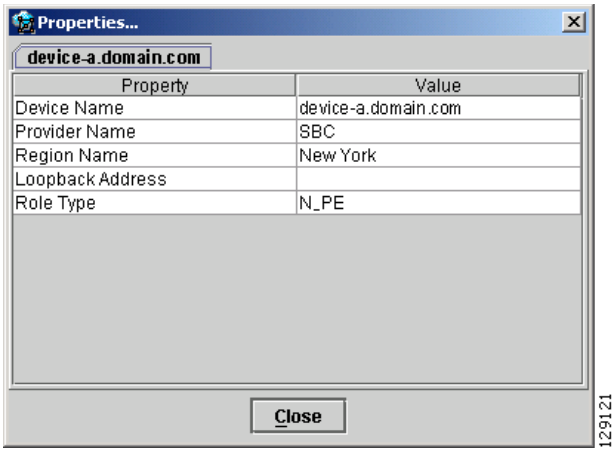
**Interfaces...**—View interface properties of the device.

**Service Requests...**—View service request properties associated with the device.

## Logical Device

When right-clicking a device and selecting **Logical Device...**, the logical device properties window in Figure 3-56 appears.

*Figure 3-56 Logical Device Properties Window*




The logical properties window displays the following information:

**Device Name**—Name of the device.

**Provider Name**—Name of the provider whom the device is serving.

**Region Name**—Name of the provider region.

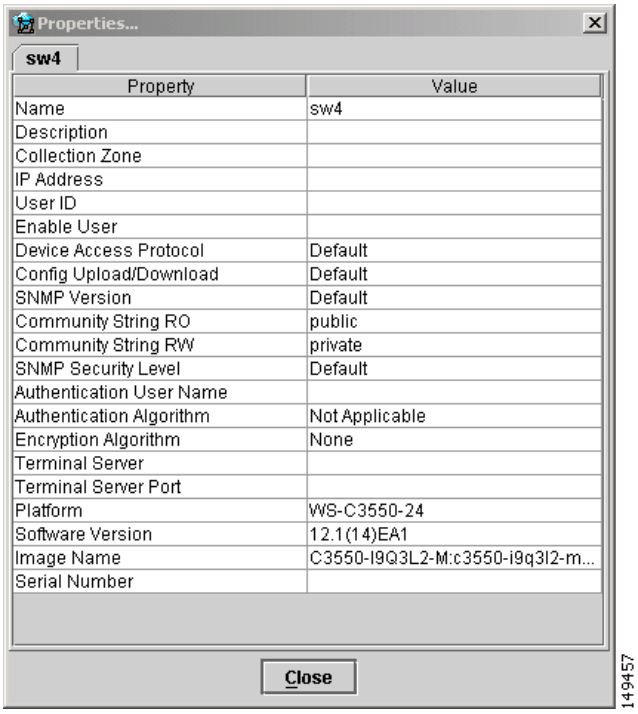
**Loopback Address**—IP address of the loopback address.

**Role Type**—Role assigned to the device.

## Physical Device

When right-clicking a device and selecting **Physical Device...**, the physical device properties window in Figure 3-57 appears.

*Figure 3-57 Physical Device Properties Window*




The physical properties window displays the following information:

**Name**—Name of the device.

**Description**—User-defined description of the device.

**Collection Zone**—Collection zone for device data.

**IP Address**—IP address of the interface used in the topology.

**User ID**—User ID for the interface.

**Enable User**—Password for the interface.

**Device Access Protocol**—Protocol used to communicate with the device.

**Config Upload/Download**—Upload/download method for the configuration file.

**SNMP Version**—Simple Network Management Protocol (SNMP) version on the device.

**Community String RO**—**public** or **private**

**Community String RW**—**public** or **private**

**SNMP Security Level**—Simple Network Management Protocol (SNMP) security level.

**Authentication User Name**—User name for performing authentication on the device.

**Authentication Algorithm**—Algorithm used to perform authentication.

**Encryption Algorithm**—Encryption algorithm used for secure communication.

**Terminal Server**—Name of the terminal server.

**Terminal Server Port**—Port number used by the terminal server.

**Platform**—Hardware platform.

**Software**—IOS version or other management software on the device.

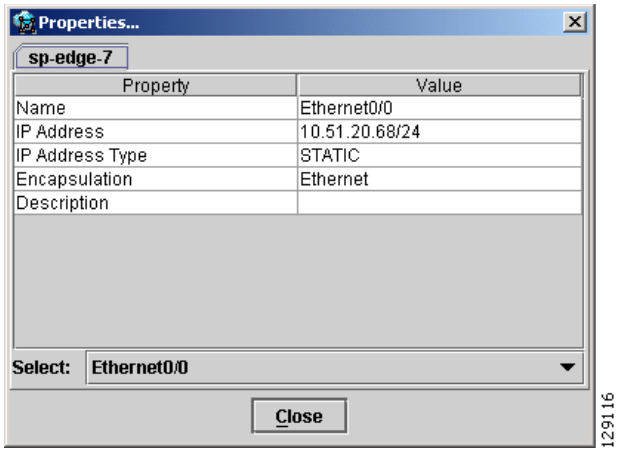
**Image Name**—Boot image for device initialization.

**Serial Number**—Serial number of the device.

## Interfaces

When right-clicking a device and selecting **Interfaces...**, the interface properties window in Figure 3-58 appears.

*Figure 3-58 Device Interface Properties Window*




The interface properties window displays the following information:

**Name**—Name of the device.

**IP Address**—IP address of the device.

**IP Address Type**—STATIC or DYNAMIC.

**Encapsulation**—Encapsulation used on the interface traffic.

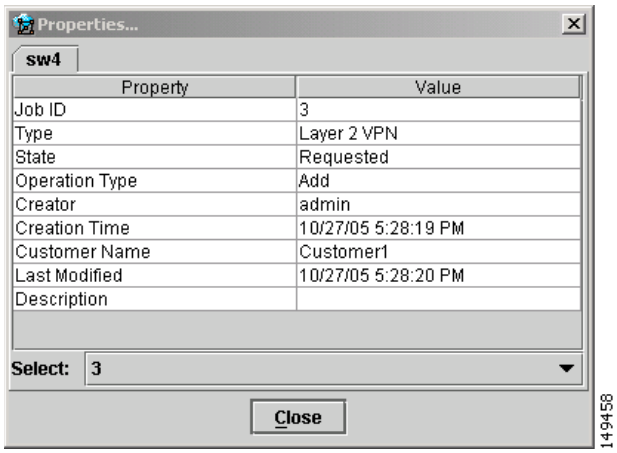
**Description**—Description assigned to the interface, if any.

**Select** (link)—If a connection is attached to the interface, a drop-down list at the bottom of the window allows you to choose between the interfaces available on the device.

## Service Requests

When right-clicking a device and selecting **Service Requests...**, the service request (SR) properties window in Figure 3-59 appears.

*Figure 3-59 Service Request Properties Window*




The service request properties window displays the following information:

**Job ID**—SR identifier.

**Type**—Protocol type used in the SR.

**State**—SR state.

**Operation Type**—Encapsulation used on the interface traffic.

**Creator**—Description assigned to the interface, if any.

**Creation Time**—Date and time when the SR was created.

**Customer Name**—Name of customer associated with the SR.

**Last Modified**—Date and time when the SR was last modified.

**Description**—User-defined description of the SR.

**Select** (SR)—If more than one SR is associated with the interface, the drop-down list at the bottom of the window allows you to choose between these SRs.

## Link Properties

To view the properties of a given link, right-click the link. The Link Properties menu in Figure 3-60 appears.

*Figure 3-60 Link Properties*


The following options are available:

**Expand**—View link details, including devices local to the link not shown in the general topology.

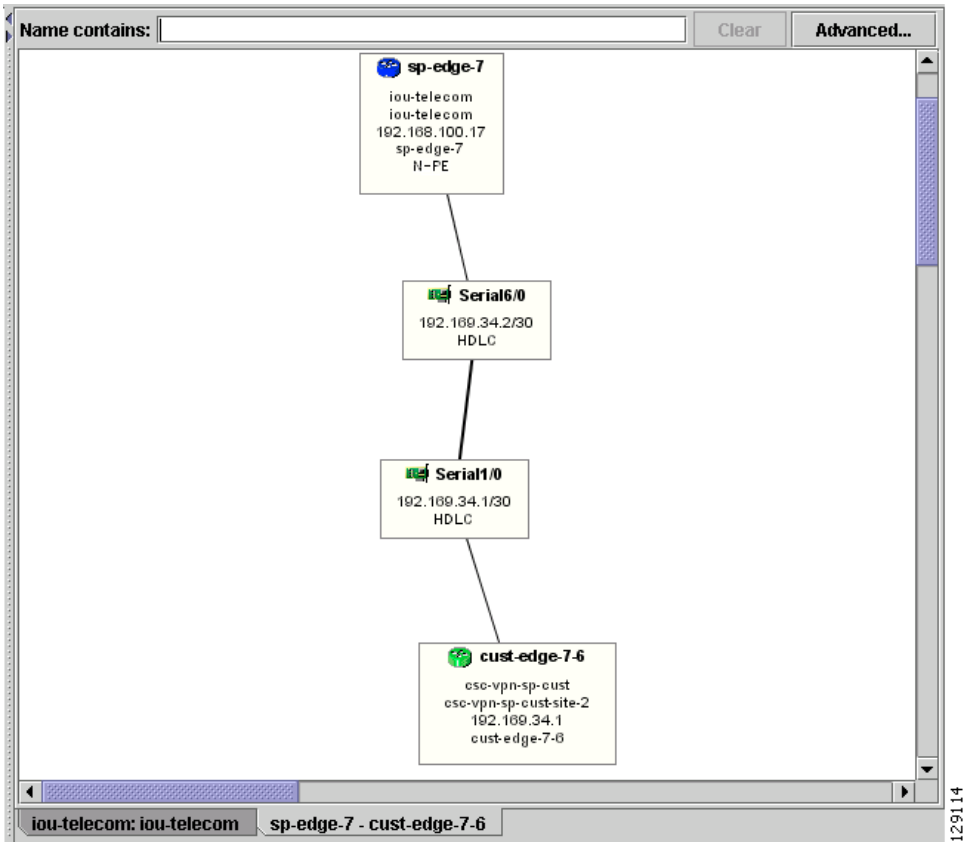
**Service Request...**—View service request properties associated with the link.

**MPLS VPN**—View the MPLS VPN properties of the link. Other link protocol properties than MPLS VPN are currently not available.

## Expand

When right-clicking a link and selecting **Expand...**, the Topology Display will display any devices and connections local to that link. An Expand Link window similar to the one in Figure 3-61 will appear.

*Figure 3-61 Expand Link Window*

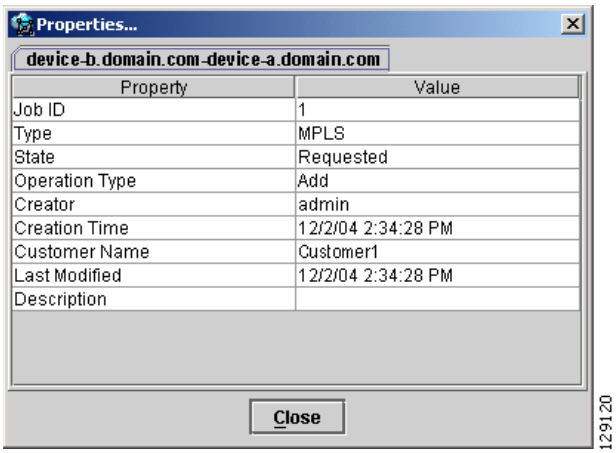



Properties information for devices and links can only be obtained in the master view as described earlier in this section.

## Service Request

When right-clicking a link and selecting **Service Requests...**, the service request (SR) properties window in Figure 3-62 appears.

*Figure 3-62 Link Service Request Properties Window*




The service request properties window displays the following information:

**Job ID**—SR identifier.

**Type**—Protocol type used in the SR.

**State**—SR state.

**Operation Type**—Encapsulation used on the interface traffic.

**Creator**—Description assigned to the interface, if any.

**Creation Time**—Date and time when the SR was created.

**Customer Name**—Name of customer associated with the SR.

**Last Modified**—Date and time when the SR was last modified.

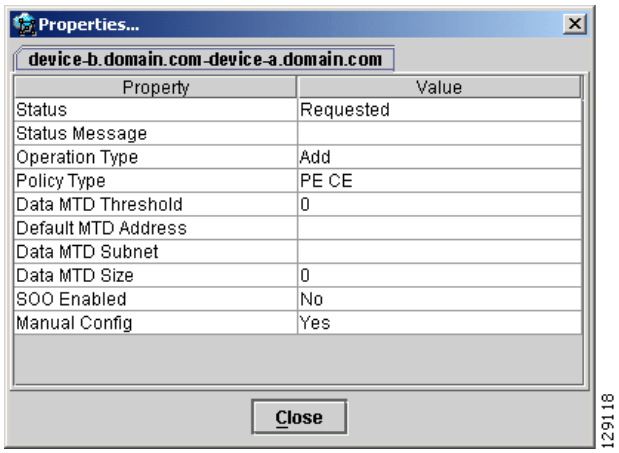
**Description**—User-defined description of the SR.

**Select** (SR)—If more than one SR is associated with the interface, the drop-down list at the bottom of the window allows you to choose between these SRs.

## MPLS VPN

When right-clicking a link that is configured for MPLS VPN and selecting **MPLS VPN...**, the MPLS VPN properties window in Figure 3-63 appears.

*Figure 3-63 Link MPLS VPN Properties Window*




The service request properties window displays the following information:

**Status**—Status of the MPLS VPN link.

**Status Message**—Displays any error or warning messages.

**Operation Type**—MPLS operation type.

**Policy Type**—The policy type applied to the link.

**Data MTD Threshold**—Memory Technology Driver (MTD) data threshold.

**Default MTD Address**—Default MTD IP address.

**Data MTD Subnet**—Data MTD subnet.

**Data MTD Size**—Data MTD size.

**SOO Enabled**—Site of Origin Enabled - **Yes** or **No**.

**Manual Config**—**Yes** or **No**.

# Filtering and Searching

On large graphs, the amount of detail can be overwhelming. In such cases, filtering might help eliminate unnecessary details, while searching can lead to a prompt location of a device you want to examine further.

Both advanced filtering and searching use the same window to enter conditions on nodes to be either filtered or located. The filtering area also allows you to quickly filter viewed objects by name.

## Filtering

The topology view can be filtered in two ways, simple and advanced.

### Simple Filtering

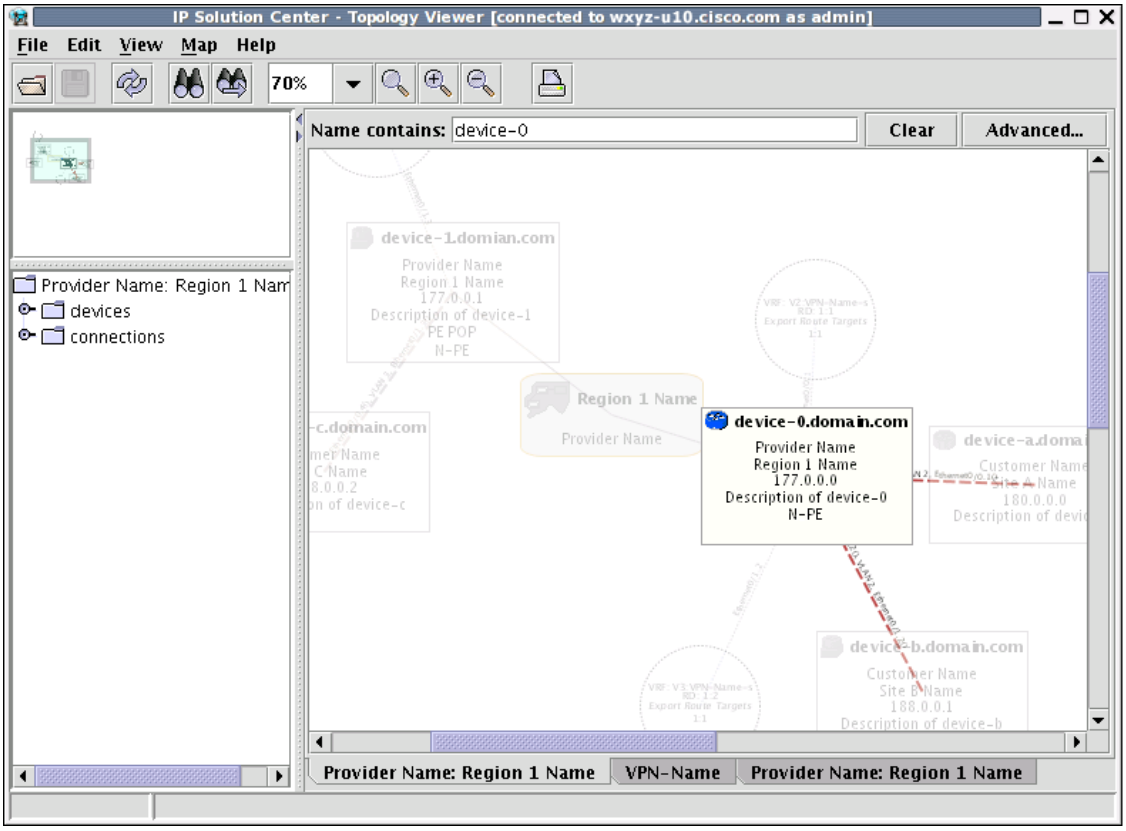
To perform simple filtering of the view, follow these steps:

**Step 1** Enter a string in area (4) of the main window, as shown in Figure 3-42 on page 3-44.

**Step 2** Press **Enter** to dim all objects whose name does not contain the specified string.

For example, to locate nodes that contain string **router** in their name you would enter **router** in area (4) and click **Enter**. All objects whose name does not contain the entered string are dimmed, as shown in Figure 3-64.

***Figure 3-64 Physical View with Dimmed Nodes***




**Note** Regular expressions are supported but only in the advanced window (click **Advanced...** button). For example, by entering ^foo.*a, you only request nodes that have names starting with "foo" followed by arbitrary characters and containing the letter 'a' somewhere in the name. The regular expressions must follow the rules defined for Java regular expressions.

## Advanced Filtering

To perform advanced filtering, follow these steps:

**Step 1** Open the advanced filtering window by clicking the **Advanced...** button.

The Advanced Filter window appears, as shown in Figure 3-65.

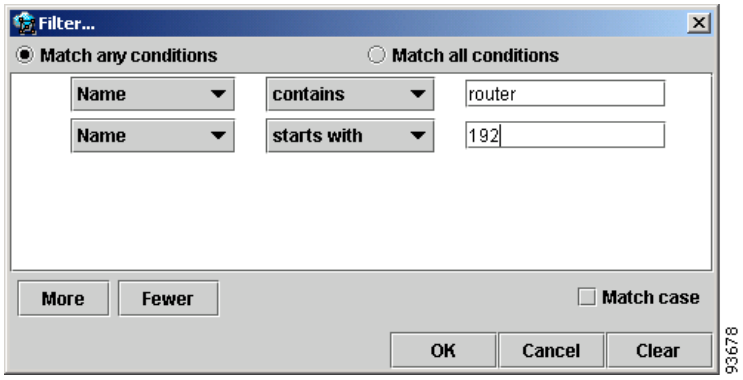
**Step 2** Make the desired filtering elections.

The window allows you to enter one or more conditions on filtered nodes. The first drop-down list allows you to specify the attribute by which the filtering is performed. The second allows you to decide how the matching between the value of the attribute and text entered in the third column is performed.

The following matching modes are supported from the drop-down list:

- **contains**—The attribute value is fetched from the device and it is selected if it contains the string given by you. The string can be located at the start, end, or middle of the attribute for the match to succeed. For example, if the pattern is **cle** the following values match it in the **contains** mode: **clean**, **nucleus**, **circle**.
- **starts with**—The value of the attribute must start with the string given by you. For example, if the pattern is **foot**, **footwork** matches, but **afoot** does not.
- **ends with**—This is the reverse of the **starts with** case, when a given attribute matches only if the specified pattern is at the end of the attribute value. In this mode, for example, the pattern **foot** matches **afoot** but not **footwork**.
- **doesn't contain**—In this mode, only those strings that do not contain the given pattern match. The results are opposite to that of the **contains** mode. For example, if you specify **cle** in this mode, **clean**, **nucleus**, and **circle** are rejected, but **foot** is deemed to match, because it does not contain **cle**.
- **matches**—This is the most generic mode, in which you can specify a full or partial expression that defines which nodes you are interested in.

*Figure 3-65 Advanced Filter Window*




By clicking one of the two radio buttons, **Match any conditions** or **Match all conditions**, you can request that any or all of the conditions are matched. In the first case, you can look for devices where, for example, the name contains **cisco** and the management IP address ends with **204**. When all conditions must be met, it is possible to look for devices that, for example, have a given name and platform.

Click **More** or **Fewer** to add more rows of conditions or remove existing rows of conditions.

By default, all matches are performed without regard for upper or lower case. However, in some cases it is beneficial to have a more exact matching that takes the case into account. To do so, check the **Match case** check box.

**Step 3** Click **OK** to start the filtering process. Click **Cancel** to hide the window without any changes to the state of the filters.

The **Clear** button allows you to clear all conditions. Clicking **Clear** followed by **OK** effectively removes all filtering, restoring all nodes to their default brightness level. If filtering is active, the same can be achieved by clicking **Clear** in area (4) of the main window, as shown in Figure 3-42 on page 3-44.

## Searching

Searching can be conducted by using the menus or the tool bar. To perform a search, follow these steps:

**Step 1** Select **Find** in the **Edit** menu

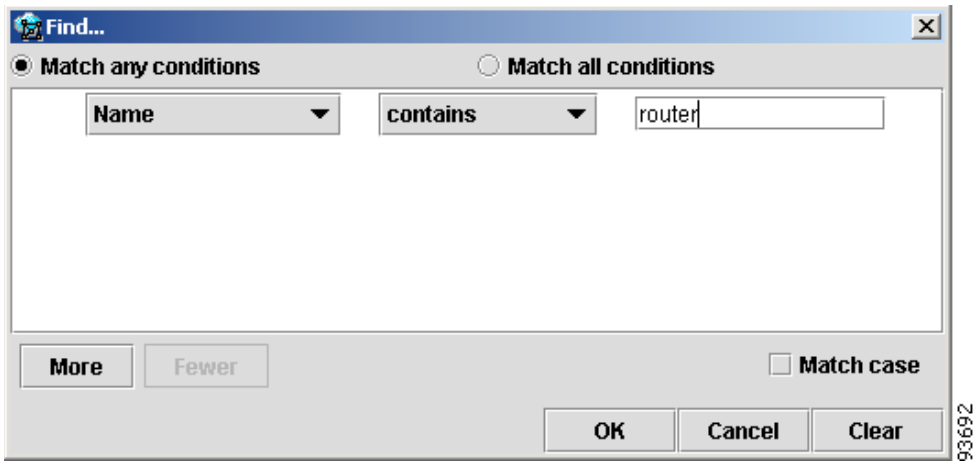
or

Click the **Find** icon in the main toolbar.

Both approaches bring up the same window, as shown in Figure 3-66.

Again, you can enter one or more conditions to locate the node.

***Figure 3-66 Find Window***




**Step 2** Make the desired filtering selections.

Match modes, case check box, and the radio button are used as described under Advanced Filtering, page 3-63, as shown in Figure 3-65.

**Step 3** Click **OK** to start searching for the first node that matches the given criteria.

If found, the node is highlighted and the view is shifted to make it appear in the currently viewed area of the main window.

**Step 4** After the first search, press **F3** or click the **Find Again** button to repeat the search

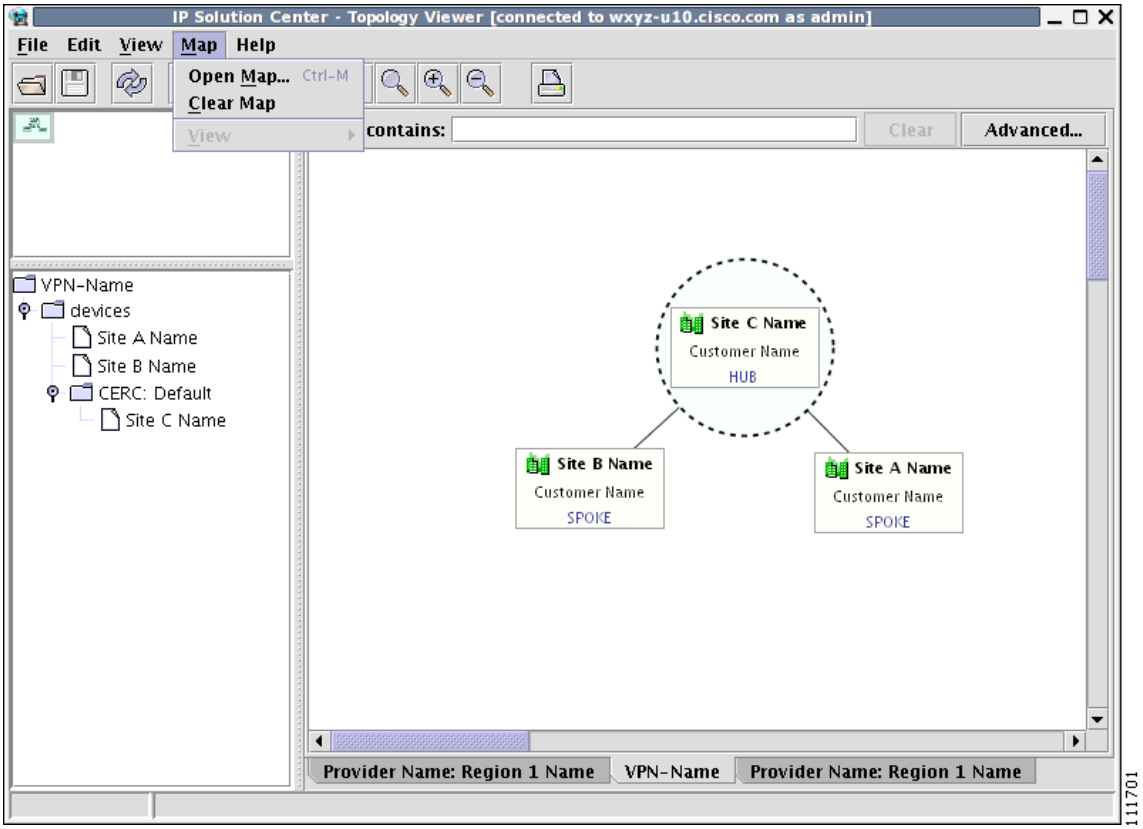
If more than one node matches the condition the **Find Again** function highlights each one of them. If no nodes match the entered criteria, the **Object Not Found** window appears.

# Using Maps

You can associate a map with each view. Currently, the topology viewer only supports maps in the Environmental Systems Research Institute, Inc. (ESRI) shape format. The following sections describe how to load maps and selectively view map layers and data associated with each map.

The map features are accessed from the **Map** menu shown in Figure 3-67.

***Figure 3-67 The Map Menu***




The **Map** menu contains the following menu items:

- **Open Map**—Loads a map into the application
- **Clear Map**—Clears the active map from the current view
- **View**—Allows you to select which layers in the map should be displayed (for example, country, state, city).

## Loading a Map

You might want to set a background map showing the physical locations of the displayed devices. To load a map, follow these steps:

**Step 1** In the menu bar, select **Map > Open Map...**.

or

Press **Ctrl-M**

**Step 2** Make your selections in the Load Map window.

The right-hand side of the window contains a small control panel, which allows you to select the projection in which a map is shown. A map projection is a projection that maps a sphere onto a plane. Typical projections are Mercator, Lambert, and Stereographic.

For more information on projections, consult the Map Projections section of Eric Weisstein's World of Mathematics at:

http://mathworld.wolfram.com/topics/MapProjections.html

For each projection, you can also select the region of the map to be shown. In most cases, the predefined values should be sufficient.

If desired, make changes to the settings in the **Longitude Range** and **Latitude Range** fields.

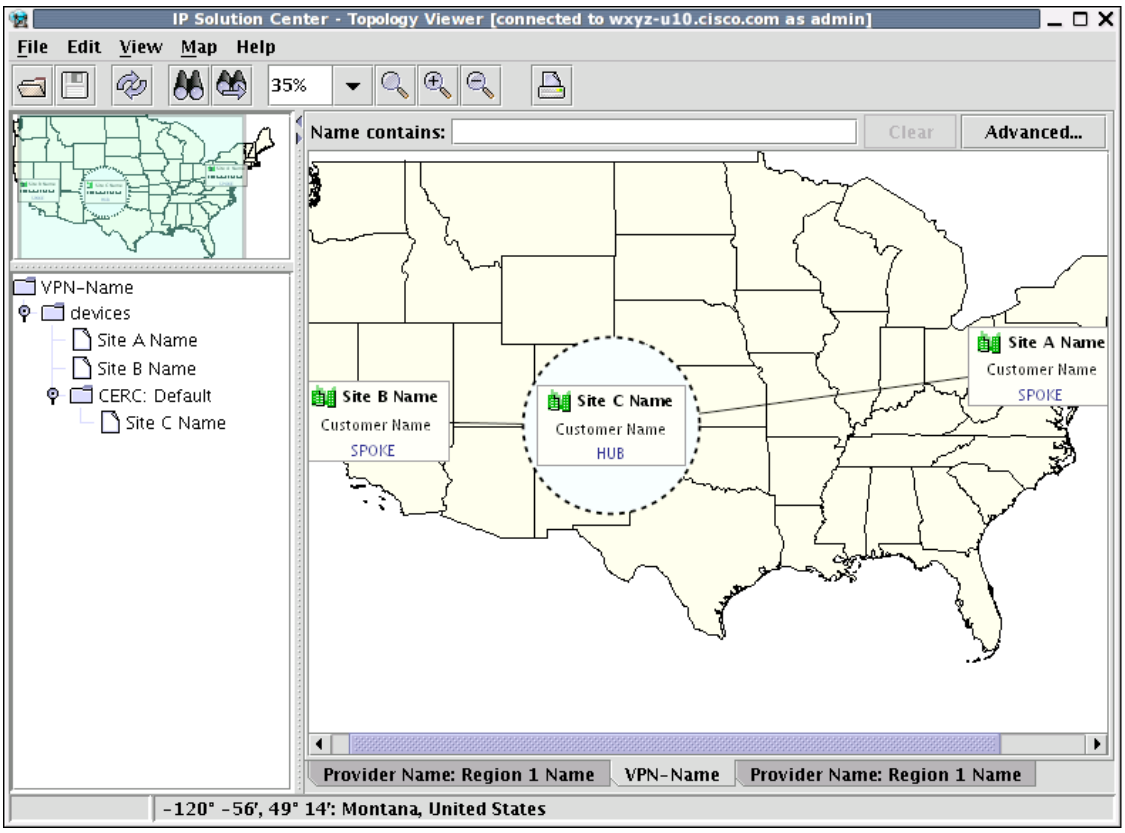
**Step 3** Select a map file and click **Open** to load the map.

Selecting the map file and clicking the **Open** button starts loading it. Maps can consist of several components and thus a progress window is shown informing you which part of the map file is loaded.

## Layers

Each map can contain several layers. For example most country maps have country, region, and city layers, as shown in Figure 3-68.

*Figure 3-68 Map Layers*




After a map is loaded, the **View** submenu of the **Map** menu is automatically populated for you. A name of each available layer is shown together with the check box indicating visibility of the layer. If a given map shows too many details, you can turn off some or all layers by unchecking the corresponding check box(es). The same submenu can be used to restore visibility of layers.

If an incorrect map is loaded or the performance of the topology tool is unsatisfactory with the map loaded, you can clear the map entirely. To do this, select **Clear Map** from the **Map** menu. Maps are automatically cleared if another map is loaded.

Consequently if you want just to load another map, there is no need to clear the existing map. The act of loading a new map does this.

## Map Data

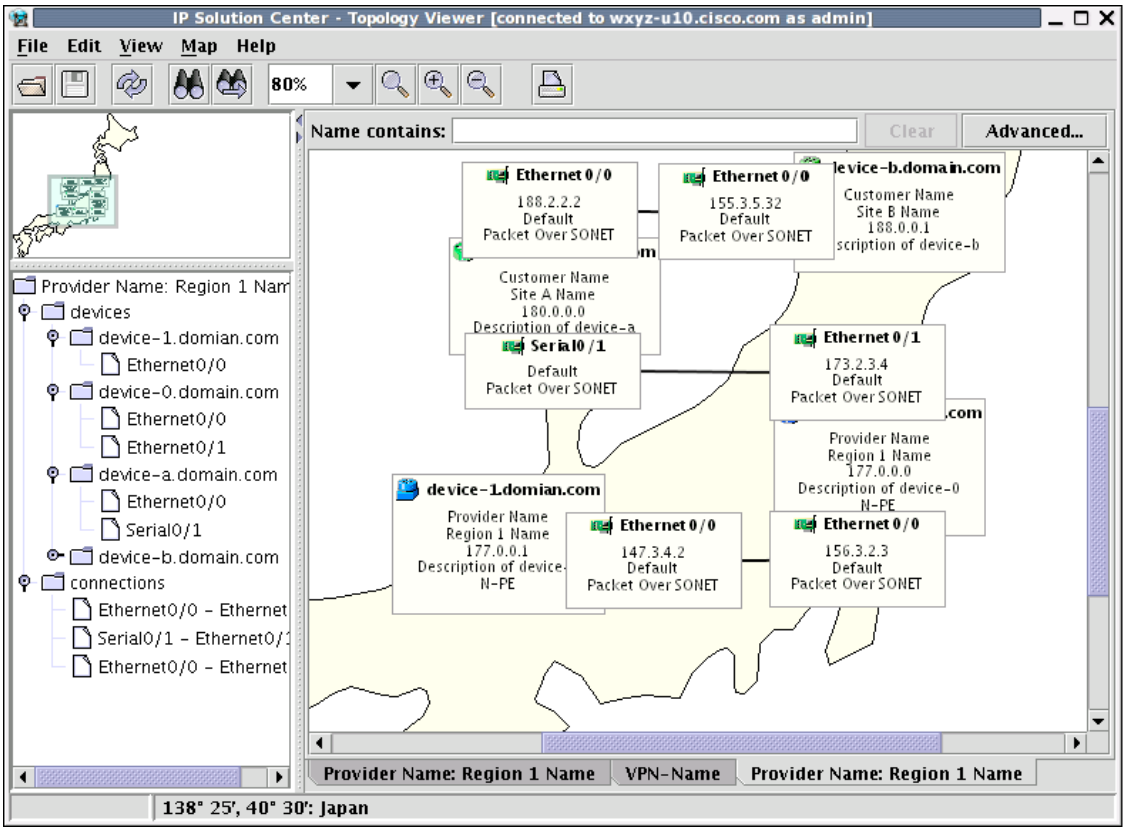
If map data files are successfully loaded with the map, the right field of the Status bar shows the longitude and latitude location of the cursor on the map. If map objects, such as cities, lakes, and so on, have data associated with them, their names are displayed after the longitude and latitude coordinates.

## Node Locations

After a map is successfully loaded, the view area is adjusted to fully accommodate it, as shown in Figure 3-69. If nodes shown on the window had longitude and latitude information associated with them, they are moved to locations on the map corresponding to their geographical location. If not, their positions remain unchanged.

However, you can manually move them to the desired location and save the positions for future reference. The next time the image of a given network is loaded, node positions are restored and the map file is loaded.

***Figure 3-69 Physical View with a Map of Japan***



## Adding New Maps

You might want to add your own maps to the selection of maps available to the topology application. This is done by saving maps in the root directory. To make this example more accessible, assume that you want to add a map of Toowong, a suburb of Brisbane, the capital of Queensland. The first step to do so is to obtain maps from a map vendor. All maps must be in the ESRI shape file format (as explained at the web site: http://www.esri.com). In addition, a data file might accompany each shape file. Data files contain information about objects whose shapes are contained within the shape file. Let us assume that the vendor provided four files:

- toowong_city.shp
- toowong_city.dbf
- toowong_street.shp
- toowong_street.dbf

Then assume you want to create a map file that informs the topology application about layers of the map. In this case, you have two layers: a city and a street layer. The map file, say, Toowong.map, would thus have the following contents:

```
toowong_city
toowong_street
```

It lists all layers that create a map of Toowong. The order is important, as the first file forms the background layer, with other layers placed on top of the preceding layers.

Having obtained shape and data files and having written the map file, decide on its location. As mentioned, Toowong is a suburb of Brisbane, located in Queensland, Australia. All map files must be located in or under the **$ISC_HOME/resources/webserver/tomcat/webapps/ipsc-maps/data** directory. Since by default this directory contains a directory called **Oceania** intended for all maps from that region, simply create a path **Australia/Queensland/Brisbane** under the directory **Oceania**. Next, place all five files in this location. After this is done, the map is automatically accessible to the topology viewer.

# Devices

Every network element that ISC manages must be defined as a device in the system. An element is any device from which ISC can collect information. In most cases, devices are Cisco IOS routers that function as Provider Edge Routers (PEs) or Customer Edge Routers (CEs) in the MPLS VPN.

**Note** To provision services with ISC, you must have IPv4 connectivity.

This section describes how to configure SSH or SSHv2, set up SNMP, manually enable an RTR responder, and create, edit, delete, and configure various types of supported devices. This section includes the following:

# Configuring SSH or SSHv2

ISC needs a mechanism to securely access and deploy configuration files on devices, which include routers and switches. And, to securely download a configlet and upload a configuration file from a device, Secure Shell (SSH) or SSH version 2(SSHv2) must be enabled.

The following sections describe:



## Configuring SSH on Cisco IOS Routers Using a Domain Name

The procedure for configuring SSH on a Cisco IOS router is as follows:

| | Command | Description |
|---|---|---|
| **Step 1** | `Router# configure terminal` | Enters global configuration mode. |
| **Step 2** | `Router(config)# ip domain-name <domain_name>` | Specifies the IP domain name. |
| **Step 3** | `Router(config)# username <username> password <password>` | Configures the user ID and password. Enter your ISC username and password. For example:<br>`username admin password iscpwd` |
| **Step 4** | `Router(config)# crypto key generate rsa` | Generates keys for the SSH session. |
| **Step 5** | You will see the following prompt:<br>`Choose the size of the key modulus in the range of 360 to 2048 for your general purpose keys. How many bits in the modulus (nnn):`<br>Press **Enter** to accept the default number of bits. | Sets the number of bits. |
| **Step 6** | `Router(config)# line vty 0 4` | Enables SSH as part of the vty login transport. |
| **Step 7** | `Router(config-line)# login local` | The **login local** command indicates that the router stores the authentication information locally. |
| **Step 8** | `Router(config-line)# transport input telnet ssh` | Enables SSH transport. |
| **Step 9** | `Router(config-line)# Ctrl+Z` | Returns to Privileged Exec mode. |
| **Step 10** | `Router# copy running startup` | Saves the configuration changes to nonvolatile random-access memory (NVRAM). |

## Configuring SSHv1 or SSHv2 on Cisco IOS Routers Using RSA Key Pairs

The procedure for configuring SSHv1 or SSHv2 on a Cisco IOS router is as follows. For more detailed information, go to *http://www.cisco.com/en/US/products/ps5845/products_configuration_guide_chapter09186a00806f9ec4.html#wp1027184*.

| | Command | Description |
|---|---|---|
| **Step 1** | `Router# enable` | Enables privileged EXEC mode.<br>Enter your password, if prompted. |
| **Step 2** | `Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | `Router(config)# ip ssh rsa keypair-name <keypair-name>` | Specifies which RSA keypair to use for SSH usage. Note: A Cisco IOS router can have many RSA key pairs. |
| **Step 4** | `Router(config)# crypto key generate rsa usage-keys label <key-label> modulus <modulus-size>` | Enables the SSH server for local and remote authentication on the router.<br>For SSH Version 2, the modulus size must be at least 768 bits.<br>Note: To delete the Rivest, Shamir, and Adelman (RSA) key-pair, use the **crypto key zeroize rsa** command. After you have deleted the RSA command, you automatically disable the SSH server. |
| **Step 5** | `Router(config)# ip ssh [timeout <seconds> \| authentication-retries <integer>]` | Configures SSH control variables on your router. |
| **Step 6** | `Router(config)# ip ssh version [1 \| 2]` | Specifies the version of SSH to be run on a router. |

## Configuring SSH or SSHv2 on Cisco IOS XR Routers

The procedure for configuring SSHv2 on a Cisco IOS XR router is as follows. For more detailed information, go to *http://www.cisco.com/univercd/cc/td/doc/product/software/ios123/123newft/123t/123t_7/gt_ssh2.htm#wp1027129*.

| | Command | Description |
|---|---|---|
| **Step 1** | `RP/0/RP0/CPU0:router# configure` | Enters global configuration mode. |
| **Step 2** | `RP/0/RP0/CPU0:router(config)# hostname <hostname>` | Configures a hostname for your router. |
| **Step 3** | `RP/0/RP0/CPU0:router(config)# domain name <domain-name>` | `Defines a default domain name that the software uses to complete unqualified host names.` |
| **Step 4** | `RP/0/RP0/CPU0:router(config)# exit` | Exits global configuration mode, and returns the router to EXEC mode. |
| **Step 5** | `RP/0/RP0/CPU0:router(config)# crypto key generate rsa [usage keys \| general-keys] [<keypair-label>]` | Generates an RSA key pair. |

| | Command | Description |
|---|---|---|
| **Step 6** | `RP/0/RP0/CPU0:router# crypto key generate dsa` | Enables the SSH server for local and remote authentication on the router.<br>The recommended minimum modulus size is 1024 bits.<br>Generates a DSA key pair. To delete the DSA key pair, use the **crypto key zeroize dsa** command. This command is used only for SSHv2. |
| **Step 7** | `RP/0/RP0/CPU0:router# configure` | Enters global configuration mode. |
| **Step 8** | `RP/0/RP0/CPU0:router# ssh timeout <seconds>` | (Optional) Configures the timeout value for user authentication to authentication, authorization, and accounting (AAA).<br>If the user fails to authenticate itself to AAA within the configured time, the connection is aborted.<br>If no value is configured, the default value of 30 is used for 30 seconds. The range is from 5 to 120. |
| **Step 9** | `RP/0/RP0/CPU0:router(config)# ssh server`<br>or<br>`RP/0/RP0/CPU0:router(config)# ssh server v2` | Brings up an SSH server.<br>To bring down an SSH server, use the **no ssh server** command.<br>(Optional) Forces the SSH server to accept only SSHv2 clients if you configure the SSHv2 option by using the **ssh server v2** command. If you choose the **ssh server v2** command, only the SSH v2 client connections are accepted. |
| **Step 10** | `RP/0/RP0/CPU0:router(config)# end`<br>or<br>`RP/0/RP0/CPU0:router(config)# commit` | Saves configuration changes.<br>When you issue the **end** command, the system prompts you to commit changes: Uncommitted changes found, commit them before exiting (yes/no/cancel)? [cancel]<br>Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.<br>Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.<br>Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.<br>Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session. |

| | Command | Description |
|---|---|---|
| **Step 11** | `RP/0/RP0/CPU0:router# show ssh` | (Optional) Displays all of the incoming and outgoing SSHv1 and SSHv2 connections to the router. |
| **Step 12** | `RP/0/RP0/CPU0:router# show ssh session details` | (Optional) Displays a detailed report of the SSHv2 connections to and from the router. |

# Setting Up SNMP

To work with ISC, SNMP must be configured on each CPE device in the customer network. In ISC, SNMP is used to:

- collect from the Interface MIB
- provision and collect SLA data.

Two security models are available: SNMPv1/v2c and SNMPv3. Table 3-6 identifies the combinations of security models and levels.

***Table 3-6 SNMP Security Models and Levels***

| Model | Level | Authentication | Encryption | Description |
|---|---|---|---|---|
| v1/v2c | No Authentication/ No Encryption | Community String | No | Uses a community string match for authentication. |
| v3 | No Authentication/ No Encryption | Username | No | Uses a username match for authentication. |
| v3 | Authentication/ No Encryption | MD5 or SHA | No | Provides authentication based on the HMAC-MD5 or HMAC-SHA algorithms. |
| v3 | Authentication/ Encryption | MD5 or SHA | DES | Provides authentication based on the HMAC-MD5 or HMAC-SHA algorithms, and provides DES 56-bit encryption in addition to authentication based on the CBC-DES (DES-56) standard. |

SNMPv3 provides for both security models and security levels. A *security model* is an authentication strategy that is set up for a user and the group in which the user resides. A *security level* is the permitted level of security within a security model. A combination of a security model and a security level determines which security mechanism is employed when handling an SNMP packet.

The security features provided in SNMPv3 are as follows:

- Message integrity—Ensures that a packet has not been tampered with in-transit.
- Authentication—Determines the message is from a valid source.
- Encryption—Encoding the contents of a packet to prevent it from being read by an unauthorized source.

SNMPv3 objects have the following characteristics:

- Each user belongs to a group.

- The group defines the access policy for a set of users and determines the list of notifications its users can receive. The group also defines the security model and security level for its users.
- The access policy defines which SNMP objects can be accessed for reading, writing, or creation.
- SNMPv3 is not supported for Discovery (see Chapter 4).

## Setting Up SNMPv1/v2c on Cisco IOS Routers

To determine whether SNMP is enabled, and to set the SNMP community strings on a Cisco IOS router, perform the following steps for each router:

| | Command | Description |
|---|---|---|
| **Step 1** | `Router> enable`<br>`Router> <enable_password>` | Enters enable mode, and then enters the enable password. |
| **Step 2** | `Router# show snmp` | Check the output of the **show snmp** command to see whether the following statement is present: "`SNMP agent not enabled.`" If SNMP is not enabled, complete the steps in this procedure. |
| **Step 3** | `Router# configure terminal` | Enters global configuration mode. |
| **Step 4** | `Router(config)# snmp-server community <userstring> RO` | Sets the community read-only string. |
| **Step 5** | `Router(config)# snmp-server community <userstring> RW` | Sets the community read-write string. |
| **Step 6** | `Router(config)# Ctrl+Z` | Returns to Privileged Exec mode. |
| **Step 7** | `Router# copy running startup` | Saves the configuration changes to NVRAM. |

**Tip** The SNMP community strings defined in ISC for each target device must be identical to those configured on the device.

## Setting SNMPv3 Parameters on Cisco IOS Routers

This section describes how to set the SNMPv3 parameters on Cisco IOS routers. SNMPv3 is only supported on IOS crypto images. For Authentication/Encryption, the IOS image must have DES56.

**Tip** The SNMP users defined in ISC for each target device must be identical to those configured on the device.

To check the existing SNMP configuration, use these commands in the router terminal session:

- **show snmp group**
- **show snmp user**

To set the SNMPv3 server group and user parameters on a Cisco IOS router, perform the following steps:

**Note** The group must be created first and then the user.

| | Command | Description |
|---|---|---|
| **Step 1** | `Router> enable`<br>`Router> <enable_password>` | Enters enable mode, then enter the enable password. |
| **Step 2** | `Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | `Router(config)# snmp-server group [<groupname> {v1 \| v2c \| v3 {auth \| noauth \| priv}}] [read <readview>] [write <writeview>] [notify <notifyview>] [access <access-list>]` | The **snmp-server group** command configures a new SNMP group or a table that maps SNMP users to SNMP views. Each group belongs to a specific security level.<br>Example: **snmp-server group v3auth v3 auth read v1default write v1default** |
| **Step 4** | `Router(config)# snmp-server user <username> [<groupname> remote <ip-address> [udp-port <port>] {v1 \| v2c \| v3 [encrypted] [auth {md5 \| sha} <auth-password> [priv des56 <priv-password>]] [access <access-list>]` | The **snmp-server user** command configures a new user to an SNMP group.<br>Example: **snmp-server user user1 v3auth v3 auth md5 user1Pass** |
| **Step 5** | `Router(config)# Ctrl+Z` | Returns to Privileged Exec mode. |
| **Step 6** | `Router# copy running startup` | Saves the configuration changes to NVRAM. |

# Manually Enabling RTR Responder on Cisco IOS Routers

**Note** SNMP must be configured on the router.

To manually enable an RTR Responder on a Cisco IOS router, execute the following steps:

| | Command | Description |
|---|---|---|
| **Step 1** | `Router> enable`<br>`Router> <enable_password>` | Enters enable mode, and then enters the enable password. |
| **Step 2** | `Router# configure terminal` | Enters the global configuration mode. |
| **Step 3** | `Router(config)# rtr responder` | Enables the SA responder on the target router of SA Agent operations. |
| **Step 4** | `Router(config)# Ctrl+Z` | Returns to Privileged Exec mode. |
| **Step 5** | `Router# copy running startup` | Saves the configuration changes to NVRAM. |

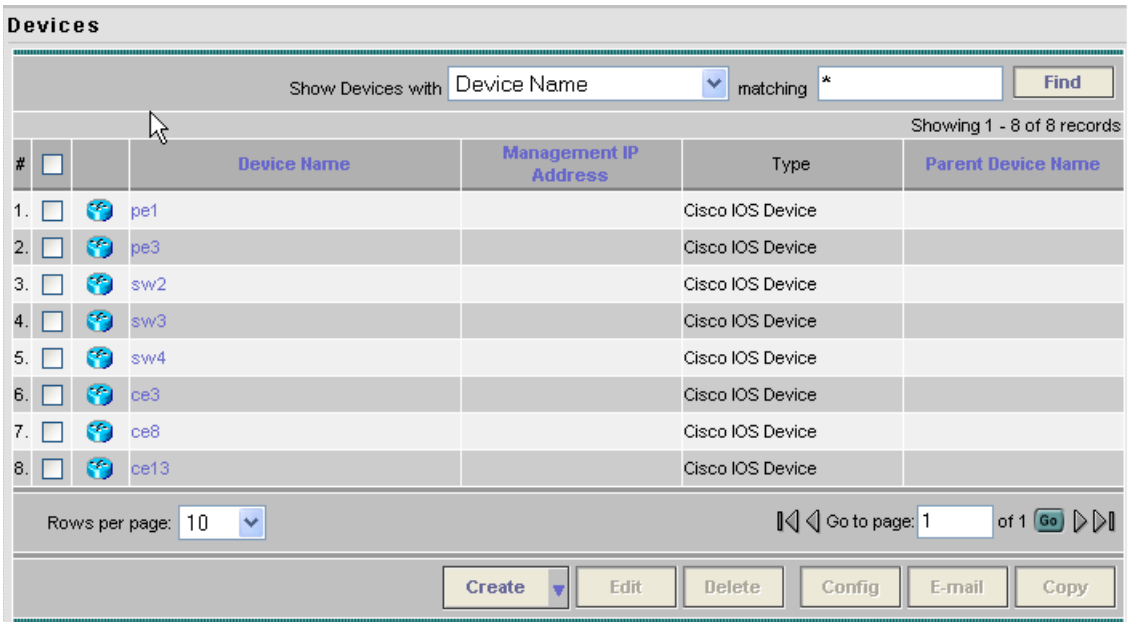
# Accessing the Devices Window

The Devices feature is used to create, edit, delete, and configure devices, and e-mail the device owner.

To access the Devices window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices**, as shown in Figure 3-70.

***Figure 3-70 Devices List Window***




The Devices window contains the following:

- **Device Name**—Lists the fully qualified host and domain name of the device. You can sort the list of devices by device name.
- **Management IP Address**—Lists the management IP address or the IE2100 address. You can sort the list of devices by this field.
- **Type**—Lists the type of the device. Types include: Cisco IOS Device, CatOs Device, Terminal Server, and IE2100.
- **Parent Device Name**—The name of the parent device.

In the Devices window, you can create, edit, delete, or configure devices, e-mail the device owner, or copy using the following buttons:

- **Create**—Click to create new devices. Enabled only if no devices are selected.
- **Edit**—Click to edit selected device (select device by checking the corresponding box). Enabled only if a single device is selected.
- **Delete**—Click to delete selected device (select device by checking the corresponding box). Enabled only if one or more devices are selected.
- **Config**—Click to change the selected device configuration (select device by checking the corresponding box). Enabled only if a single device is selected.

- **E-mail**—Click to send e-mail to the owner of the selected device(s) (select device(s) by checking the corresponding box(es)). Enabled only if one or more devices are selected.
- **Copy**—Click to copy selected device (select device by checking the corresponding box). Enabled only if a single device is selected.

# Creating a Device

From the Create window, you can define different types of devices.

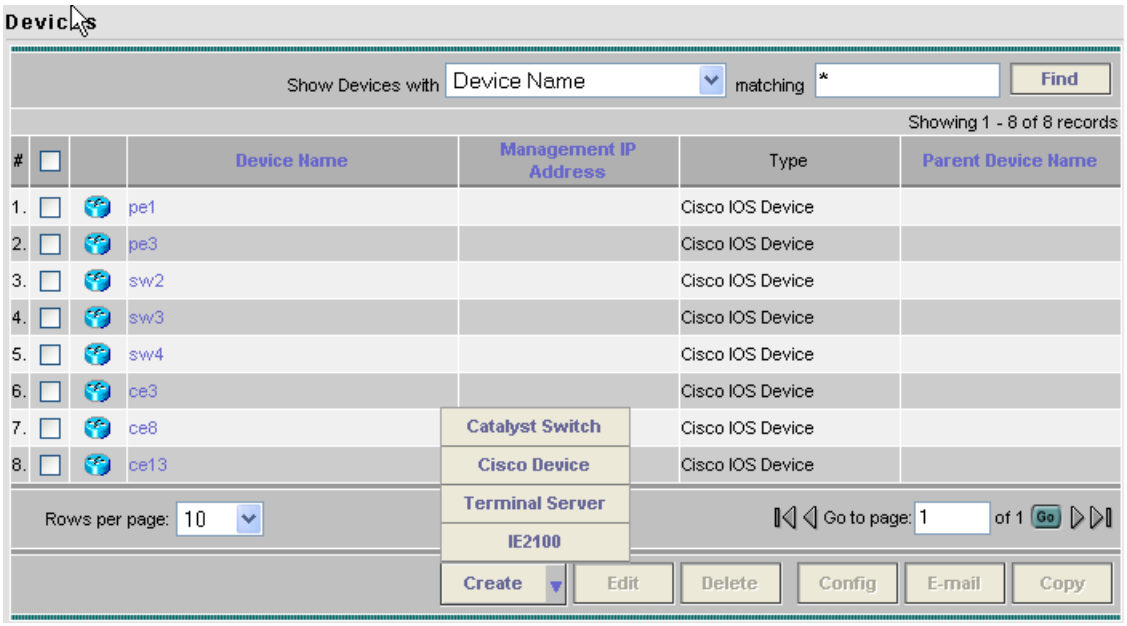
To create a device, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices**.

**Step 2** Click the **Create** button.

The Create options window appears, as shown in Figure 3-71.

***Figure 3-71 Create Options Window***




The **Create** options include the following:

- **Catalyst Switch**—A Catalyst device running the Catalyst Operating System.
- **Cisco Device**—Any router that runs the Cisco IOS. This includes Catalyst devices running Cisco IOS.
- **Terminal Server**—A device that represents the workstation that can be used to provision edge routers.
- **IE2100**—Any Cisco Intelligence Engine (IE) 2100 series network device.

**Step 3** See the following sections for instructions on creating each type of device.

- Creating a Catalyst Switch, page 3-79

- Creating a Cisco Device, page 3-84
- Creating a Terminal Server, page 3-90
- Creating a Cisco Configuration Engine Server, page 3-95

## Creating a Catalyst Switch

To create a Catalyst switch, follow these steps:

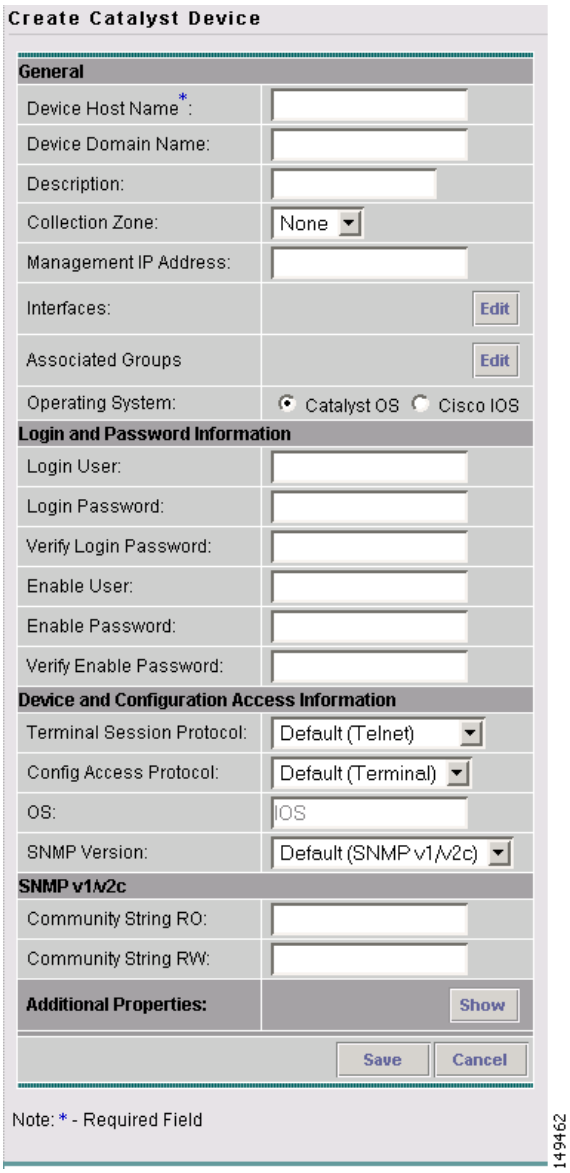
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices**.

**Step 2** Click the **Create** button.

**Step 3** Select **Catalyst Switch**.

The Create Catalyst Device window appears, as shown in Figure 3-72.

*Figure 3-72 Create Catalyst Device Window*




The General section of the Create Catalyst Device window contains the following fields:

- **Device Host Name** (required)—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field must match the name configured on the target router device. Limited to 256 characters.
- **Device Domain Name** (optional)—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. The name must match the domain name on the target router device.
- **Description** (optional)—Limited to 80 characters. Can contain any pertinent information about the device such as the type of device, its location, or other information that might be helpful to service provider operators.
- **Collection Zone** (optional)—Drop-down list of all collection zones within the ISC. Choices include: None and all collection zones within the ISC. Default: None.

- **Management IP Address** (optional)—Valid IP address of the device that ISC uses to configure the target router device.
- **Interfaces** (optional)—Click the **Edit** button to view, add, edit, and delete all interfaces associated with the device. See Table 3-7 for a description of the Interfaces fields.

*Table 3-7 Create Catalyst Device Interfaces Fields*

| Field | Description | Additional |
|---|---|---|
| Interface Name | Name of this interface. | List can be sorted by this field. Limited to 80 characters. |
| IPV4 Address | IPv4 address associated with this interface. | |
| IPV6 Address | IPv6 address associated with this interface. | |
| Encapsulation | The Layer 2 Encapsulation for this device. | DEFAULT<br>DOT1Q<br>ETHERNET<br>ISL<br>FRAME_RELAY<br>FRAME_RELAY_IETF<br>HDLC<br>PPP<br>ATM<br>AAL5SNAP<br>AAL0<br>AAL5<br>AAL5MUX<br>AAL5NLPID<br>AAL2<br>ENCAP_QinQ<br>GRE |
| Port Type | | NONE<br>ACCESS<br>TRUNK<br>ROUTED |
| Description | | |
| IP Address Type | | |

- **Associated Groups** (optional)—Click the **Edit** button to view, add, and remove all Device Group associations.

- **Operating System** (optional)—Click the radio button for the operating system currently running on the CAT switch. Choices include: Catalyst OS or Cisco IOS. Default: Catalyst OS. When you choose the IOS operating system, VPNSM is available under the heading Catalyst Properties. If you click the **Edit** button for **VPNSM**, you can **Create**, **Edit**, and **Delete** VPN Service Modules (VPNSMs).

The Login and Password Information section of the Create Catalyst Device window contains the following fields:

- **Login User** (optional)—Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Login Password** (optional)—Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password, because ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Login Password** (optional)—Must match the Login Password field. Limited to 80 characters.
- **Enable User** (optional)—Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Enable Password** (optional)—Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Enable Password** (optional)—Must match the Enable Password field. Limited to 80 characters.

The Device and Configuration Access Information section of the Create Catalyst Device window contains the following fields:

- **Terminal Session Protocol** (optional)—Configures the method of communication between ISC and the device. Choices include: Telnet, Secure Shell (SSH), CNS, RSH, and SSH version 2 (SSHv2). In previous versions of ISC, this field was called the Transport field. Default: The default set in the DCPL properties.
- **Config Access Protocol** (optional)—Administers the access protocol for config upload and download. Choices include: Terminal, TFTP, FTP, and RCP. Default: The default set in the DCPL properties.
- **SNMP Version** (optional)—Configures the version of SNMP to use when communicating with the device. Choices include: SNMP v1/v2c and SNMP v3. Default: The default set in the DCPL properties.

The SNMP v1/v2c section of the Create Catalyst Device window contains the following fields:

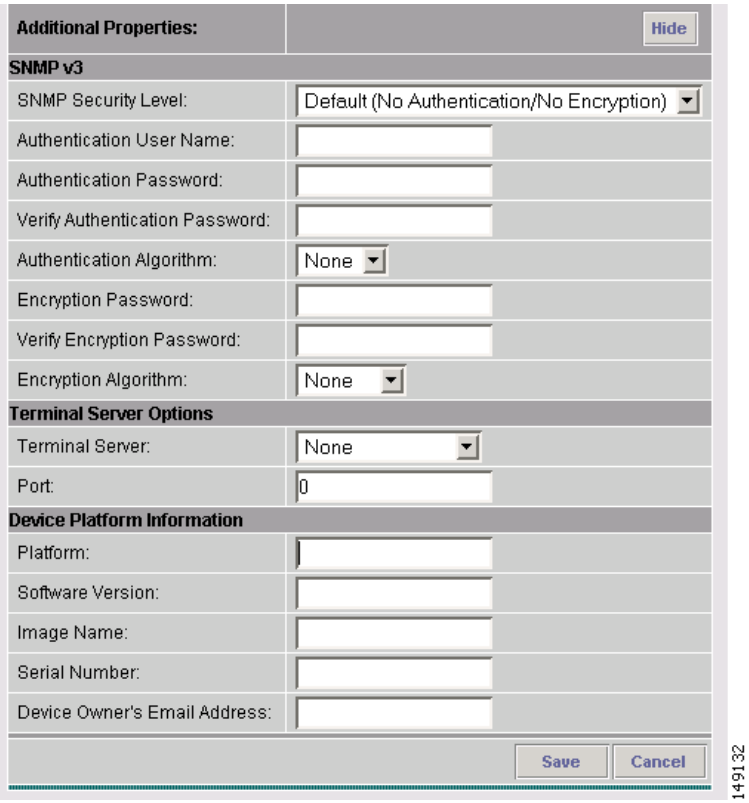
- **Community String RO** (optional)—SNMP Read-Only Community String. Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.
- **Community String RW** (optional)—SNMP Read-Write Community String. Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.

**Step 4** Enter the desired information for the Catalyst device you are creating.

**Step 5** To access the Additional Properties section of the **Create Catalyst Device**, click **Show**.

The Additional Properties window appears, as shown in Figure 3-73.

*Figure 3-73 Catalyst Device Additional Properties Window*




The SNMP v3 section of the Catalyst Device Properties window contains the following fields:

- **SNMP Security Level** (optional)—Choices include: Default (<*default_set_in_DCP*L>), Authentication/No Encryption, Authentication/Encryption, and No Authentication/No Encryption. Default: Default (<*default_set_in_DCP*L>). Note: When you change the DCPL property, the <*default_set_in_DCP*L> variable changes.
- **Authentication User Name** (optional)—User name configured on the specified device router. User must have permission to the object identification numbers (OIDs) specified in the security request (that is, write permission for a set request, and read permission for a get request). Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Limited to 80 characters.
- **Authentication Password** (optional)—Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Authentication Password** (optional)—Must match the Encryption Password field. Limited to 80 characters.
- **Authentication Algorithm** (optional)—Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Choices include: None, MD5, and SHA. Default: None.
- **Encryption Password** (optional)—In previous versions of ISC, this field was called Privacy Password. Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Limited to 80 characters.

- **Verify Encryption Password** (optional)—Must match the Encryption Password field. Limited to 80 characters.
- **Encryption Algorithm** (optional)—In previous versions of ISC, this field was called Privacy Protocol. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Choices include: None and DES 56. Default: None.

The Terminal Server Options section of the Catalyst Device Properties window contains the following fields:

- **Terminal Server** (optional)—Choices include: None and the list of existing Terminal Server names. Default: None.
- **Port** (optional)—Disabled until a Terminal Server is selected. Range: 0-65535. Default: 0.

The Device Platform Information section of the Catalyst Device Properties window contains the following fields:

- **Platform** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Software Version** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Image Name** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Serial Number** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Device Owner's Email Address** (optional)—Used in the To: field when the Email button is selected from the device list. Limited to 80 characters and must be valid Email format.

**Step 6** Enter any desired Additional Properties information for the Catalyst device you are creating.

**Step 7** Click **Save**.

The Devices window reappears with the new Catalyst device listed.

## Creating a Cisco Device

To create a Cisco device, follow these steps:

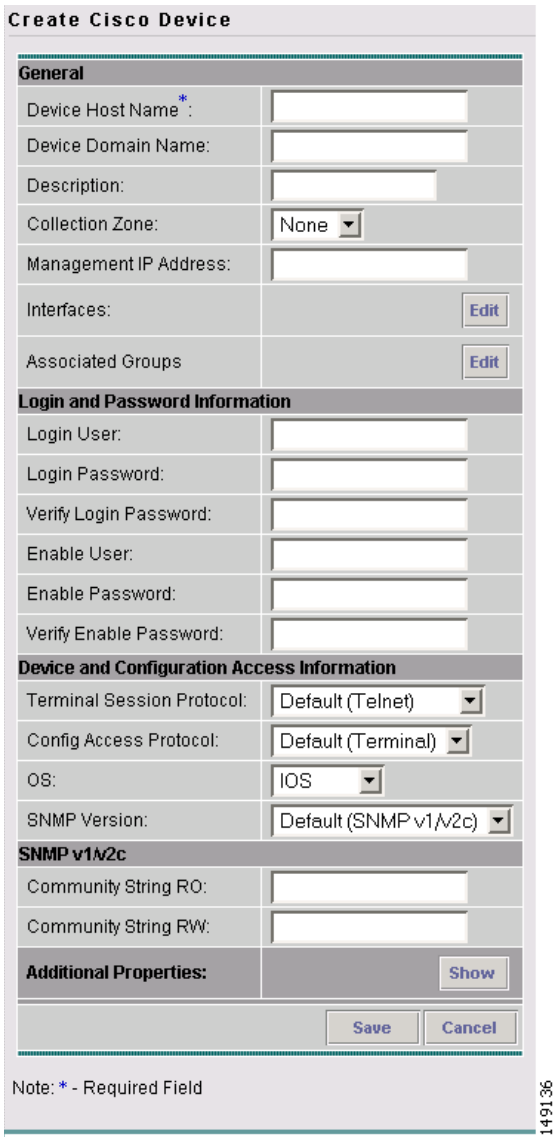
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices**.

**Step 2** Click the **Create** button.

**Step 3** Select **Cisco Device**.

The Create Cisco Device window appears, as shown in Figure 3-74.

*Figure 3-74 Create Cisco Device Window*



The General section of the Create Cisco IOS Device window contains the following fields:

- **Device Host Name**—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field is required and must match the name configured on the target router device. Limited to 256 characters.
- **Device Domain Name** (optional)—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. The name must match the domain name on the target router device.
- **Description** (optional)—Limited to 80 characters. Can contain any pertinent information about the device such as the type of device, its location, or other information that might be helpful to service provider operators.
- **Collection Zone** (optional)—Drop-down list of all collection zones within the ISC. Choices include: None and all collection zones within the ISC. Default: None.
- **Management IP Address** (optional)—Valid IP address of the device that ISC uses to configure the target router device.
- **Interfaces** (optional)—Click the Edit button to view, add, edit, and delete all interfaces associated with the device. See Table 3-8 for a description of the Interface fields

***Table 3-8 Create Cisco Device Interface Fields***

| Field | Description | Additional |
|---|---|---|
| Interface Name | Name of this interface. | List can be sorted by this field. Limited to 80 characters. |
| IPV4 Address | IP address associated with this IPv4 interface. | |
| IPV6 Address | IP address associated with this IPv6 interface. | |
| Encapsulation | The Layer 2 Encapsulation for this device. | DEFAULT<br>DOT1Q<br>ETHERNET<br>ISL<br>FRAME_RELAY<br>FRAME_RELAY_IETF<br>HDLC<br>PPP<br>ATM<br>AAL5SNAP<br>AAL0<br>AAL5<br>AAL5MUX<br>AAL5NLPID<br>AAL2<br>ENCAP_QinQ<br>GRE |

*Table 3-8 Create Cisco Device Interface Fields (continued)*

| Field | Description | Additional |
|---|---|---|
| Description | | |
| IP Address Type | | |

- **Associated Groups** (optional).
- Click the **Edit** button to view, add, and remove all Device Group associations.

The Login and Password Information section of the Create Cisco IOS Device window contains the following fields:

- **Login User** (optional)—Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Login Password** (optional)—Displayed as stars (*). Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Login Password** (optional)—Displayed as stars (*). Must match the Login Password field. Limited to 80 characters.
- **Enable User** (optional)—Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Enable Password** (optional)—Displayed as stars (*). Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Enable Password** (optional)—Displayed as stars (*). Must match the Enable Password field. Limited to 80 characters.

The Device and Configuration Access Information section of the Create Cisco IOS Device window contains the following fields:

- **Terminal Session Protocol** (optional)—Configures the method of communication between ISC and the device. Choices include: Telnet, Secure Shell (SSH), CNS, RSH, and SSH version 2 (SSHv2).
- **Config Access Protocol** (optional)—Administers the access protocol for config upload and download. Choices include: Terminal, TFTP, FTP, and RCP. Default: The default set in the DCPL properties.
- **OS** (optional)—The choices are: IOS and IOS_XR.
- **SNMP Version** (optional)—Configures the version of SNMP to use when communicating with the device. Choices include: SNMP v1/v2c and SNMP v3. Default: The default set in the DCPL properties.

The SNMP v1/v2c section of the Create Cisco IOS Device window contains the following fields:

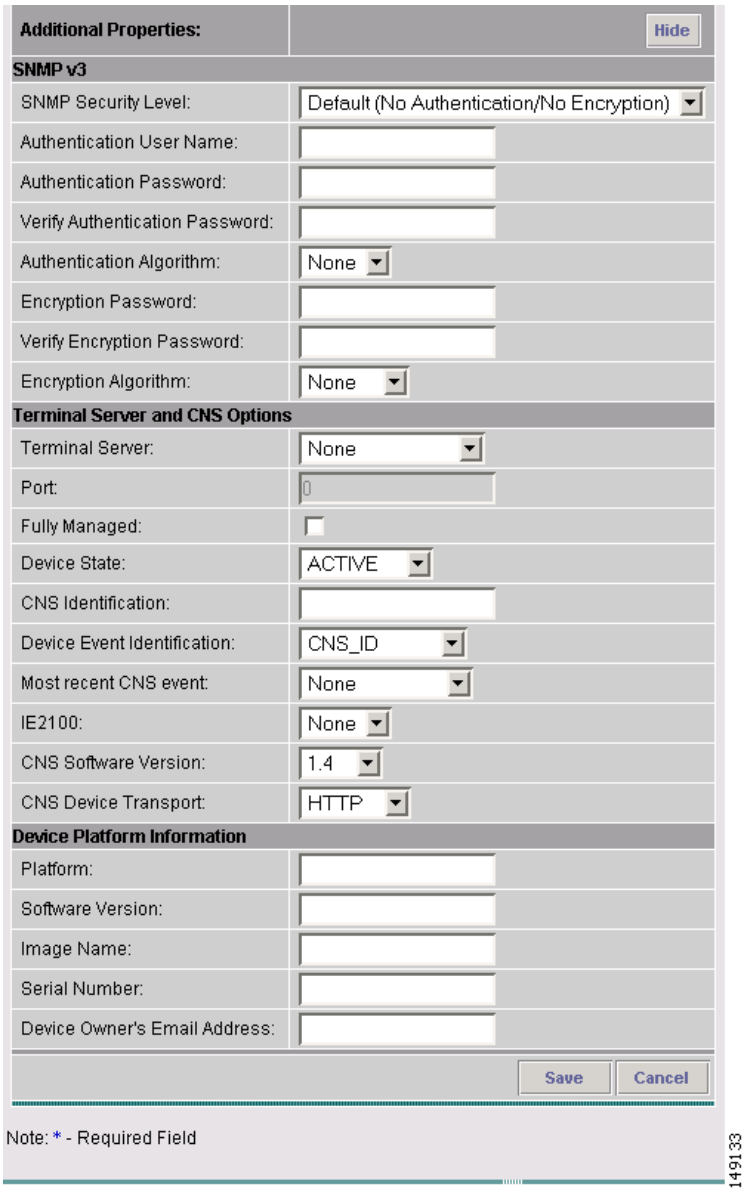
- **Community String RO** (optional)—SNMP Read-Only Community String. Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.
- **Community String RW** (optional)—SNMP Read-Write Community String. Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.

**Step 4** Enter the desired information for the Cisco IOS device you are creating.

**Step 5** To access the Additional Properties section of the **Create Cisco Device**, click **Show**.

The Additional Properties window appears, as shown in Figure 3-75.

***Figure 3-75 Additional Properties for the Cisco Device Properties Window***




The SNMP v3 section of the Cisco IOS Device Properties window contains the following fields:

- **SNMP Security Level** (optional)—Choices include: Default (<*default_set_in_DCP*L>), Authentication/No Encryption, Authentication/Encryption, and No Authentication/No Encryption. Default: Default (<*default_set_in_DCP*L>). Note: When you change the DCPL property, the <*default_set_in_DCP*L> variable changes.

- **Authentication User Name** (optional)—User name configured on the specified device router. User must have permission to the object identification numbers (OIDs) specified in the security request (that is, write permission for a set request, and read permission for a get request). Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Limited to 80 characters.
- **Authentication Password** (optional)—Displayed as stars (*). Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Authentication Password** (optional)—Displayed as stars (*). Must match the Encryption Password field. Limited to 80 characters.
- **Authentication Algorithm** (optional)—Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Choices include: None, MD5, and SHA. Default: None.
- **Encryption Password** (optional)—Displayed as stars (*). In previous versions of ISC, this field was called Privacy Password. Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Limited to 80 characters.
- **Verify Encryption Password** (optional)—Displayed as stars (*). Must match the Encryption Password field. Limited to 80 characters.
- **Encryption Algorithm** (optional)—In previous versions of ISC, this field was called Privacy Protocol. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Choices include: None and DES 56. Default: None.

The Terminal Server and CNS Options section of the Cisco IOS Device Properties window contains the following fields:

- **Terminal Server** (optional)—Choices include: None and the list of existing Terminal Server names. Default: None.
- **Port** (optional)—Disabled until a Terminal Server is selected. Range: 0-65535. Default: 0.
- **Fully Managed** (optional)—If the Fully Managed check box is checked, the device becomes a fully managed device. ISC performs additional management actions only for fully managed devices. These actions include e-mail notifications upon receipt of device configuration changes originated outside ISC and the scheduling of enforcement audit tasks upon detection of possible intrusion. Default: Not selected and therefore not selected.
- **Device State** (optional)—Choices include: ACTIVE and INACTIVE. ACTIVE indicates that the router has been plugged on the network and can be part of ISC tasks such as collect config and provisioning. INACTIVE indicates the router has not been plugged-in. Default: ACTIVE.
- **CNS Identification**—Required if the Device Event Identification field is set to CNS_ID. Only valid characters that Cisco IOS allows are alphanumeric characters and (.) (-) (_).
- **Device Event Identification** (optional)—Indicates whether the CNS Identification field contains a HOST_NAME or CNS_ID. Default: HOST_NAME.
- **Most Recent CNS event** (optional)—Choices include: None, CONNECT, and DISCONNECT. Changing from the default of None is not recommended. Note: The last connect or disconnect CNS TIBCO event received by ISC for each CNS-enabled IOS device is automatically recorded.
- **IE2100** (optional)—Disabled unless the Device State field is INACTIVE or the Terminal Session Protocol field is CNS. A valid IE2100 must be selected if the Terminal Session Protocol is CNS. Choices include: None and the list of existing IE2100 names. Default: None.

- **Cisco Configuration Engine Software Version** (optional)—Choices include: 1.3, 1.3.1, 1.3.2, 1.4, 1.5, 2.0, and 3.0. This is the release version of Cisco Configuration Engine that manages the IOS device. Default: 1.4.
- **CNS Device Transport** (optional)—Choices include: HTTP and HTTPS. This field determines what will be the transport mechanism used by ISC to create, delete, or edit devices in the Cisco Configuration Engine repository. If HTTPS is used, the Cisco Configuration Engine must be running in secure mode. Default: HTTP.

The Device Platform Information section of the Cisco IOS Device Properties window contains the following fields:

- **Platform** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Software Version** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Image Name** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Serial Number** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Device Owner's Email Address** (optional)—Used in the To: field when the Email button is selected from the device list. Limited to 80 characters and must be valid Email format.

**Step 6** Enter any desired Additional Properties information for the Cisco IOS device you are creating.

**Step 7** Click **Save**.

The Devices window reappears with the new Cisco IOS device listed.

## Creating a Terminal Server

To create a Terminal Server device, follow these steps:

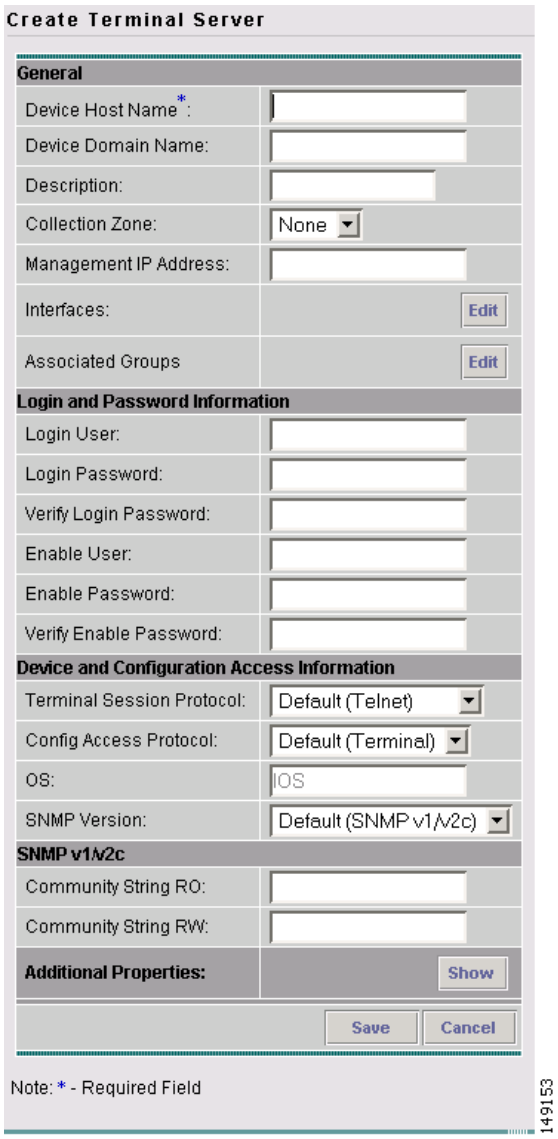
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices**.

**Step 2** Click the **Create** button.

**Step 3** Select **Terminal Server**.

The Create Terminal Server window appears, as shown in Figure 3-76.

*Figure 3-76 Create Terminal Server Window*




The General section of the Create Terminal Server window contains the following fields:

- **Device Host Name** (required)—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field must match the name configured on the target router device. Limited to 256 characters.
- **Device Domain Name** (optional)—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. The name must match the domain name on the target router device.
- **Description** (optional)—Limited to 80 characters. Can contain any pertinent information about the device such as the type of device, its location, or other information that might be helpful to service provider operators.
- **Collection Zone** (optional)—Drop-down list of all collection zones within the ISC. Choices include: None and all collection zones within the ISC. Default: None.

- **Management IP Address** (optional)—Valid IP address of the device that ISC uses to configure the target router device.
- **Interfaces** (optional)—Click the **Edit** button to view, add, edit, and delete all interfaces associated with the device. See Table 3-9 for a description of the Interfaces fields.

*Table 3-9 Create Terminal Server Device Interfaces Fields*

| Field | Description | Additional |
|---|---|---|
| Interface Name | Name of this interface. | List can be sorted by this field. Limited to 80 characters. |
| Encapsulation | The Layer 2 Encapsulation for this device. | DEFAULT<br>DOT1Q<br>ETHERNET<br>ISL<br>FRAME_RELAY<br>FRAME_RELAY_IETF<br>HDLC<br>PPP<br>ATM<br>AAL5SNAP<br>AAL0<br>AAL5<br>AAL5MUX<br>AAL5NLPID<br>AAL2<br>ENCAP_QinQ<br>GRE |
| Port Type | | NONE<br>ACCESS<br>TRUNK<br>ROUTED |
| Description | | |
| IP Address Type | | |

- **Associated Groups** (optional)—Click the **Edit** button to view, add, and remove all Device Group associations.

The Login and Password Information section of the Create Terminal Server window contains the following fields:

- **Login User** (optional— Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.

- **Login Password** (optional)—Displayed as stars (*). Not required by ISC. However, collection and upload/download will not function without the Login User and Login Password as ISC will not be able to access the device. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Login Password** (optional)—Displayed as stars (*). Must match the Login Password field. Limited to 80 characters.
- **Enable User** (optional)—Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Enable Password** (optional)—Displayed as stars (*). Not required by ISC. However, collection and upload/download only function if the Login User has sufficient privileges to configure the router in EXEC mode. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Enable Password** (optional)—Displayed as stars (*). Must match the Enable Password field. Limited to 80 characters.

The Device and Configuration Access Information section of the Create Terminal Server window contains the following fields:

- **Terminal Session Protocol** (optional)—Configures the method of communication between ISC and the device. Choices include: Telnet, Secure Shell (SSH), CNS, RSH, and SSH version 2 (SSHv2). In previous versions of ISC, this field was called the Transport field. Default: The default set in the DCPL properties.
- **Config Access Protocol** (optional)—Administers the access protocol for config upload and download. Choices include: Terminal, TFTP, FTP, and RCP. Default: The default set in the DCPL properties.
- **OS** (optional)—The choices are: IOS and IOS_XR.
- **SNMP Version** (optional)—Configures the version of SNMP to use when communicating with the device. Choices include: SNMP v1/v2c and SNMP v3. Default: The default set in the DCPL properties.

The SNMP v1/v2c section of the Create Terminal Server window contains the following fields:

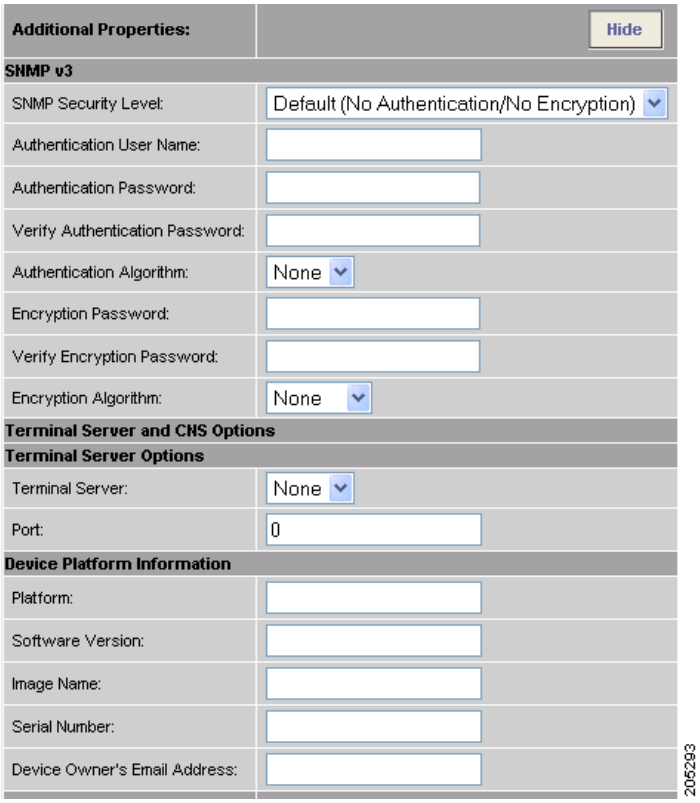
- **Community String RO** (optional)—SNMP Read-Only Community String. Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.
- **Community String RW** (optional)—SNMP Read-Write Community String. Many tasks use SNMP to access the device. This field must match what is configured on the target router device. Limited to 80 characters.

**Step 4** Enter the desired information for the Terminal Server you are creating.

**Step 5** To access the Additional Properties section of the **Create Terminal Server**, click **Show**.

The Additional Properties window appears, as shown in Figure 3-77.

*Figure 3-77 Additional Properties for the Terminal Server Device Properties Window*




The SNMP v3 section of the Terminal Server Device Properties window contains the following fields:

- **SNMP Security Level** (optional)—Choices include: Default (<*default_set_in_DCPL*>), Authentication/No Encryption, Authentication/Encryption, and No Authentication/No Encryption. Default: Default (<*default_set_in_DCPL*>). Note: When you change the DCPL property, the <*default_set_in_DCPL*> variable changes.
- **Authentication User Name** (optional)—User name configured on the specified device router. User must have permission to the object identification numbers (OIDs) specified in the security request (that is, write permission for a set request, and read permission for a get request). Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Limited to 80 characters.
- **Authentication Password** (optional)—Displayed as stars (*). Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Should match what is configured on the target router device. Limited to 80 characters.
- **Verify Authentication Password** (optional)—Displayed as stars (*). Must match the Encryption Password field. Limited to 80 characters.
- **Authentication Algorithm** (optional)—Should be provisioned if the SNMP Security Level is Authentication/No Encryption or Authentication/Encryption. Choices include: None, MD5, and SHA. Default: None.
- **Encryption Password** (optional)—Displayed as stars (*). In previous versions of ISC, this field was called Privacy Password. Should match what is configured on the target router device. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Limited to 80 characters.

- **Verify Encryption Password** (optional)—Displayed as stars (*). Must match the Encryption Password field. Limited to 80 characters.
- **Encryption Algorithm** (optional)—In previous versions of ISC, this field was called Privacy Protocol. Should be provisioned if the SNMP Security Level is Authentication/Encryption. Choices include: None and DES 56. Default: None.

The Terminal Server Options section of the Terminal Server Device Properties window contains the following fields:

- **Terminal Server** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Port** (optional)—An integer that indicates the port; default is 0.

The Device Platform Information section of the Terminal Server Device Properties window contains the following fields:

- **Platform** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Software Version** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Image Name** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Serial Number** (optional)—Should match what is configured on the target router device. Limited to 80 characters.
- **Device Owner's Email Address** (optional)—Used in the To: field when the Email button is selected from the device list. Limited to 80 characters and must be valid Email format.

**Step 6** Enter any desired Additional Properties information for the Terminal Server device you are creating.

**Step 7** Click **Save**.

The Devices window reappears with the new Terminal Server device listed.

## Creating a Cisco Configuration Engine Server

**Note** To use the Cisco Configuration Engine server functionality on ISC, you must first set up the Cisco Configuration Enginer server and the ISC workstation as explained in Appendix B, "Setting Up Cisco Configuration Engine with ISC" in the *Cisco IP Solution Center Installation Guide, 5.2*. You must also create a Cisco IOS device to communicate with the Cisco Configuration Engine server. See Appendix A, "Setting Up Oracle for ISC," in the *Cisco IP Solution Center Installation Guide, 5.2*.

To create a Cisco Configuration Engine server, follow these steps:

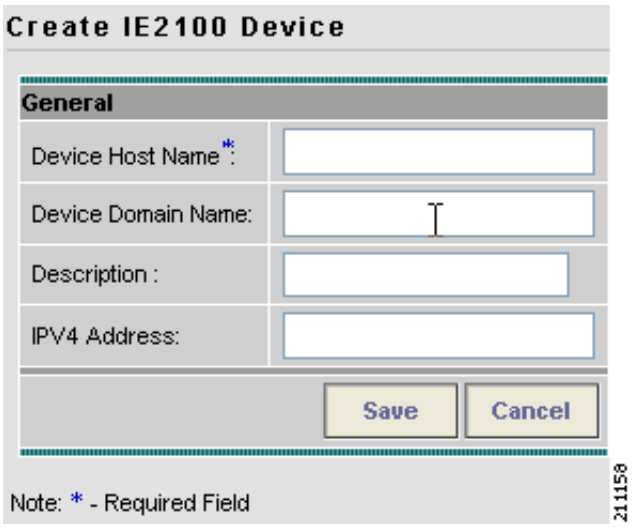
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices**.

**Step 2** Click the **Create** button.

**Step 3** Select **IE2100**.

The Create IE2100 Device window appears, as shown in Figure 3-78.

*Figure 3-78 Create IE2100 Device Window*




The General section of the Create IE2100 Device window contains the following fields:

- **Device Host Name** (required)—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. This field must match the name configured on the target router device. Limited to 256 characters.
- **Device Domain Name** (optional)—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. The name must match the domain name on the target router device.
- **Description** (optional)—Limited to 80 characters. Can contain any pertinent information about the device such as the type of device, its location, or other information that might be helpful to service provider operators.
- **IPV4 Address** (optional)—Valid IPv4 address of the Cisco Configuration Engine server that ISC uses to configure the target router device.

**Step 4** Enter the desired information for the Cisco Configuration Engine server you are creating.

**Step 5** Click **Save**.

The Devices window reappears with the new Cisco Configuration Engine server listed.

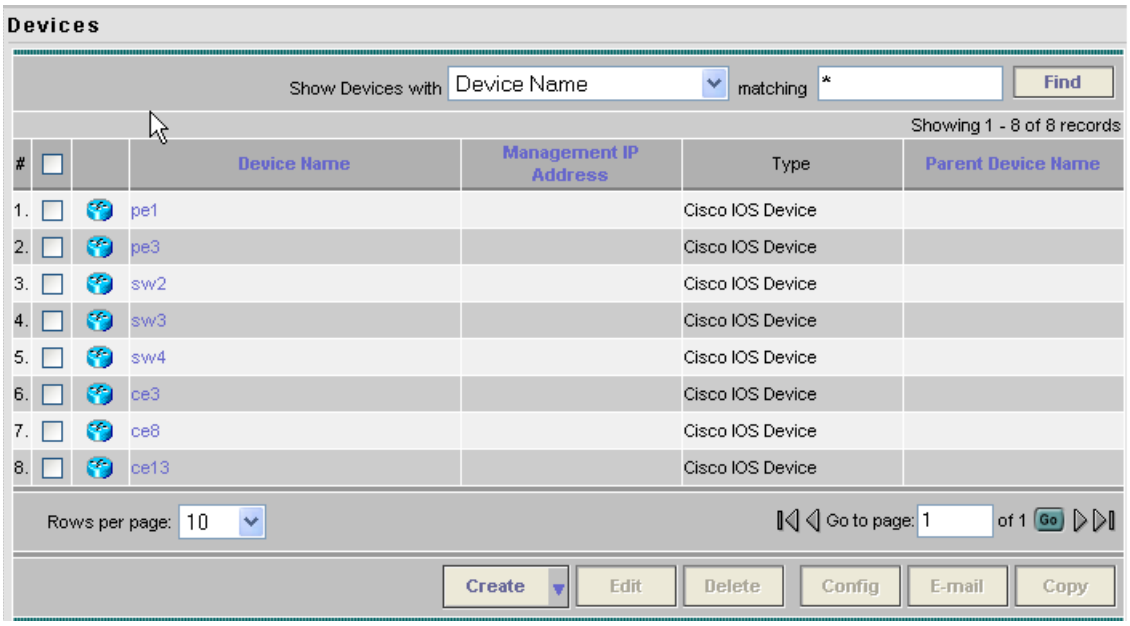
# Editing a Device

From the Edit window, you can modify the fields that have been specified for a particular device.

To access the Edit window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices** to access the Devices window shown in Figure 3-79.

*Figure 3-79 Devices List Window*

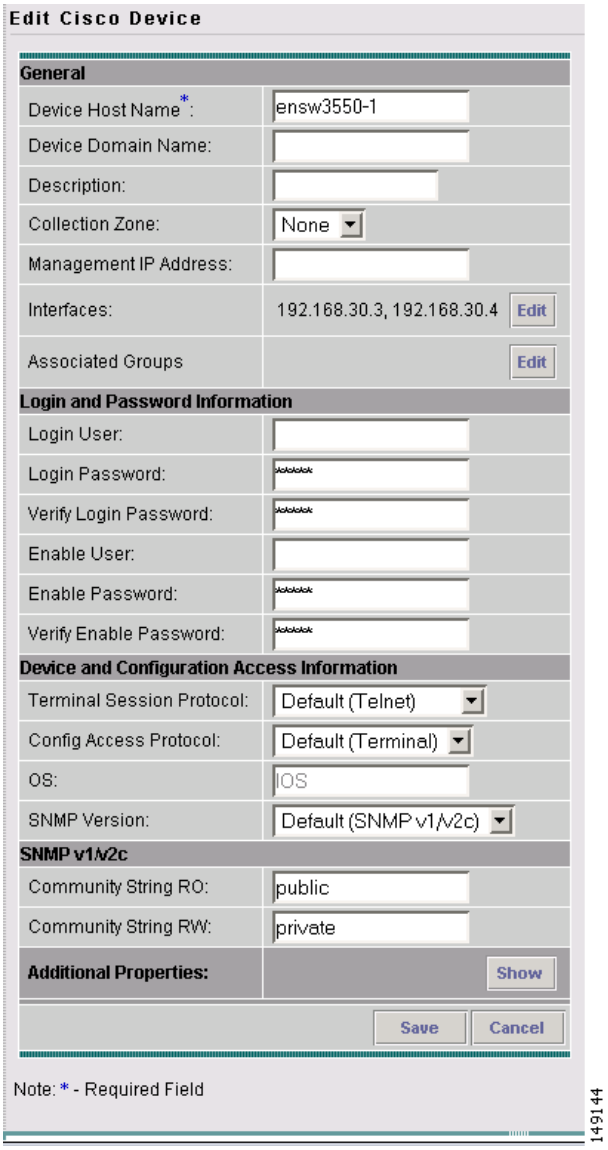



**Step 2** Select a single device to edit by checking the box to the left of the Device Name. You can also select a device to edit by clicking on the hyperlink of the device name.

**Step 3** Click the **Edit** button. This button is only enabled if a device is selected.

The Edit window appropriate to the type of device selected appears. For example, if you selected a Cisco IOS device the Edit Cisco IOS Device window appears, as shown in Figure 3-80.

*Figure 3-80 Editing a Device Window*




**Step 4** Enter the changes you want to make to the selected device.

**Step 5** Click **Save**.

The changes are saved and the Devices window reappears.

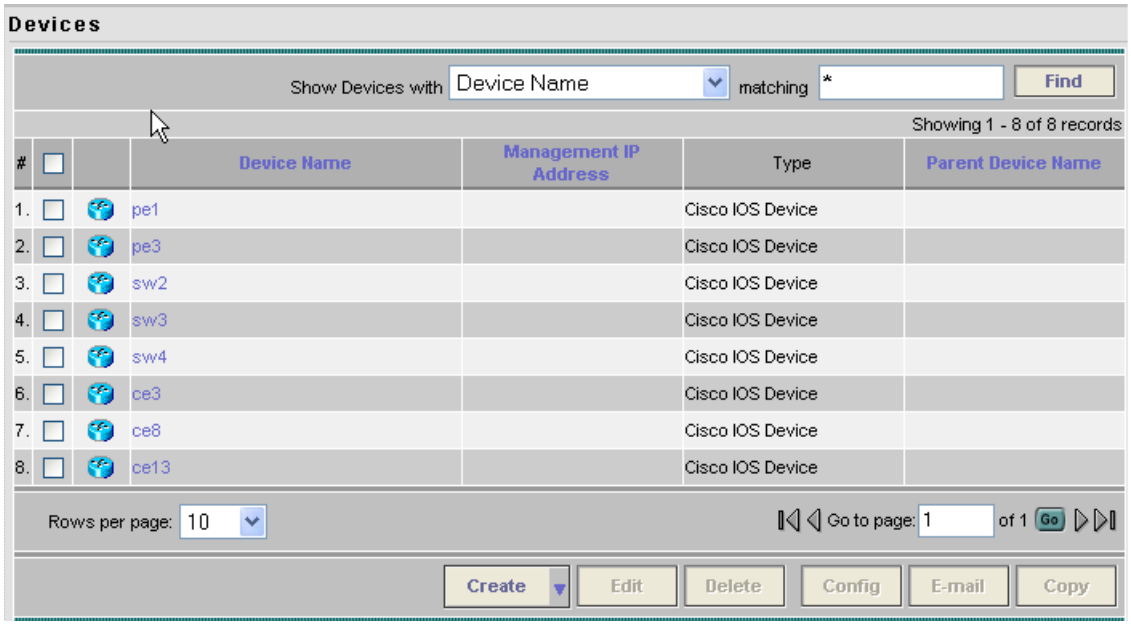
# Deleting Devices

From the Delete window, you can remove selected devices from the database.

To access the Delete window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices** to access the Devices window shown in Figure 3-81.

***Figure 3-81 Devices List Window***




**Step 2** Select one or more devices to delete by checking the check box(es) to the left of the Device Name(s).

**Step 3** Click the **Delete** button. This button is only enabled if one or more devices are selected.

The Confirm Delete window appears, as shown in Figure 3-82.

***Figure 3-82 Confirm Delete Window***

**Step 4** Click the **Delete** button to confirm that you want to delete the device(s) listed.

The Devices window reappears with the specified device(s) deleted.

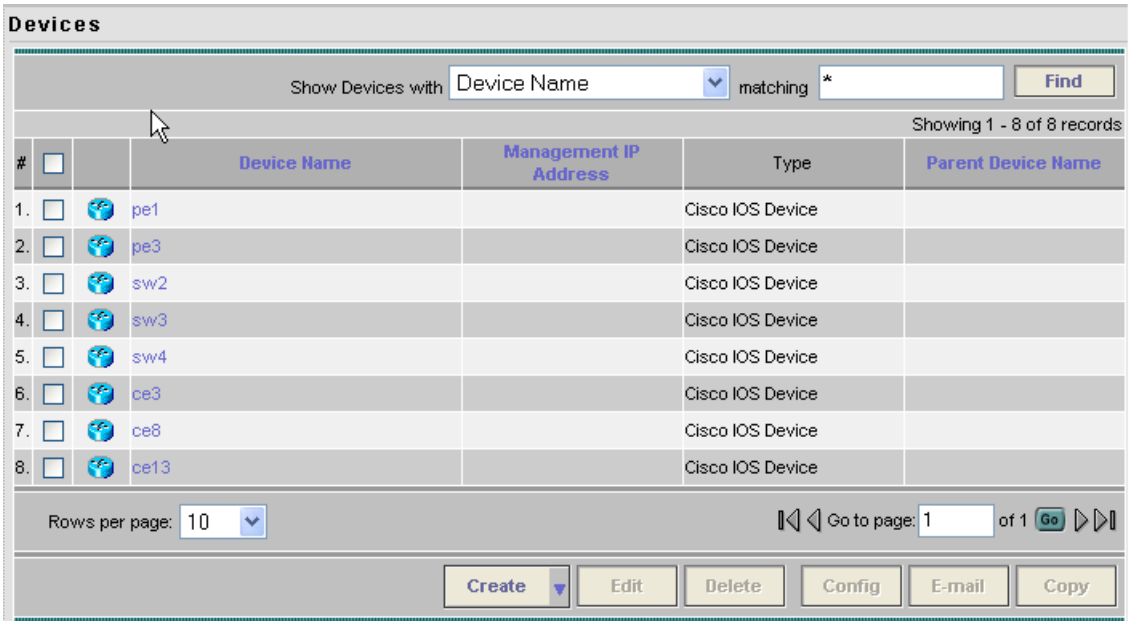
# Editing a Device Configuration

From the Config window, you can edit the configuration for a specified device.

To access the Config window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices** to access the Devices window shown in Figure 3-83.

***Figure 3-83 Devices List Window***

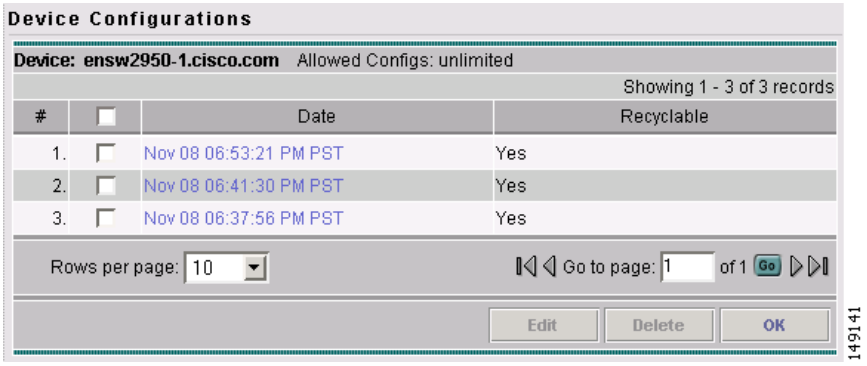



**Step 2** Select a single device to modify by checking the check box to the left of the Device Name.

**Step 3** Click the **Config** button.

The Device Configurations window for the selected device appears, as shown in Figure 3-84.

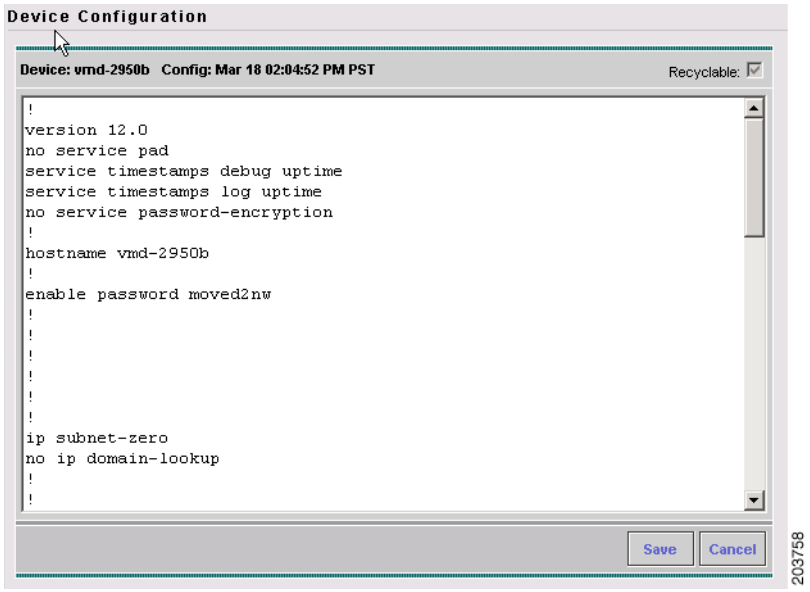
*Figure 3-84 Device Configurations Window*




**Step 4** Check the box to the left of the Date for the configuration that you want to modify and click the **Edit** button. This button is only enabled if a device is selected.

The Device Configuration window for the selected device appears, as shown in Figure 3-85.

*Figure 3-85 Device Configuration Window*




**Step 5** Enter the changes you want to make to the selected device configuration.

**Step 6** Click **Save**.

The changes are saved and the Device Configurations window reappears.

**Step 7** Click **OK** to return to the Devices window.

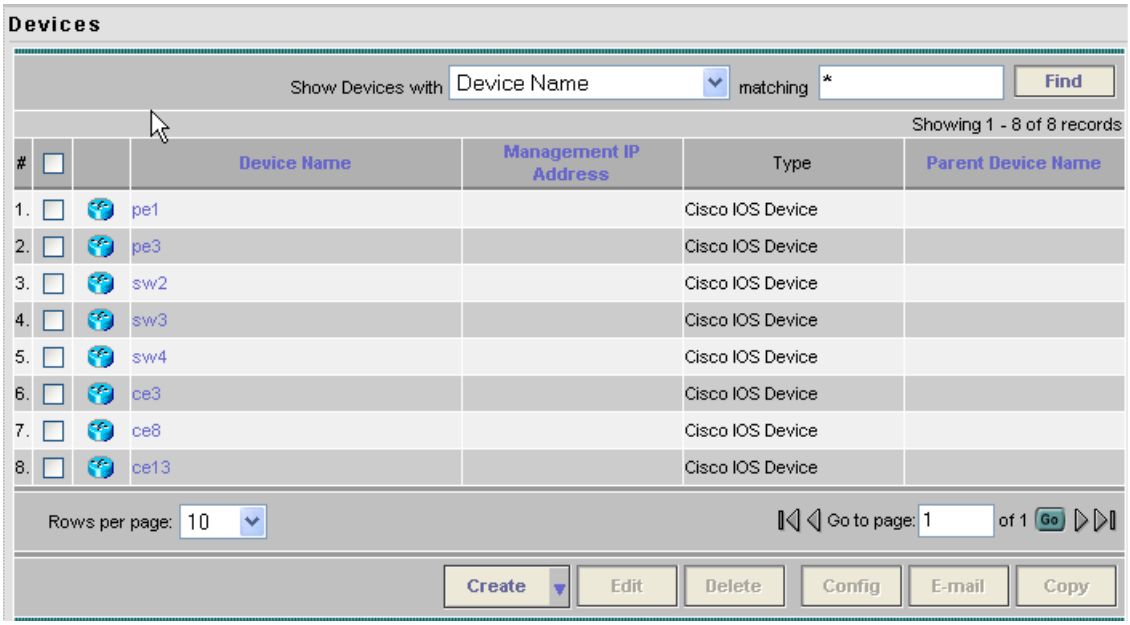
# E-mailing a Device's Owner

From the E-mail window, you can send a device report via e-mail to the owners of specified devices.

To access the E-mail window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices** to access the Devices window shown in Figure 3-86.

***Figure 3-86 Devices List Window***




**Step 2** Select the devices for which you want to send a device report by checking the check box(es) to the left of the Device Name(s).

**Step 3** Click the **E-mail** button. This button is only enabled if one or more devices are selected.

The Send Mail to Device Owners window appears, as shown in Figure 3-87.

*Figure 3-87 Send Mail to Device Owners Window*


**Step 4** Compose the e-mail that you want to send to the selected device owners.

**Step 5** Click **Send**.

The e-mail is sent and the Devices window reappears.

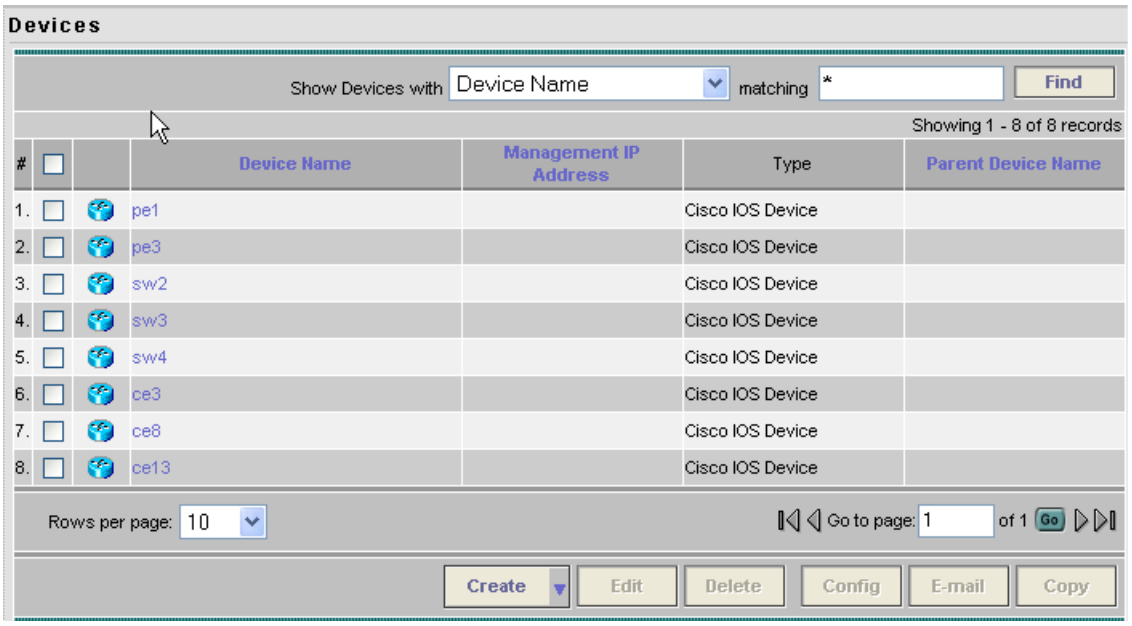
# Copying a Device

From the Copy window, you receive a copy of the chosen device and can name it and change values.

To access the Copy window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Devices** to access the Devices window shown in Figure 3-88.

*Figure 3-88 Devices List Window*




**Step 2** Select a single device to copy by checking the check box to the left of the Device Name.

**Step 3** Click the **Copy** button. This button is only enabled if a device is selected.

A window appropriate to the type of device selected to copy appears. You receive an exact copy of the selected device but the Name, Management IP Address, all Interfaces, and VPNSM blades for a Catalyst Switch running Cisco IOS are blanked out and you must fill in the required information and save this new device. See the "Creating a Device" section on page 3-78 for specifics.

# Device Groups

Every network element that ISC manages must be defined as a device in the system. After you have defined your network elements as devices, you can organize the devices into groups for collection and management purposes.

This section describes how to create, edit, and delete device groups and e-mail device group owners. This section includes the following:

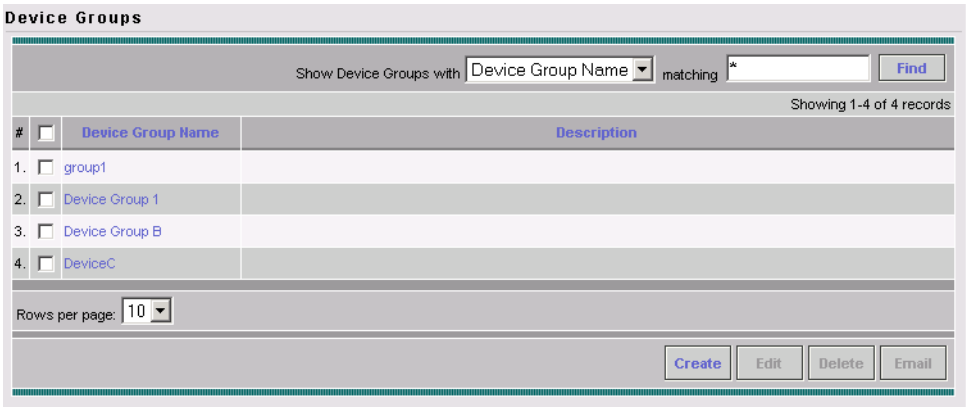
# Accessing the Device Groups Window

The Device Groups feature is used to create, edit, and delete device groups and e-mail device group owners.

To access the Device Groups window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Device Groups** to access the Device Groups window shown in Figure 3-89.

***Figure 3-89 Device Groups Window***




The Device Groups window contains the following:

- **Device Group Name**—Lists the name of the device group. You can sort the list by device group name.
- **Description**—Lists the description of the device group.

From the Device Groups window, you can create, edit, or delete device groups or e-mail device group owners using the following buttons:

- **Create**—Click to create new device groups. Enabled only if no device group is selected.
- **Edit**—Click to edit a selected device group (select device group by checking the corresponding box). Enabled only if a single device group is selected.
- **Delete**—Click to delete selected device group(s) (select device group by checking the corresponding box). Enabled only if one or more device groups are selected.
- **E-mail**—Click to send e-mail to the owner of a selected device group (select device group by checking the corresponding box). Enabled only if one or more device groups are selected.

# Creating a Device Group

From the Create Device Group window, you can create different device groups.

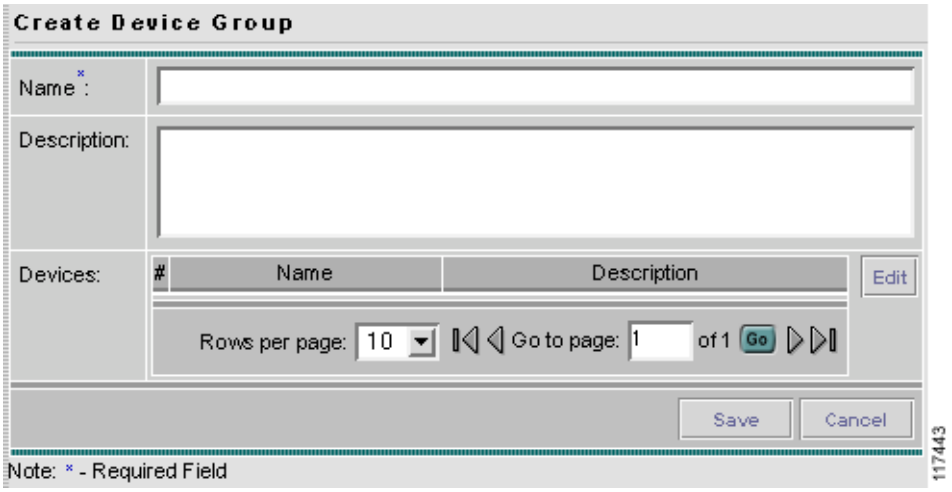
To create a device group, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Device Groups**.

**Step 2** Click the **Create** button.

The Create Device Group window appears, as shown in Figure 3-90.

***Figure 3-90 Create Device Group Window***




The Create Device Group window contains the following fields:

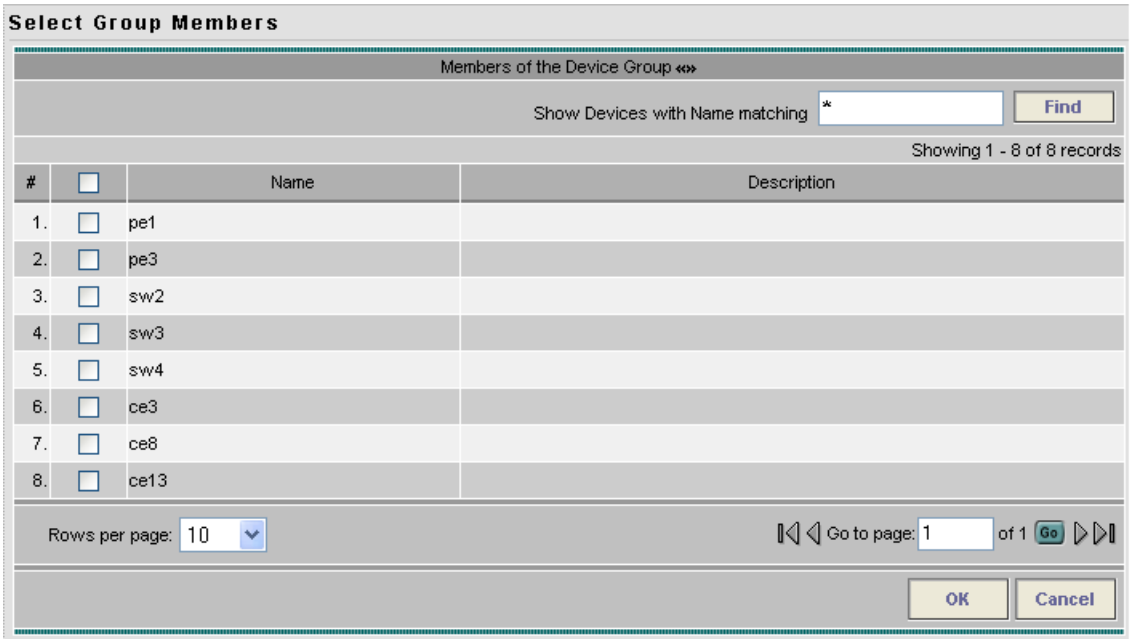
- **Name** (required)—Must begin with a letter, digit, or underscore followed by letters, digits, underscores, spaces, hyphens, or dots ending with a letter, digit, or underscore. Limited to 80 characters.
- **Description** (optional)—Any pertinent information about the device group that could be helpful to service provider operators. Limited to 512 characters.

**Step 3** Enter the name and the description of the Device Group that you are creating.

**Step 4** Click **Edit**.

The Select Group Members window appears, as shown in Figure 3-91.

*Figure 3-91 Select Group Members Window*

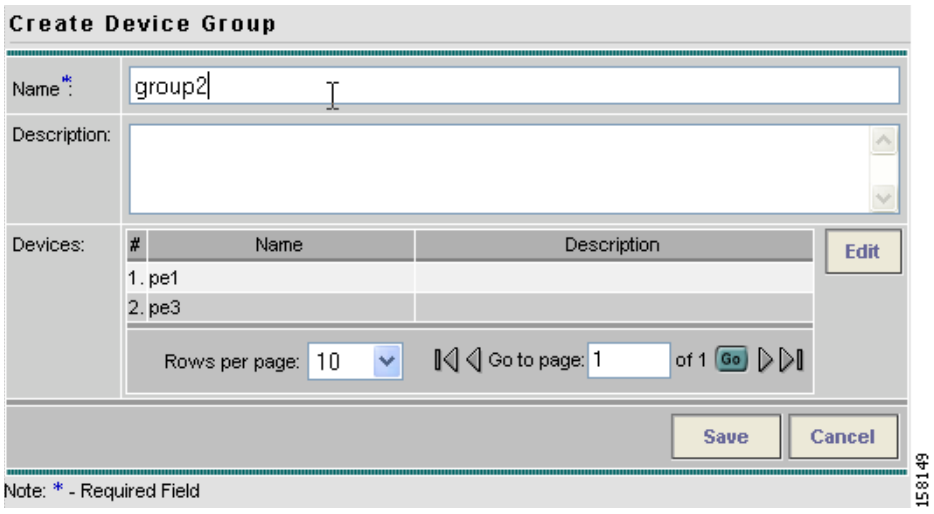



**Step 5** Select the devices that you want to be group members by checking the check box to the left of the device name.

**Step 6** Click **OK**.

The Create Device Group window appears listing the selected devices, as shown in Figure 3-92.

*Figure 3-92 Create Device Group Window*




**Step 7** Click **Save**.

The Device Groups window reappears with the new device group listed.

# Editing a Device Group

From the Edit Device Group window, you can modify the fields that have been specified for a particular device group.

To access the Edit Device Group window, follow these steps:

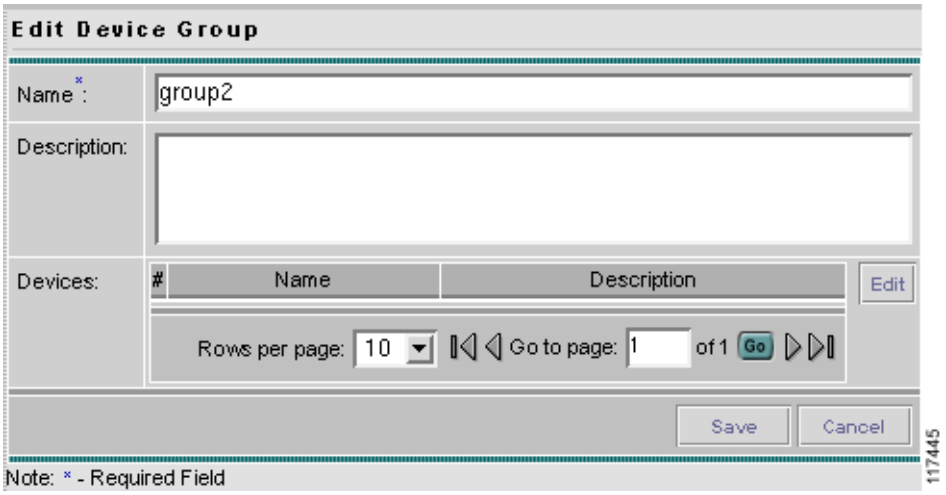
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Device Groups**.

**Step 2** Select a single device group to modify by checking the check box to the left of the Device Group Name.

**Step 3** Click the **Edit** button. This button is only enabled if a device group is selected.

The Edit Device Group window appears, as shown in Figure 3-93.

***Figure 3-93 Edit Device Group Window***




**Step 4** Enter the changes you want to make to the selected device group.

**Step 5** Click **Save**.

The changes are saved and the Device Groups window reappears.

# Deleting Device Groups

From the Delete window, you can remove selected device groups from the database.

To access the Delete window, follow these steps:

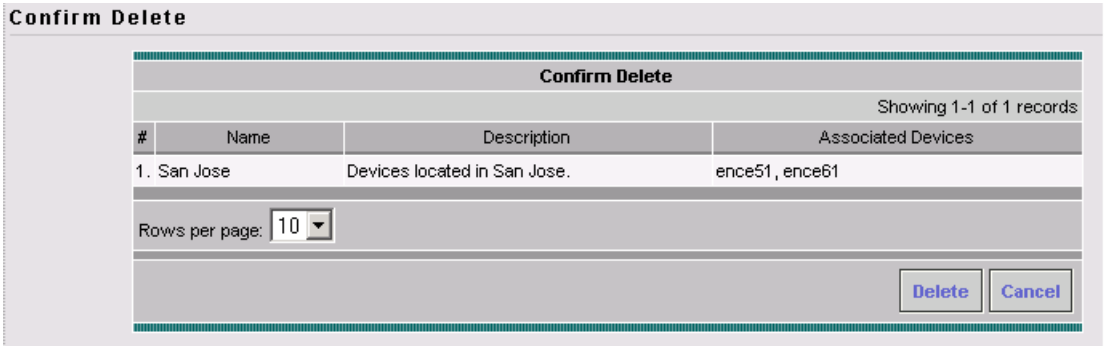
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Device Groups.**

**Step 2** Select one or more device groups to delete by checking the check box(es) to the left of the Device Group Names.

**Step 3** Click the **Delete** button. This button is only enabled if one or more device groups are selected.

The Confirm Delete window appears, as shown in Figure 3-94.

*Figure 3-94 Confirm Delete Window*




**Step 4** Click the **Delete** button to confirm that you want to delete the device group(s) listed.

The Device Groups window reappears with the specified device group(s) deleted.

# E-mailing a Device Group

From the E-mail window, you can send a device report via e-mail to the owners of specified device groups.

To access the E-mail window, follow these steps:

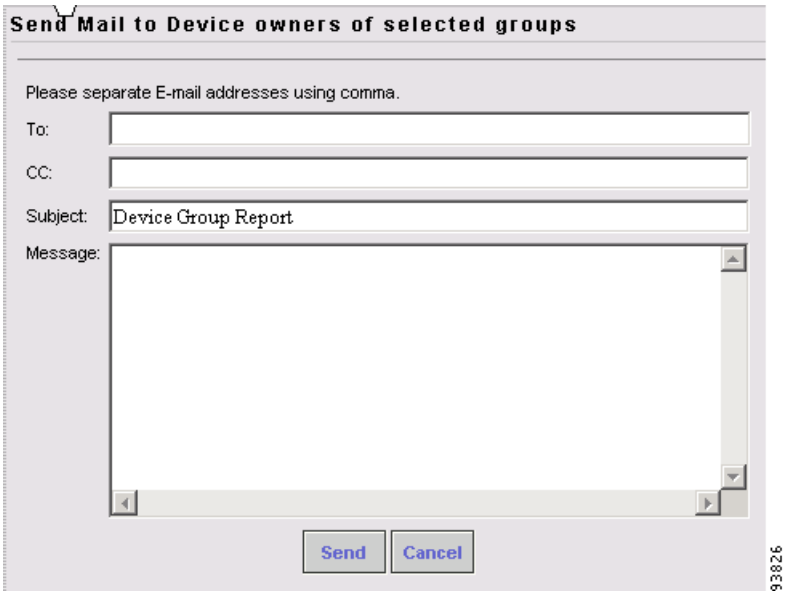
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Device Groups**.

**Step 2** Select the device groups for which you want to send a device report by checking the check box to the left of the Device Group Name.

**Step 3** Click the **E-mail** button. This button is only enabled if one or more device groups are selected.

The Send Mail to Device owners of selected groups window appears, as shown in Figure 3-95.

*Figure 3-95 Send Mail to Device Owners of Selected Groups Window*




**Step 4** Compose the e-mail that you want to send to the selected device group owners.

**Step 5** Click **Send**.

The e-mail is sent and the Device Groups window reappears.

# Customers

A customer site is a set of IP systems with mutual IP connectivity between them without the use of a VPN. Each customer site belongs to exactly one customer. A customer site can contain one or more (for load balancing) edge device routers. This section describes how to create, edit, and delete customers. This section includes the following:

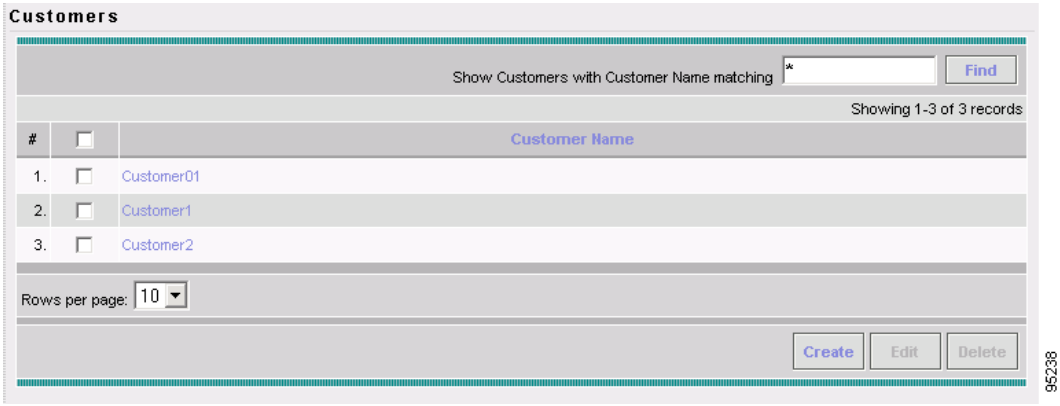
# Accessing the Customers Window

The Customers feature is used to create, edit, and delete customers.

To access the Customers window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Customers** to access the Customers window shown in Figure 3-96.

***Figure 3-96 Customers Window***




The Customers window contains the following:

- **Customer Name**—Lists the names of customers. You can sort the list by customer name.

From the Customers window, you can create, edit, or delete customers using the following buttons:

- **Create**—Click to create new customers.
- **Edit**—Click to edit selected customer (select by checking the corresponding box). Enabled only if a single customer is selected.
- **Delete**—Click to delete selected customer (select customer by checking the corresponding box). Enabled only if one or more customers are selected.

# Creating a Customer

From the Create Customer window, you can create different customers.

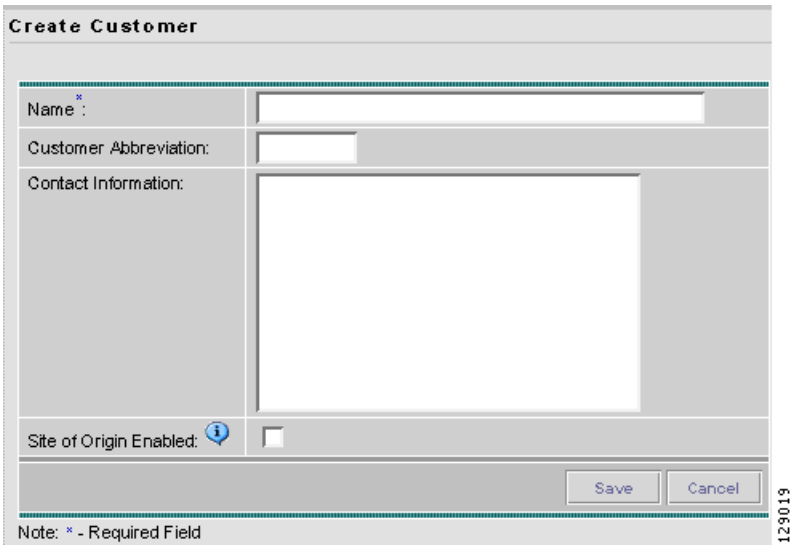
To create a customer, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Customers**.

**Step 2** Click the **Create** button.

The Create Customer window appears, as shown in Figure 3-97.

*Figure 3-97 Create Customer Window*




The Create Customer window contains the following fields:

- **Name** (required)—Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters.
- **Customer Abbreviation**—This field in used only for L2VPN and L2TPv3 Frame Relay service requests. The entry in this field is used to construct a connect name. When this field is left blank, DLCI switching is the transport mode used. Limited to 9 characters.
- **Customer Information** (optional)—Any pertinent information about the customer that could be helpful to service provider operators. Limited to 256 characters.
- **Site of Origin Enabled** (optional)—This check box appears only when you have MPLS permissions. Check this check box to enable the site of origin.

**Step 3** Enter the name and information for the Customer that you are creating. Check the **Site of Origin Enabled** check box if you want this enabled.

**Step 4** Click **Cancel** if you do not want to save this information, and you will proceed to the previous window.

Otherwise, click **Save**. The changes are then saved and the Customers window reappears.

# Editing a Customer

From the Edit Customer window, you can modify the fields that have been specified for a particular customer.

To access the Edit Customer window, follow these steps:

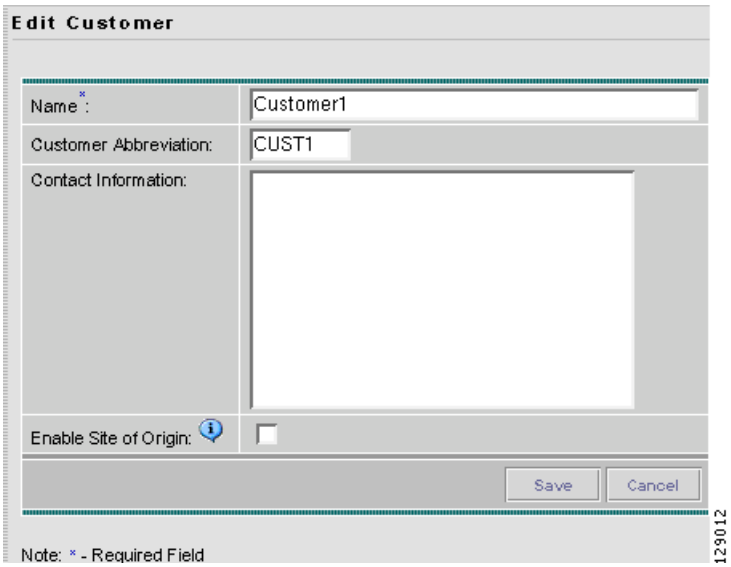
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Customers**.

**Step 2** Select a single customer to modify by checking the check box to the left of the Customer Name.

**Step 3** Click the **Edit** button. This button is only enabled if a customer is selected.

The Edit Customer window appears, as shown in Figure 3-98.

*Figure 3-98 Edit Customer Window*




**Step 4** Enter the changes you want to make to the selected customer.

**Step 5** Click **Cancel** if you do not want to save this information, and you will proceed to the previous window. Otherwise, click **Save**. The changes are then saved and the Customers window reappears.

# Deleting Customers

From the Delete window, you can remove selected customers from the database.

To access the Delete window, follow these steps:

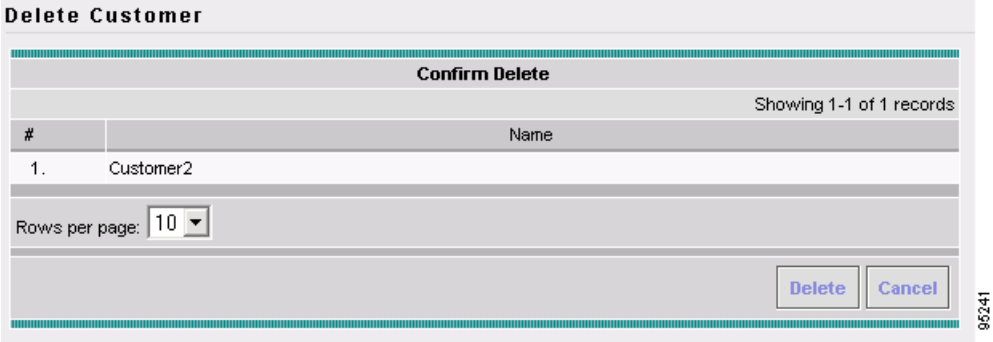
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Customers.**

**Step 2** Select one or more customers to delete by checking the check box to the left of the Customer Name.

**Step 3** Click the **Delete** button. This button is only enabled if one or more customers are selected.

The Confirm Delete window appears, as shown in Figure 3-99.

*Figure 3-99 Confirm Delete Window*




**Step 4** Click **Cancel** if you do not want to save this information, and you will proceed to the previous window.

Otherwise, click **Delete** to confirm that you want to delete the customer(s) listed. The Customers window reappears with the specified customer(s) deleted.

# Creating Customer Sites

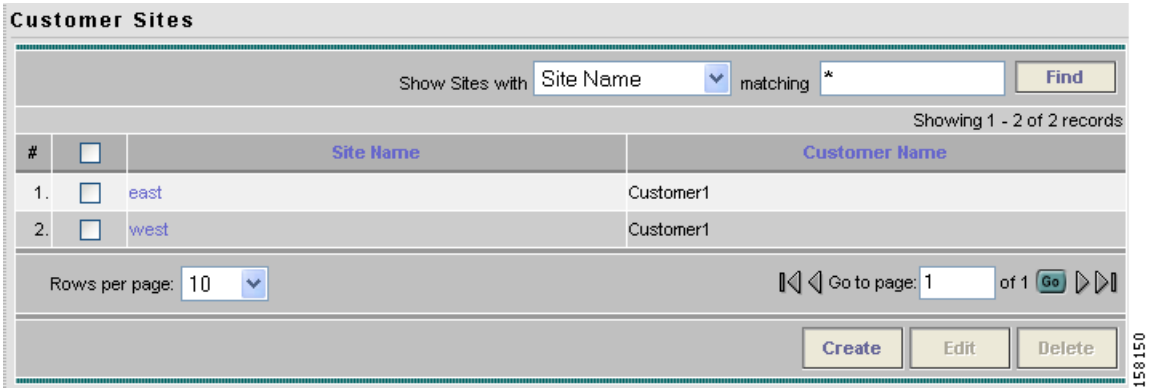
To access the Customer Sites window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager.**

**Step 2** Click on **Customer Sites** listed in the Inventory and Connection Manager tree in the left column under Customers.

The Customer Sites window appears.

*Figure 3-100 Customer Sites Window*




The Customer Sites window contains the following:

- **Site Name**—Lists the names of sites. The first character must be a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limit: 80 characters. You can sort the list by site name.

- **Customer Name**—Lists the names of customer. The first character must be a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limit: 80 characters. You can sort the list by customer name.

From the Customer Sites window, you can create, edit, or delete customer sites using the following buttons:

- **Create**—Click to create new customer sites. Enabled only if no customer site is selected.
- **Edit**—Click to edit selected customer sites (select by checking the corresponding box). Enabled only if a single customer site is selected.
- **Delete** —lick to delete selected customer site(s) (select by checking the corresponding box(es)). Enabled only if one or more customer sites are selected.

# CPE Devices

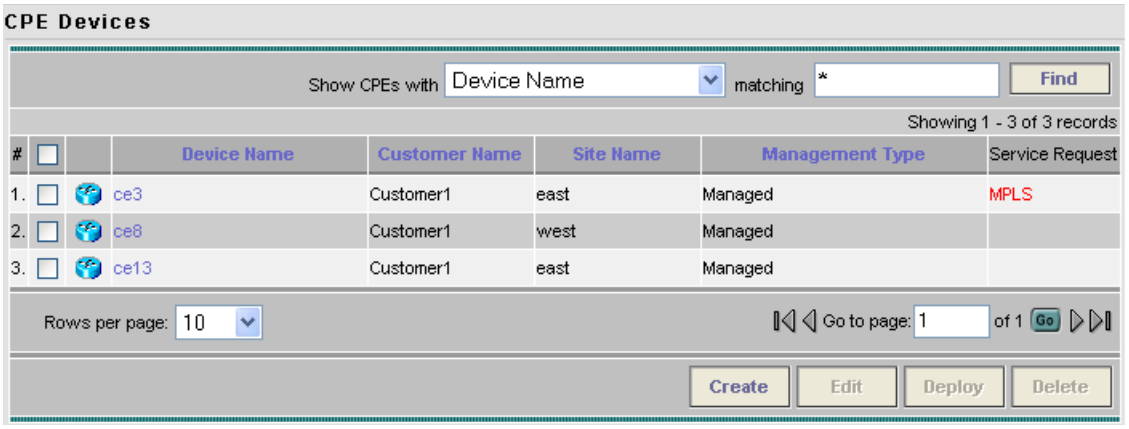
The CPE feature provides a list of CPEs that have been associated with a site through the CPE editor or Inventory Manager. To access the CPE Devices window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager.**

**Step 2** Click on **CPE Devices** listed in the Inventory and Connection Manager tree in the left column under Customers.

The CPE Devices window appears.

***Figure 3-101 CPE Devices Window***




The CPE Devices window contains the following:

- **Device Name**—Lists the names of devices. The first character must be a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limit: 80 characters. You can sort the list by device name.
- **Customer Name**—Lists the names of customer. The first character must be a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limit: 80 characters. You can sort the list by customer name.

- **Site Name**—Lists the names of sites. The first character must be a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limit: 80 characters. You can sort the list by site name.
- **Management Type—**When associating a CE with a customer site, you can select Managed or Unmanaged. Other choices are available (see below), but they should not be confused with this primary choice.
  - Managed—A managed CE can be provisioned directly by the provider using ISC. The CE must be reachable from an ISC server.
  - Unmanaged —An unmanaged CE cannot be provisioned directly by the provider. If Unmanaged is selected, the provider can use ISC to generate a configuration, and then send the configuration to the customer for placement on the CE.
  - Managed - Management LAN —A managed Management LAN or Management CE (MCE) is configured like a managed CE router, but it resides in the provider space. Normally, an MCE acts as the network operations center (NOC) gateway router.
  - Unmanaged - Management LAN —An unmanaged Management LAN or MCE is configured like an unmanaged CE router, but it resides in the provider space. Normally, an MCE acts as the network operations center (NOC) gateway router.
  - Directly Connected —In most cases, the CE is connected to a PE router. In this case, the CE is connected to a workstation or other device.
  - Directly Connected Management Host —In most cases, the CE is connected to a PE router. In this case, the CE is connected to a workstation or other device, on which ISC resides.
  - Multi-VRF —A multi-VRF CE (MVRFCE) is owned by the customer, but resides in the provider space. It is used to off-load traffic from the PE.
  - Unmanaged Multi-VRF—An unmanaged multi-VRF CE is provisioned like an unmanaged CE (configurations are not uploaded or downloaded to the device by the provider). It is owned by the customer and resides in the provider space.

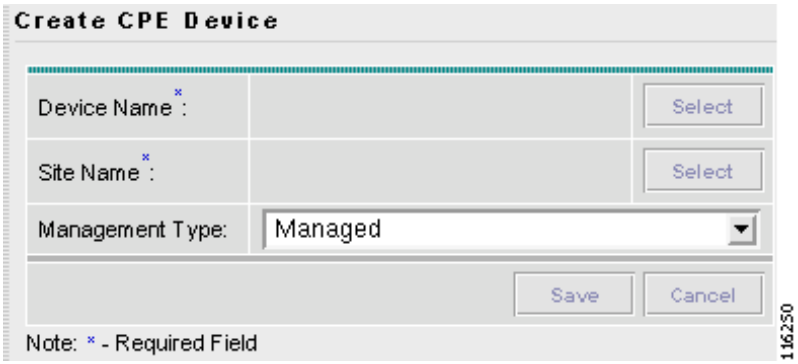
## Create CPE Device

This section explains how to create a CPE device.

**Step 1** Click **Create** to create new CPE devices. Enabled only if no customer site is selected.

The resulting window is shown in Figure 3-102, "Create CPE Device Window."

*Figure 3-102 Create CPE Device Window*




**Step 2** Click **Select** for the required **Device Name** and **Site Name**.

For each, you receive a list of the devices and sites, respectively, from which you can choose one in each window and then click **Select**. Click **Cancel** if you do not want to save this information, and you will proceed to the previous window.

**Step 3** The drop-down window for **Management Type** allows you choose the management type of the CPE device you are creating.

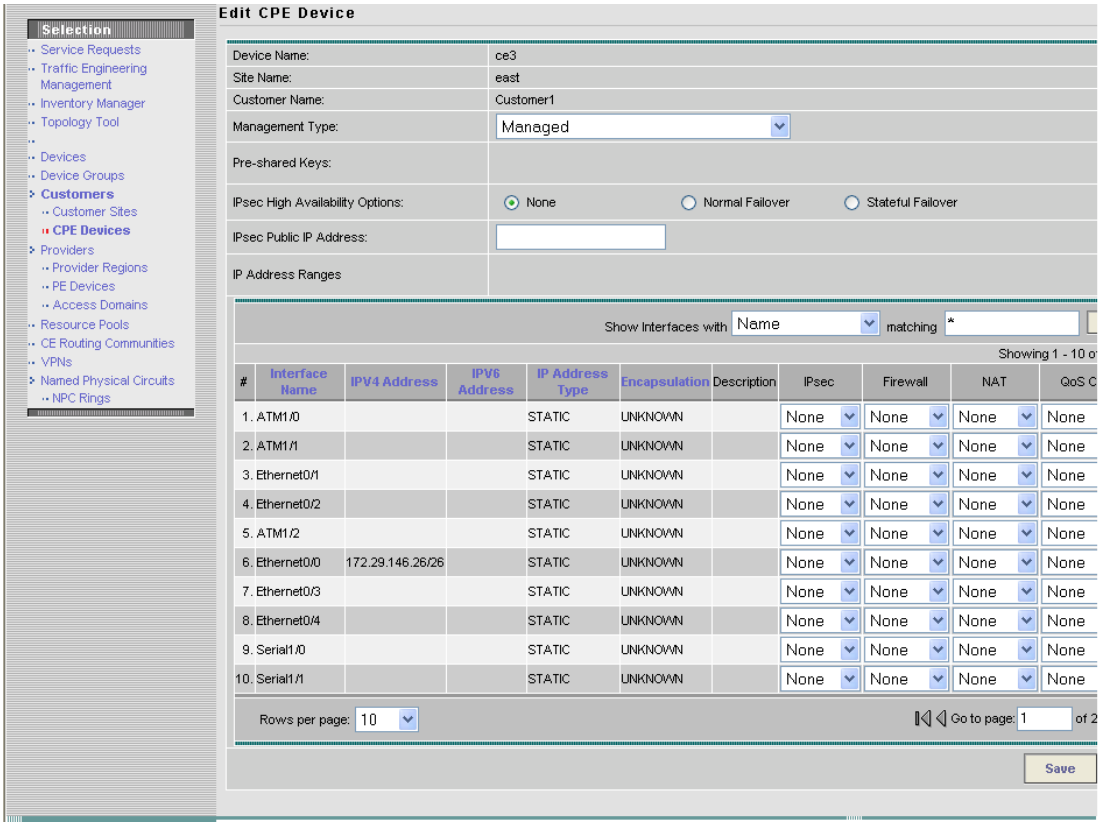
**Step 4** Click **Cancel** if you do not want to save this information, and you will proceed to the previous window.

Otherwise, click **Save**. The changes are saved and the CPE Device window reappears.

## Edit CPE Device

Click **Edit** to edit a single CPE device selected in Figure 3-101. The result is a window as shown in the example in Figure 3-103, "Edit CPE Device Window," for which you can make changes and **Save**.

*Figure 3-103 Edit CPE Device Window*




## Delete CPE Device

Click **Delete** to delete selected CPE device(s) (select by checking the corresponding box). Enabled only if one or more CPE devices are selected. A Confirm Delete window allows you to continue with the deletion or cancel this deletion.

# Providers

This section describes how to create and manage providers. This section includes the following:

- Accessing the Providers Window, page 3-119
- Creating a Provider, page 3-119
- Editing a Provider, page 3-120
- Deleting Providers, page 3-121
- Creating Provider Regions, page 3-122
- Creating PE Devices, page 3-123
- Creating Access Domains, page 3-124

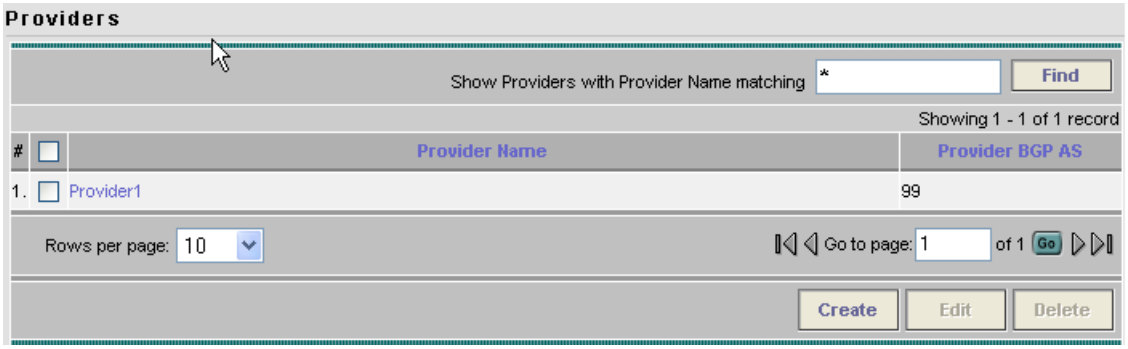
# Accessing the Providers Window

The Providers feature is used to create and manage providers.

To access the Providers window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Providers** to access the Providers window shown in Figure 3-104.

***Figure 3-104 Providers Window***




The Providers window contains the following:

- **Provider Name**—Lists the names of providers. You can sort the list by provider name.
- **Provider BGP AS**—The Unique number assigned to each BGP autonomous system. Range: 1 to 65535.

From the Providers window, you can create, edit, or delete providers using the following buttons:

- **Create**—Click to create new providers. Enabled only if no customer is selected.
- **Edit**—Click to edit a selected provider (check the corresponding box). Enabled only if a single provider is selected.
- **Delete**—Click to delete selected provider(s) (check the corresponding box(es)). Enabled only if one or more providers are selected.

# Creating a Provider

From the Create Provider window, you can create different providers.

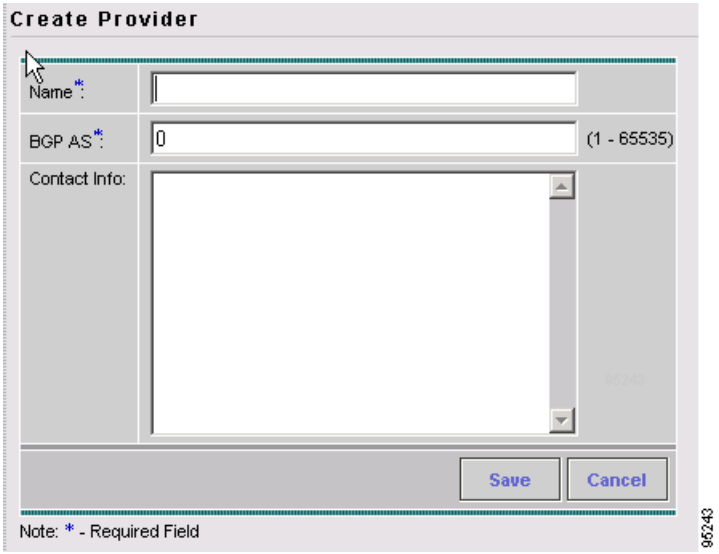
To create a provider, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Providers**.

**Step 2** Click the **Create** button.

The Create Provider window appears, as shown in Figure 3-105.

*Figure 3-105 Create Provider Window*




The Create Provider window contains the following fields:

- **Name** (required)—Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters.
- **BGP AS** (required)—Each BGP autonomous system is assigned a unique 16-bit number by the same central authority that assigns IP network numbers. Range: 1 to 65535.
- **Contact Information** (optional)—Any pertinent information about the provider that could be helpful to service provider operators. Limited to 256 characters.

**Step 3** Enter the name, BGP AS, and any contact information for the Provider that you are creating.

**Step 4** Click **Save**.

The Providers window reappears with the new provider listed.

# Editing a Provider

From the Edit Provider window, you can modify the fields that have been specified for a particular provider.

To access the Edit Provider window, follow these steps:

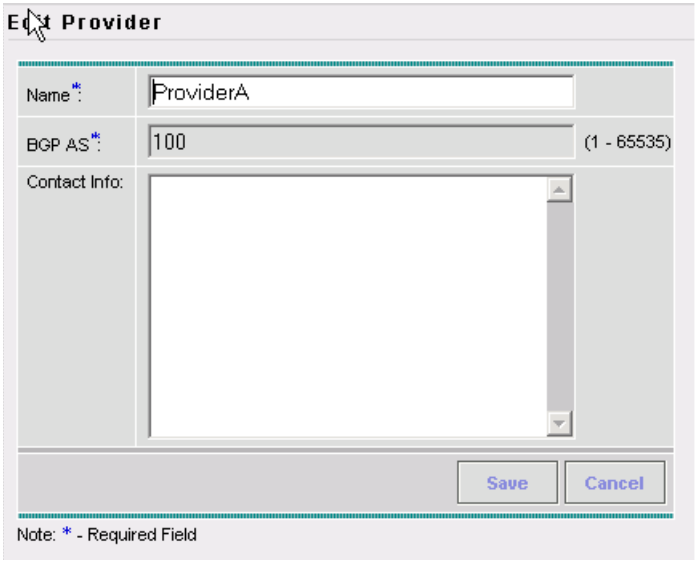
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Providers**.

**Step 2** Select a single provider to modify by checking the check box to the left of the Provider Name.

**Step 3** Click the **Edit** button. This button is only enabled if a customer is selected.

The Edit Provider window appears, as shown in Figure 3-106.

*Figure 3-106 Edit Provider Window*




**Step 4** Enter the changes you want to make to the selected provider.

**Step 5** Click **Save**.

The changes are saved and the Providers window reappears.

# Deleting Providers

From the Delete window, you can remove selected providers from the database.

To access the Delete window, follow these steps:

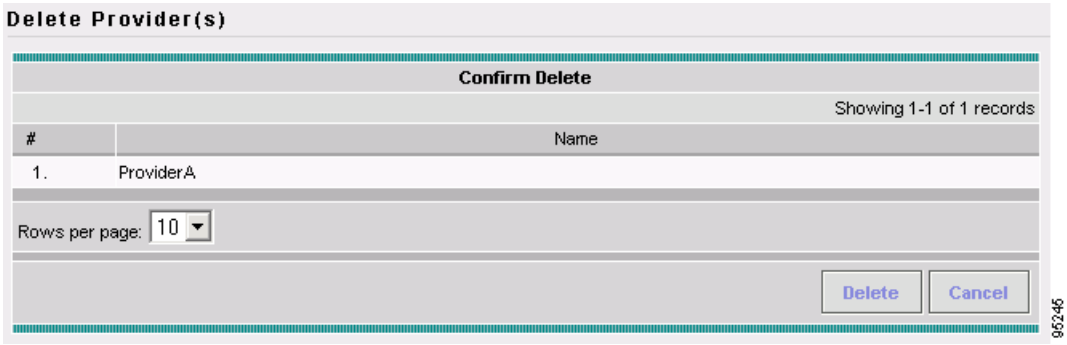
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Providers.**

**Step 2** Select provider(s) to delete by checking the check box to the left of the Provider Name.

**Step 3** Click the **Delete** button. This button is only enabled if one or more Providers are selected.

The Confirm Delete window appears, as shown in Figure 3-107.

*Figure 3-107 Confirm Delete Window*




**Step 4** Click the **Delete** button to confirm that you want to delete the provider(s) listed.

The Providers window reappears with the specified provider(s) deleted.

# Creating Provider Regions

A Provider Region is considered to be a group of provider edge routers (PEs) within a single BGP autonomous system. The primary objective for defining Provider Regions is to allow a provider to employ unique IP address pools in large Regions, such as Europe, Asia Pacific, and so forth.

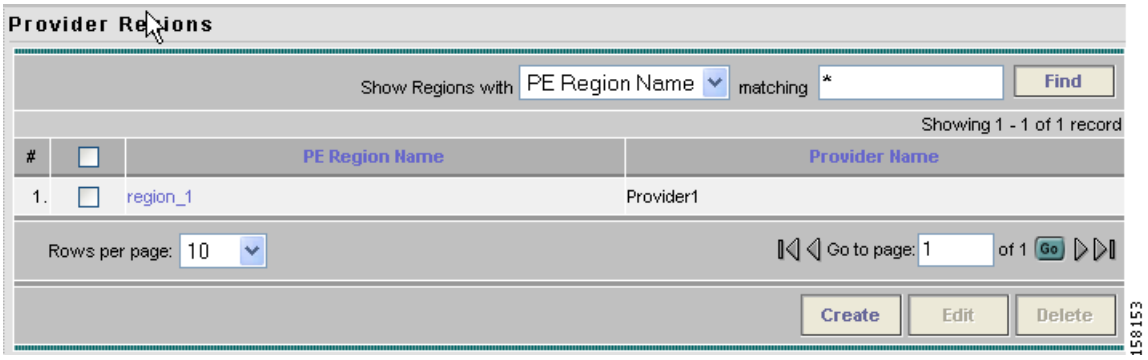
To access the Provider Regions window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager.**

**Step 2** Click on **Provider Regions** listed in the Inventory and Connection Manager tree in the left column under Providers.

The Provider Regions window appears.

*Figure 3-108 Provider Regions Window*




The Provider Regions window contains the following:

- **PE Region Name**—Lists the names of regions. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by region name.

- **Provider Name**—Lists the names of providers. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by provider name.

From the Provider Regions window, you can create, edit, or delete provider regions using the following buttons:

- **Create**—Click to create new provider regions. Enabled only if no customer is selected.
- **Edit**—Click to edit selected provider regions (check the corresponding box). Enabled only if a single provider region is selected.
- **Delete**—Click to delete selected provider regions (check the corresponding box(es)). Enabled only if one or more provider regions are selected.

# Creating PE Devices

The PE Devices feature provides a list of provider edge routers (PEs) that have been associated with the region, either through the PE editor or Inventory Manager.

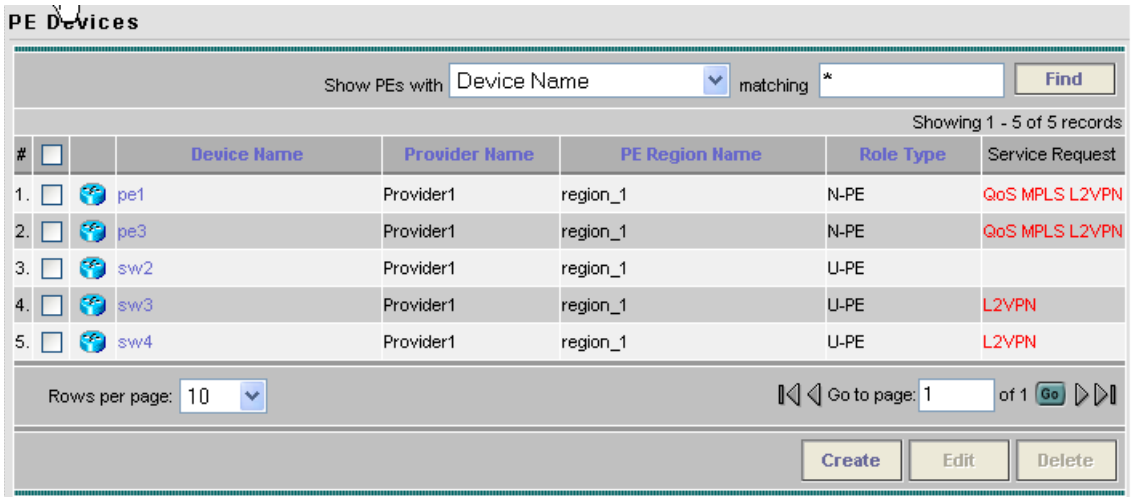
To access the PE Devices window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager.**

**Step 2** Click on **PE Devices** listed in the Inventory and Connection Manager tree in the left column under Providers.

The PE Devices window appears.

***Figure 3-109 PE Devices Window***




The PE Devices window contains the following:

- **Device Name**—Lists the names of devices. The first character must be a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limit: 80 characters. You can sort the list by device name.

- **Provider Name**—Lists the names of providers. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by provider name.
- **Region Name**—Lists the names of regions. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by region name.
- **Role Type**—Choices include: N-PE, U-PE, P, PE_AGG.

From the PE Devices window, you can create, edit, or delete providers using the following buttons:

- **Create**—Click to create new PE device. Enabled only if no PE device is selected.
- **Edit**—Click to edit selected PE device (check the corresponding box). Enabled only if a single PE device is selected.

**Note** Next to the PE Role Type, for both the Create and Edit selections, is a 6VPE check box. During the configuration collect operation, the device is detected as 6VPE if it is feature compatible.

- **Delete**—Click to delete selected PE device(s) (check the corresponding box(es)). Enabled only if one or more PE devices are selected.

# Creating Access Domains

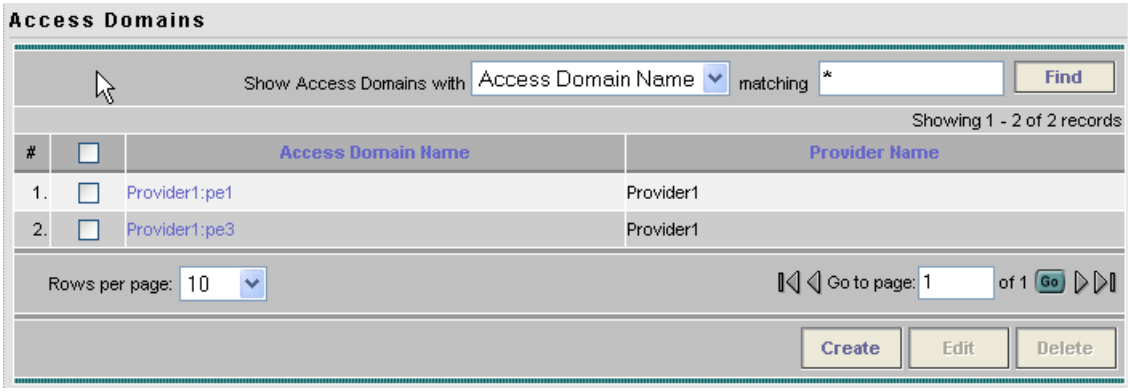
To access the Access Domains window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager.**

**Step 2** Click on **Access Domains** listed in the Inventory and Connection Manager tree in the left column under Providers.

The Access Domains window appears.

***Figure 3-110 Access Domains Window***



The Access Domains window contains the following:

- **Access Domain Name**—Lists the names of access domain. The first character must be a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limit: 80 characters. You can sort the list by access domain name.
- **Provider Name**—Lists the names of providers. Must begin with a letter. Can contain letters, numbers, and these punctuation characters: period, underscore, and dash. Limited to 80 characters. You can sort the list by provider name.

From the Access Domains window, you can create, edit, or delete access domains using the following buttons:

- **Create**—Click to create new access domain. Enabled only if no access domain is selected.
- **Edit**—Click to edit a selected access domain (check the corresponding box). Enabled only if a single access domain is selected.
- **Delete**—Click to delete selected access domain(s) (check the corresponding box(es)). Enabled only if one or more access domains are selected.

# Resource Pools

Cisco IP Solution Center enables multiple pools to be defined and used during operations. The following resource pools are available:

- IP address pool: The IP address pool can be defined and assigned to regions or VPNs. This feature gives the service operator the flexibility to manage the allocation of all IP addresses in the network.
- Multicast pool: The Multicast pool is used for Multicast MPLS VPNs.
- Route Target (RT) pool: A route target is the MPLS mechanism that informs PEs as to which routes should be inserted into the appropriate VRFs. Every VPN route is tagged with one or more route targets when it is exported from a VRF and offered to other VRFs. The route target can be considered a VPN identifier in MPLS VPN architecture. RTs are a 64-bit number.
- Route Distinguisher (RD) pool: The IP subnets advertised by the CE routers to the PE routers are augmented with a 64-bit prefix called a route distinguisher (RD) to make them unique. The resulting 96-bit addresses are then exchanged between the PEs, using a special address family of Multiprotocol BGP (referred to as MP-BGP). The RD pool is a pool of 64-bit RD values that Cisco IP Solution Center uses to make sure the IP addresses in the network are unique.
- Site of origin pool: The pool of values for the site-of-origin (SOO) attribute. The site-of-origin attribute prevents routing loops when a site is multihomed to the MPLS VPN backbone. This is achieved by identifying the site from which the route was learned, based on its SOO value, so that it is not readvertised back to that site from a PE in the MPLS VPN network.
- VC ID pool: VC ID pools are defined with a starting value and a size of the VC ID pool. (VC ID is a 32-bit unique identifier that identifies a circuit/port.) A given VC ID pool is not attached to any Inventory object. During the deployment of an Ethernet Service (EWS, ERS for example), VC ID is auto-allocated from the VC ID pool.
- VLAN ID pool: VLAN ID pools are defined with a starting value and a size of the VLAN pool. A given VLAN ID pool can be attached to an Access Domain. During the deployment an Ethernet Service (EWS, ERS for example), VLAN ID can be auto-allocated from the Access Domain's VLAN pools. This gives the Service Provider a tighter control of VLAN ID allocation.

All these resources, that are made available to the service provider, enable the automation of service deployment.

This section describes how you can create and manage pools for various types of resources. This section includes the following:

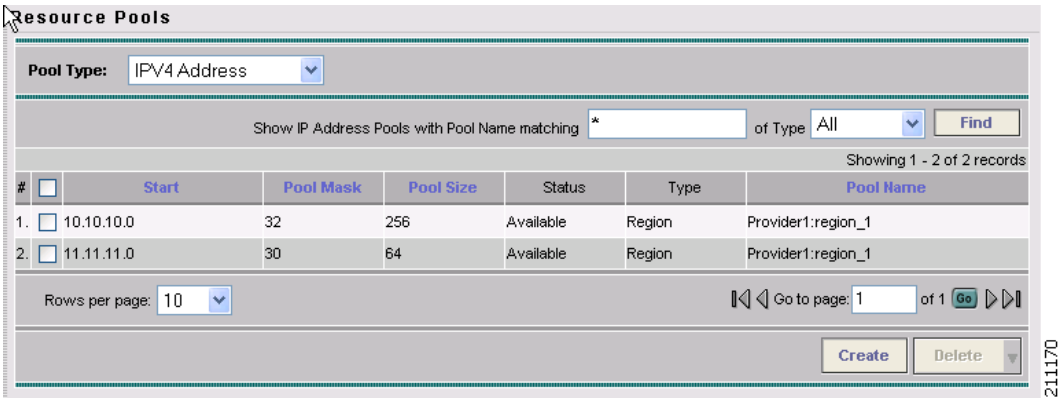


# Accessing the Resource Pools Window

The Resource Pools feature is used to create and manage various types of resource pools.

Choose **Service Inventory > Inventory and Connection Manager > Resource Pools** to access the Resource Pools window shown in Figure 3-111.

***Figure 3-111 Resource Pools Window***




From the Resource Pools window, you have access to the following buttons:

- **Pool Type**—Choices include: IPV4 Address, Multicast, Route Distinguisher, Route Target, Site of Origin, VC ID, and VLAN. The fields displayed in the Resource Pools window vary depending on the pool type selected.
- **Create**—Click to create new resource pools. Enabled only if no resource pool is selected.
- **Delete**—Click to delete selected resource pools (select by checking the corresponding box(es)). Enabled only if one or more resource pools are selected.

# Creating an IP Address Pool

ISC uses IP address pools to automatically assign IP addresses to PEs and CEs. Each Region has an IP address pool to use for IP numbered addresses (/30 pools) and a separate IP address pool for IP unnumbered addresses (/32 loopback address pools).

Within a VPN or extranet, all IP addresses must be unique. Customer IP addresses must not overlap with the provider's IP addresses. Overlapping IP addresses are only possible when two devices cannot see each other—that is, when they are in isolated VPNs.

From the Create IP Address Pool window, you can create IP address pools.

To create an IP address pool, follow these steps:

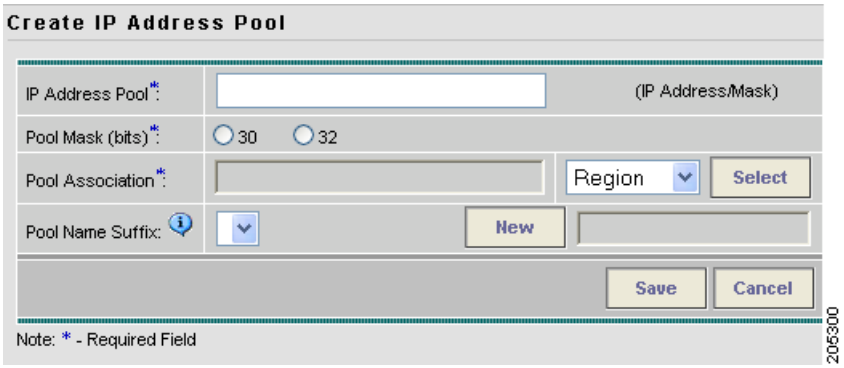
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Resource Pools**.

**Step 2** Select **IPV4 Address** from the **Pool Type** in the upper left of the Resource Pools window.

**Step 3** Click the **Create** button.

The Create IP Address Pool window appears, as shown in Figure 3-112.

***Figure 3-112 Create IP Address Pool Window***




The Create IP Address Pool window contains the following fields:

- **IP Address Pool** (required)—Text field in the format a.b.c.d/mask, for example 172.0.0.0/8.
- **Pool Mask (bits)** (required)—Choices include: **30** and **32**

  where:

  **30** is used for IP numbered address pools (/30)

  **32** is used for IP unnumbered loopback address pools (/32).
- **Pool Association** (required)—Choices include: **Region**, **VPN**, and **Customer** from the drop-down list. Then you can click the **Select** button to receive all selections for the choice you made in the drop-down list. From this new window, make your selection and click **Select**.

**Note** If you choose **VPN**, an additional optional field appears, **Pool Name Suffix**, when you return to Figure 3-112. This field allows the creation of multiple address pools within the same VPN. If you are creating this address pool for DMVPN usage, the recommendation is to use this field to specify a suffix.

- **Pool Name Suffix** (optional)—Suffixes are used to make a pool name unique. You can append this IP Address Pool to an existing pool by selecting a previously defined suffix, or click **New** to create a new pool.

**Step 4** Enter the required information for the IP address pool you are creating.

**Step 5** Click **Save**.

The Resource Pools window reappears with the new IP address pool listed.

# Creating a Multicast Pool

From the Create Multicast Pool window, you can create multicast pools. These pools are global and are not associated with any provider or customer.

To create a multicast pool, follow these steps:

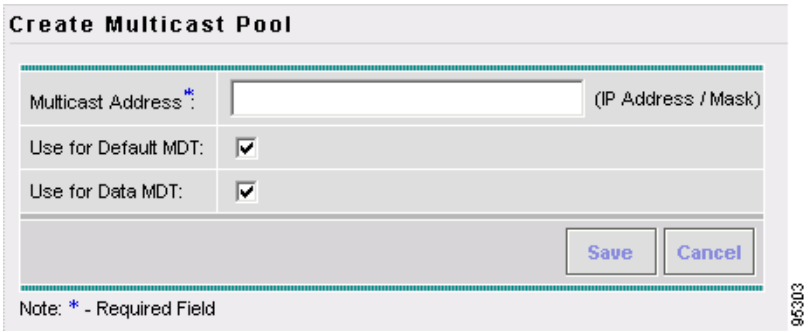
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Resource Pools**.

**Step 2** Select **Multicast** from the **Pool Type** in the upper left of the Resource Pools window.

**Step 3** Click the **Create** button.

The Create Multicast Pool window appears, as shown in Figure 3-113.

***Figure 3-113 Create Multicast Pool Window***




The Create Multicast Pool window contains the following fields:

- **Multicast Address** (required)—Text field in the format **a.b.c.d/mask**, for example 239.0.0.0/8. Range: 224.0.1.0/8 to 239.255.255.255/32.
- **Use for default MDT** (optional)—This is a check box. Default: selected.
- **Use for Data MDT** (optional)—This is a check box. The *data MDT* contains a range of multicast group addresses and a bandwidth threshold. Thus, whenever a CE behind a multicast-VRF exceeds that bandwidth threshold while sending multicast traffic, the PE sets up a new data MDT for the multicast traffic from that source. The PE informs the other PEs about this data MDT and, if they have receivers for the corresponding group, the other PEs join this data MDT. Default: selected.

**Step 4** Enter the required information for the multicast pool you are creating.

**Step 5** Click **Save**.

The Resource Pools window reappears with the new multicast pool listed.

# Creating a Route Distinguisher and Route Target Pool

MPLS-based VPNs employ Border Gateway Protocol (BGP) to communicate between PEs to facilitate customer routes. This is made possible through extensions to BGP that carry addresses other than IPv4 addresses. A notable extension is called the route distinguisher (RD).

The purpose of the route distinguisher (RD) is to make the prefix value unique across the network backbone. Prefixes should use the same RD if they are associated with the same set of route targets (RTs) and anything else that is used to select routing policy. The community of interest association is based on the route target (RT) extended community attributes distributed with the Network Layer Reachability Information (NLRI). The RD value must be a globally unique value to avoid conflict with other prefixes.

The MPLS label is part of a BGP routing update. The routing update also carries the addressing and reachability information. When the RD is unique across the MPLS VPN network, proper connectivity is established even if different customers use non-unique IP addresses.

For the RD, every CE that has the same overall role should use a VRF with the same name, same RD, and same RT values. The RDs and RTs are only for route exchange between the PEs running BGP. That is, for the PEs to do MPLS VPN work, they have to exchange routing information with more fields than usual for IPv4 routes; that extra information includes (but is not limited to) the RDs and RTs.

From the Create Route Distinguisher Pool window, you can create route distinguisher pools.

To create a route distinguisher pool, follow these steps:

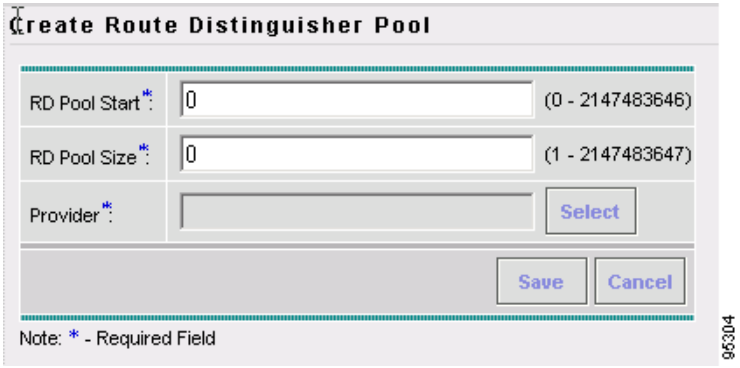
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Resource pools**.

**Step 2** Select **Route Distinguisher** from the **Pool Type** in the upper left of the Resource Pools window.

**Step 3** Click the **Create** button.

The Create Route Distinguisher Pool window appears, as shown in Figure 3-114.

***Figure 3-114 Create Route Distinguisher Pool Window***




The Create Route Distinguisher Pool window contains the following fields:

- **RD Pool Start** (required)—Range: 0 to 2147483646.

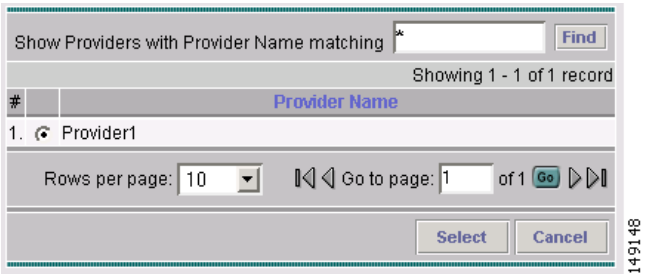
- **RD Pool Size** (required)—Range: 1 to 2147483647.
- **Provider** (required)

**Step 4** Enter the **RD Pool Start** and **Size** information for the route distinguisher pool you are creating.

**Step 5** Click the **Select** button.

The Provider for new Resource Pool window appears, as shown in Figure 3-115.

***Figure 3-115 Provider for New Resource Pool Window***




**Step 6** Select one of the providers listed and click **Select**.

**Step 7** Click **Save**.

The Resource Pools window reappears with the new route distinguisher pool listed.

---

To create a Route Target Pool, follow these steps:

---

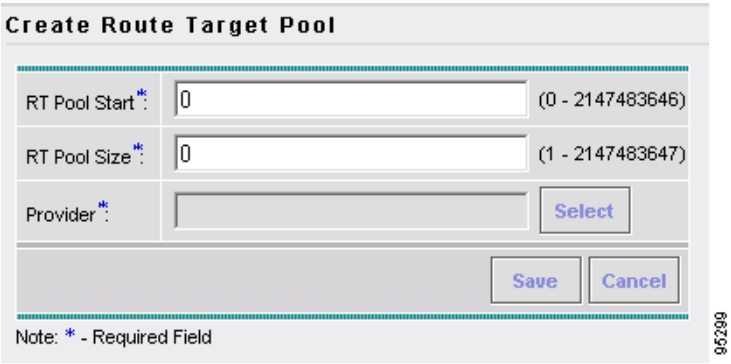
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Resource pools**.

**Step 2** Select **Route Target** from the **Pool Type** in the upper left of the Resource Pools window.

**Step 3** Click the **Create** button.

The Create Route Target Pool window appears, as shown in Figure 3-116.

***Figure 3-116 Create Route Target Pool Window***




The Create Route Target Pool window contains the following fields:

- **RT Pool Start** (required)—Range: 0 to 2147483646.

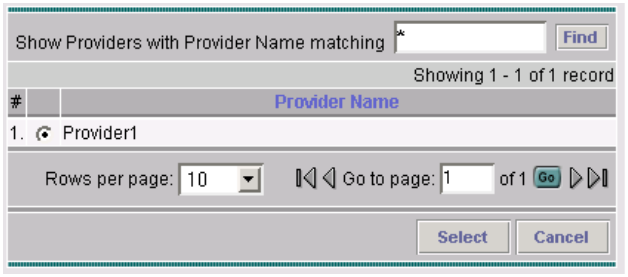
- **RT Pool Size** (required)—Range: 1 to 2147483647.
- **Provider** (required)

**Step 4** Enter the **RT Pool Start** and **Size** information for the route target pool you are creating.

**Step 5** Click the **Select** button.

The Provider for new Resource Pool window appears, as shown in Figure 3-117.

***Figure 3-117 Provider for New Resource Pool Window***




**Step 6** Select one of the providers listed and click **Select**.

**Step 7** Click **Save**.

The Resource Pools window reappears with the new route target pool listed.

# Creating a Site of Origin Pool

In MPLS VPN, CE sites use private/public AS numbers and when one AS number is used for each VPN, all sites belonging to the same VPN share the same private/public AS number. The default BGP behavior is to drop any prefix if its own AS number is already in the AS path. As a result, a customer site does not learn prefixes of a remote site in this situation. AS-OVERRIDE must be configured (if there are hub sites involved, ALLOWAS-IN must be configured) to allow those prefixes to be sent by PE routers but a routing loop can occur.

For example, CE1 and CE2 belong to the same customer VPN and have the same AS number 65001. The AS path between two customer sites is 65001 - 1234 - 65001 and prefixes cannot be exchanged between customer sites because AS 65001 is already in the path. To solve this problem, AS-OVERRIDE options are configured on PE routers; but it introduces a routing loop into the network without using extended community site of origin attributes.

Site of origin is a concept in MPLS VPN architecture that prevents routing loops in sites that are multi-homed to the MPLS VPN backbone and in sites using AS-OVERRIDE in conjunction. Site of origin is a type of BGP extended community attribute used to identify a prefix that originated from a site so that the re-advertisement of that prefix back to the site can be prevented. This attribute uniquely identifies the site from which the PE router learned the route. Site of origin is tagged at PE in peering with BGP neighbors using an inbound route-map and works in conjunction with BGP CE-PE routing protocol.

Site of origin must be unique per customer site per VPN/customer (when these sites are multi-homed). Therefore, the same value of site of origin must be used on PE routers connected to the same CE router or to the same customer site.

**Note** Each time a customer site is created, ISC generates a unique site of origin value from the selected site of origin provider pool if Site of Origin is enabled. This site of origin value must be unique per customer site per customer/VPN.

From the Create Site of Origin Pool window, you can create site of origin pools.

To create a site of origin pool, follow these steps:

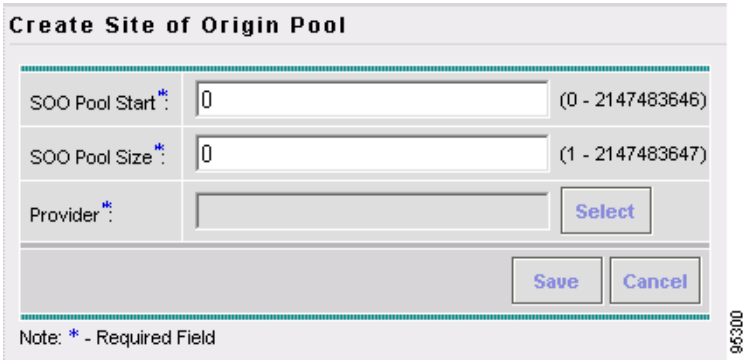
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Resource pools**.

**Step 2** Select **Site of Origin** from the **Pool Type** in the upper left of the Resource Pools window.

**Step 3** Click the **Create** button.

The Create Site of Origin Pool window appears, as shown in Figure 3-118.

***Figure 3-118 Create Site of Origin Pool Window***




The Create Site of Origin Pool window contains the following fields:

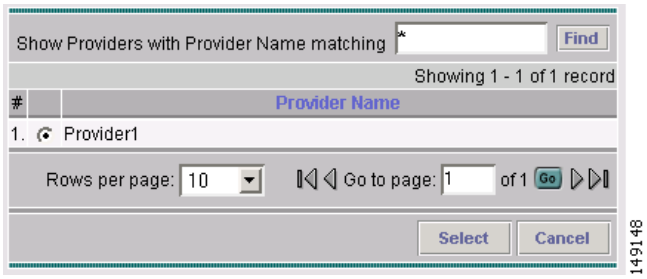
- **SOO Pool Start** (required)—Range: 0 to 2147483646.
- **SOO Pool Size** (required)—Range: 1 to 2147483647.
- **Provider** (required)

**Step 4** Enter the **SOO Pool Start** and **Size** information for the site of origin pool you are creating.

**Step 5** Click the **Select** button.

The Provider for new Resource Pool window appears, as shown in Figure 3-119.

***Figure 3-119 Provider for New Resource Pool Window***



**Step 6** Select one of the providers listed and click **Select**.

**Step 7** Click **Save**.

The Site of Origin pools window reappears with the new route target pool listed.

# Creating a VC ID Pool

From the Create VC ID Pool window, you can create VC ID pools. These pools are global and are not associated with any provider or customer

To create a VC ID pool, follow these steps:

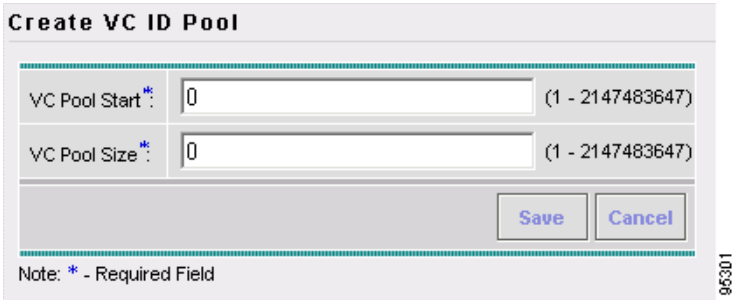
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Resource pools**.

**Step 2** Select **VC ID** from the **Pool Type** in the upper left of the Resource Pools window.

**Step 3** Click the **Create** button.

The Create VC ID Pool window appears, as shown in Figure 3-120.

***Figure 3-120 Create VC ID Pool Window***




The Create VC ID Pool window contains the following fields:

- **VC Pool Start** (required)—Range: 1 to 2147483646.
- **VC Pool Size** (required)—Range: 1 to 2147483647.

**Step 4** Enter the required information for the site of origin pool you are creating.

**Step 5** Click **Save**.

The VC ID Pools window reappears with the new VC ID pool listed.

# Creating a VLAN Pool

From the Create VLAN Pool window, you can create VLAN pools.

To create a VLAN pool, follow these steps:

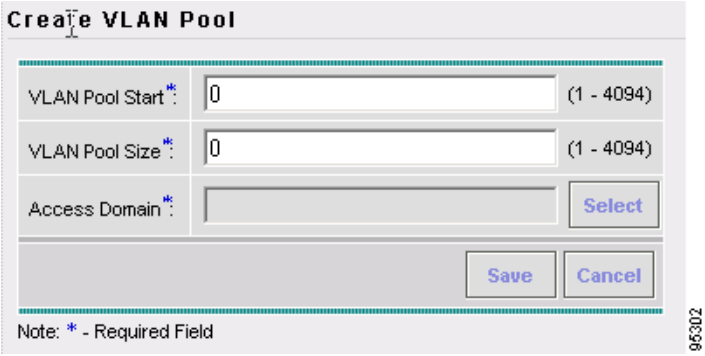
**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Resource pools**.

**Step 2** Select **VLAN** from the **Pool Type** in the upper left of the Resource Pools window.

**Step 3** Click the **Create** button.

The Create VLAN Pool window appears, as shown in Figure 3-121.

***Figure 3-121 Create VLAN Pool Window***




The Create VLAN Pool window contains the following fields:

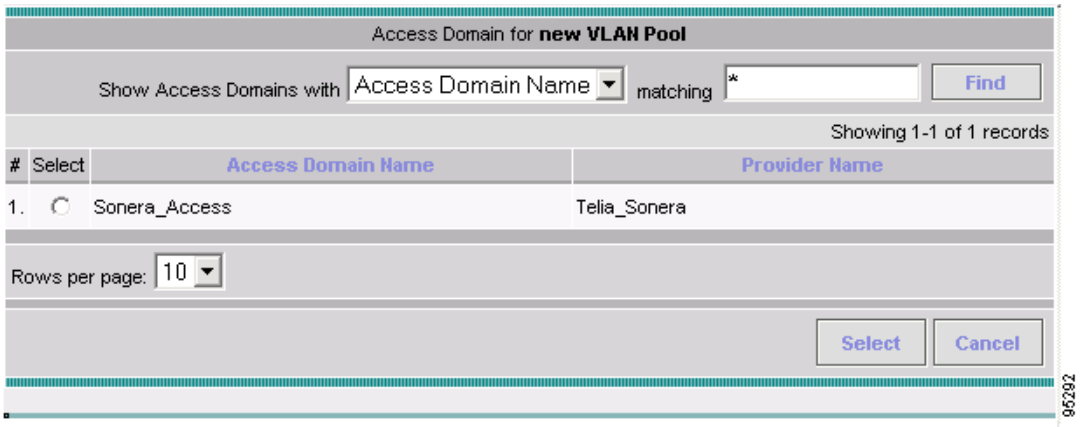
- **VLAN Pool Start** (required)— Range: 1 to 4094.
- **VLAN Pool Size** (required)—Range: 1 to 4094.
- **Access Domain** (required)

**Step 4** Enter the **VLAN Pool Start** and **Size** information for the VLAN pool you are creating.

**Step 5** Click the **Select** button.

The Access Domain for new VLAN Pool window appears, as shown in Figure 3-122.

***Figure 3-122 Access Domain for new VLAN Pool Window***




**Step 6** Select one of the access domains listed and click **Select**.

**Step 7** Click **Save**.

The VLAN Pools window reappears with the new VLAN pool listed.

## Deleting Resource Pools

From the Resource Pool window, you can delete specific resource pools.

To delete resource pools, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Resource pools**.

**Step 2** Select a pool type from the **Pool Type** in the upper left of the Resource Pools window.

**Step 3** Select one or more resource pools to delete by checking the check box(es) to the left of the resource pool(s).

**Step 4** Click the **Delete** button.

A Confirm Delete window appears.

**Step 5** Click the new **Delete** button to confirm that you want to delete the resource pool(s) listed.

The Resource Pools window reappears with the specified pool(s) deleted.

# CE Routing Communities

A VPN can be organized into subsets called *CE routing communities*, or CERCs. A CERC describes how the CEs in a VPN communicate with each other. Thus, CERCs describe the logical topology of the VPN. Cisco IP Solution Center can be employed to form a variety of VPN topologies between CEs by building hub and spoke or full mesh CE routing communities. CERCs are building blocks that allow you to form complex VPN topologies and CE connectivity.

The most common types of VPNs are *hub-and-spoke* and *full mesh*.

- A hub-and-spoke CERC is one in which one or a few CEs act as hubs, and all spoke CEs talk only to or through the hubs, never directly to each other.
- A full mesh CERC is one in which every CE connects to every other CE.

These two basic types of VPNs—full mesh and hub and spoke—can be represented with a single CERC. Whenever you create a VPN, the Cisco IP Solution Center software creates one default CERC for you. This means that until you need advanced customer layout methods, you will not need to define new CERCs. Up to that point, you can think of a CERC as standing for the VPN itself—they are one and the same. If, for any reason, you must override the software's choice of route target values, you can do so only at the time you create a CERC in the Cisco IP Solution Center software.

To build very complex topologies, it is necessary to break down the required connectivity between CEs into groups, where each group is either fully meshed, or has a hub and spoke pattern. (Note that a CE can be in more than one group at a time, if each group has one of the two basic patterns.) Each subgroup in the VPN wants its own CERC. Any CE that is only in one group just joins the corresponding CERC (as a spoke if necessary). If a CE is in more than one group, then you can use the Advanced Setup choice during provisioning to add the CE to all the relevant groups in one service request. Given this information, the provisioning software does the rest, assigning route target values and VRF tables to arrange exactly the connectivity the customer requires. You can use the Topology tool to double-check the CERC memberships and resultant VPN connectedness.

Cisco IP Solution Center supports multiple CEs per site and multiple sites connected to the same PE. Each CERC has unique route targets (RT), route distinguisher (RD), and VPN Routing and Forwarding instance (VRF) naming. After provisioning a CERC, it is a good idea to run the audit reports to verify the CERC deployment and view the topologies created by the service requests. The product supports linking two or more CE routing communities in the same VPN.

This section describes how you can create and manage CE routing communities. This section includes the following:



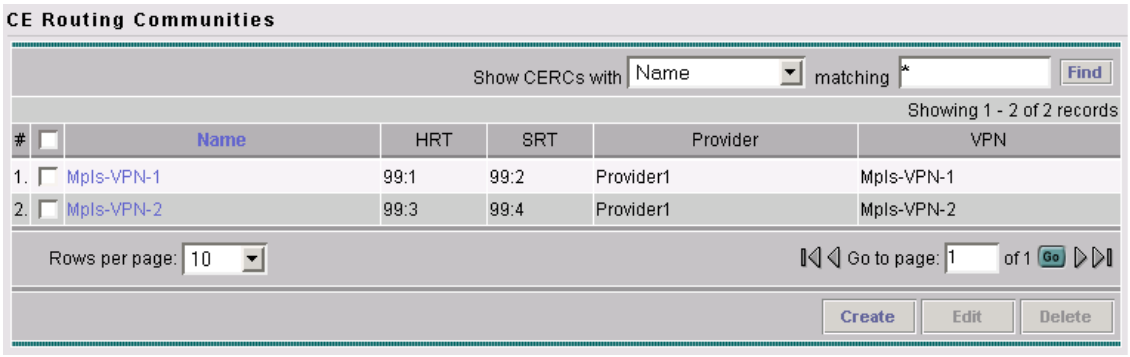
# Accessing the CE Routing Communities Window

The CE Routing Communities feature is used to create and manage CERCs.

To access the CE Routing Communities window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > CE Routing Communities** to access the CE Routing Communities window shown in Figure 3-123.

***Figure 3-123 CE Routing Communities Window***




From the CE Routing Communities window, you can create, edit, or delete CE routing communities using the following buttons:

- **Create**—Click to create new CE routing communities. Enabled only if no CE routing community is selected.
- **Edit**—Click to edit selected CE routing communities (select by checking the corresponding box). Enabled only if one CE routing community is selected.
- **Delete**—Click to delete selected CE routing communities (select by checking the corresponding box(es)). Enabled only if one or more CE routing communities are selected.

# Creating CE Routing Communities

When you create a VPN, the Cisco IP Solution Center software creates one default CE routing community (CERC) for you. But if your network topology and configuration require customized CERC definitions, you can define CERCs customized for your network.

**Tip** Customized CERCs should be defined only in consultation with the VPN network administrator. To build complex topologies, it is necessary to break down the required connectivity between CEs into groups, where each group is either fully meshed or has a hub-and-spoke pattern. A CE can be in more than one group at a time, as long as each group has one of the two basic configuration patterns.

Each subgroup in the VPN wants its own CERC. Any CE that is only in one group just joins the corresponding CERC (as a spoke if necessary). If a CE is in more than one group, then you can use the Advanced Setup choice during provisioning to add the CE to all the relevant groups in one service request. Given this information, Cisco IP Solution Center does the rest, assigning route target values and VRF tables to arrange the precise connectivity the customer requires.

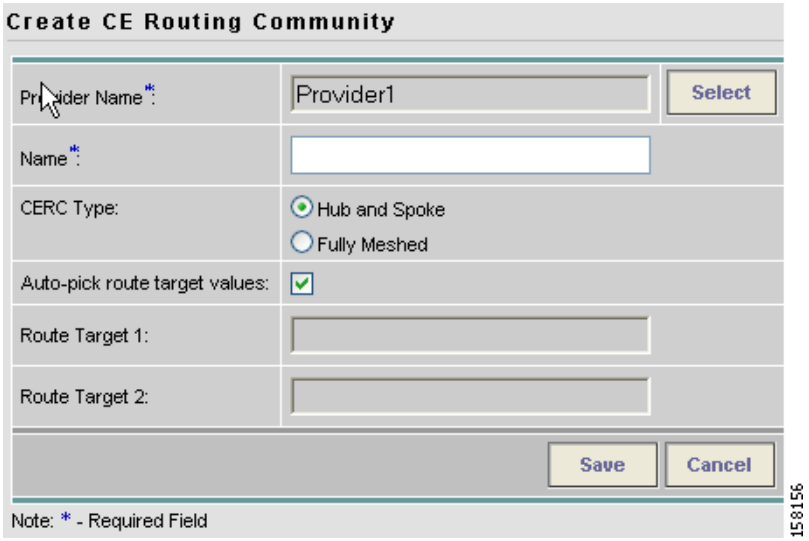
To create a CE routing community, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > CE Routing Communities**.

**Step 2** Click **Create**.

The Create CE Routing Community window appears, as shown in Figure 3-124.

***Figure 3-124 Create CE Routing Community Window***




**Step 3** Complete the CERC fields as required for the CE Routing Community:

a. **Provider Name** (required)—To specify the service provider associated with this CERC, click **Select**.

   The Select Provider window is displayed.

b. From this new window, choose the name of the service provider, then click **Select**.

c. **Name** (required)—Enter the name of the CERC.

d. **CERC Type**—Specify the CERC type: Hub and Spoke or Fully Meshed.

e. **Auto-Pick Route Target Values**—Choose to either let Cisco IP Solution Center automatically set the route target (RT) values or set the RT values manually.

   By default, the **Auto-pick route target values** check box is checked. If you uncheck the check box, you can enter the Route Target values manually.

**Caution** If you choose to bypass the **Auto-pick route target values** option and set the route target (RT) values manually, note that the RT values cannot be edited after they have been defined in the ISC software.

**Step 4** When you have finished entering the information in the Create CE Routing Community window, click **Save**.

After creating the CERC, you can add it to the VPN.

## Deleting CE Routing Communities

From the CE Routing Community window, you can delete specific CERCs.

To delete CERC(s), follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > CE Routing Communities**

**Step 2** Select CERC(s) to delete by checking the check box(es) to the left of the CERC name.

**Step 3** Click the **Delete** button.

The Confirm Delete window appears.

**Step 4** Click **OK** to confirm that you want to delete the CERC(s) listed.

The CE Routing Communities window reappears with the specified CERC(s) deleted.

# VRFs

There are two VPN routing and forwarding (VRF) models.

In the traditional VRF model, the operator first creates a VPN object and then associates it to an MPLS VPN link. The necessary VRF information is generated and deployed at the time the MPLS VPN link is provisioned. The VRF information is removed only when the last link associated with the VRF is decommissioned.

The independent VRF management feature allows you to have the VRF information provisioned independent of the physical link. You can create, modify, and delete VRF objects independently of MPLS VPN links. This provides the following advantages:

- VRF information and templates can be directly deployed on a PE device without being associated with an interface.
- VRF information can exist without links pointing to it.

- A VRF object can be modified, even if it is associated with links.
- Route targets (RTs) can be added and removed without causing outages.

Managing VRFs independently of physical links involves the following tasks:

- Creating, modifying, and deleting VRF objects.
- Creating, modifying, deploying, decommissioning, and deleting a new type of service request, called a VRF service request.
- Using deployed VRF objects with MPLS VPN links via service policies and service requests.
- Migrating traditional MPLS VPN service requests to the independent VRF model.

This section describes how you can create and manage independent VRF objects. This section includes the following:

- Accessing the VRFs Window, page 3-139
- Creating a VRF, page 3-140
- Editing VRFs, page 3-143

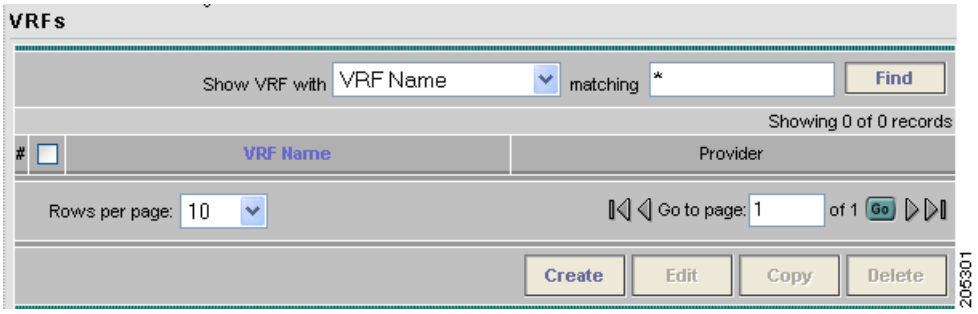
# Accessing the VRFs Window

The VRF feature is used to create and manage various types of VRFs.

To access the VRF window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > VRF** to access the VRF window shown in Figure 3-125.

***Figure 3-125 VRFs Window***




From the VRFs window, you can create, edit, copy, or delete VRFs using the following buttons:

- **Create**—Click to create a new VRF. This is enabled only if no VRF is selected. Then proceed to the "Creating a VRF" section on page 3-140.
- **Edit**—Check the corresponding check box(es) for VRFs and then click **Edit**. Then proceed to the "Editing VRFs" section on page 3-143.

- **Copy**—Check the corresponding check box for one VRF and then click **Copy**. You can then copy the information that appears as in a window similar to Figure 3-126.
- **Delete**—Check the corresponding check box(es) for one or more VRFs you want to delete. Then proceed to the "Editing VRFs" section on page 3-143.

# Creating a VRF

After you create a VRF object, you can provision it using a VRF service request, as explained in the *Cisco IP Solution Center MPLS VPN User Guide, 5.2.*

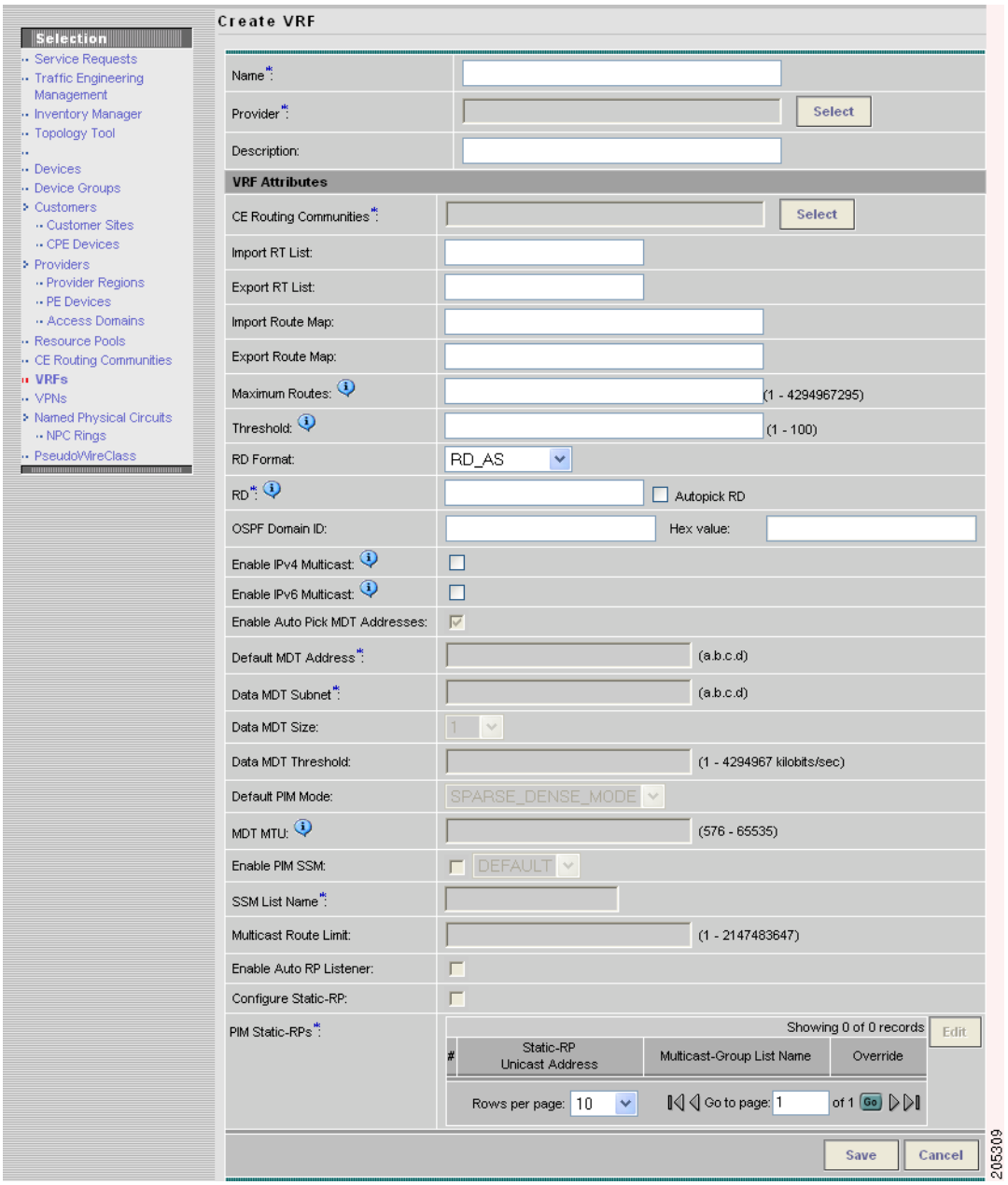
To create a VRF, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > VRF**.

**Step 2** Click **Create**.

The Create VRF window appears, as shown in Figure 3-126.

*Figure 3-126 Create VRF Window*




**Step 3** Complete the fields as required for the VRF:

a. **Name** (required)—Enter the name of the VRF, any name of your choice. This name is directly deployed on the PE device.

b. **Provider** (required)—To select the provider associated with this VRF, choose **Select**.

c. From the list of providers, select the appropriate provider, and then click **Select**.

d. **Description** (optional)—Enter a description, if you choose.

e. **CE Routing Communities** (required)—Click the **Select** button.

f. From the list of CE Routing Communities (CERCs), choose only one appropriate CERC, and then click **Select**.

g. **Import RT List**—Enter one or more Route Targets (RTs) to be imported in the VRF. For multiple RTs, separate the RTs by commas. An example RT list is: 100:120,100:130,100:140.

h. **Export RT List**—Enter one or more Route Targets (RTs) to be exported from the VRF. For multiple RTs, separate the RTs by commas.

i. **Import Route Map**—Enter the name of a route map defined on the device. ISC validates this name while provisioning the VRF and generates an error if the route map is not defined.

j. **Export Route Map**—Enter the name of a route map defined on the device. ISC validates this name while provisioning the VRF and generates an error if the route map is not defined.

k. **Maximum Routes**—Specify an integer that indicates the maximum number of routes that can be imported into the VRF. The range for IOS devices is from 1 - 4294967295, and the range for IOS XR devices is from 32 - 2000000. Device type specific validations occur during service request creation.

l. **Threshold**—Specify the threshold value, which is a percentage, 1 to 100. If this percentage is exceeded, a warning message occurs. This is mandatory for IOS devices and optional for IOS XR devices. Device type specific validations occur during service request creation.

m. **RD Format**—From the drop-down list, you have two choices. Choose **RD_AS** for the Route Distinguisher (RD) to be in autonomous system (AS) format, for example: 100:202. Otherwise, choose **RD_IPADDR** for the RD to be in RD_IPADDRESS format, for example: 10.2.2.3:1021.

n. **RD** (required)—Specify a Route Distinguisher (RD) manually or check the **Autopick RD** check box to have ISC automatically choose an RD from the Route Distinguisher pool, if one has been set up.

o. **Enable IPv4 Multicast**—Multicast VRF deployments are supported only for IPv4 deployments. CERC is mandatory if multicast is enabled. Check the check box to enable IPv4 multicast VRF deployments.

p. **Enable IPv6 Multicast**—Multicast VRF deployments are supported only for IPv6 deployments. CERC is mandatory if multicast is enabled. Check the check box to enable IPv6 multicast VRF deployments.

q. **Enable Auto Pick MDT Addresses** (optional)—Check this check box to use **Default MDE Address** and **Default MDT Subnet** values from a multicast resource pool.

r. **Default MDT Address**—If **Enable Auto Pick MDT Addresses** is not checked (set on), you can provide the **Default MDT Address**.

s. **Data MDT Subnet** (optional)—If **Enable Auto Pick MDT Addresses** is not checked (set on), you can provide the **Default MDT Subnet**.

t. **Data MDT Size** (optional)—If **Enable Multicast** is set on, **Data MDT Size** is required. From the drop-down list, select the data MDT size.

   MDT refers to a *multicast distribution tree* (MDT). The MDT defined here carries multicast traffic from providers associated with the multicast domain.

u. **Data MDT Threshold** (optional)—If **Enable Multicast** is set on, **Data MDT Threshold** is required. Enter the bandwidth threshold for the data multicast distribution tree. The valid range is 1-4294967 and indicates kilobits/second.

   The *data MDT* contains a range of multicast group addresses and a bandwidth threshold. Thus, whenever a PE behind a multicast-VRF exceeds that bandwidth threshold while sending multicast traffic, the PE sets up a new data MDT for the multicast traffic from that source. The PE informs the other PEs about this data MDT and, if they have receivers for the corresponding group, the other PEs join this data MDT.

v. **Default PIM Mode** (optional)—For Default Protocol Independent Multicast (PIM) mode, click the drop-down list and choose **SPARSE_MODE** or **SPARSE_DENSE_MODE**. For IOS XR devices, no configlet is generated for either mode.

w. **MDT MTU** (optional)**—**For this MDT Maximum Transmission Unit (MTU), the range for IOS devices is 576 to 18010, and the range for IOS XR devices is 1401 to 65535. Device type specific validations occur during service request creation.

x. **Enable PIM SSM** (optional)—Check this check box for PIM Source Specific Multicast (SSM).

y. **SSM List Name** (optional)—Choose **DEFAULT** from the drop-down list and you create the following CLI: **ip pim vrf** <*vrfName*> **ssm default**. No configlet is generated for IOS XR devices, because they are using the standard SSM range 232.0.0.0/8. Choose **RANGE** from the drop-down list to associate an access-list number or a named access-list with the SSM configuration. This creates the following CLI: **ip pim vrf** <*vrfName*> **ssm range {ACL#!named-ACL-name}**.

z. **Multicast Route Limit** (optional)—Enter a valid value of 1 to 2147483647. For IOS XR devices, no configlet is generated.

aa. **Enable Auto RP Listener** (optional)—Check this check box to enable the Rendezvous Point (RP) listener function. By default, this feature is running on IOS XR devices and no configlet is generated for this attribute.

ab. **My PIM Static-RPs**—To configure static RPs, check this check box. An edit option then goes active. Click **Edit** and fill in the applicable fields in the window that appears. Then click **OK**.

**Step 4** When you are satisfied with the settings for this VRF, click **Save**.

You have successfully created a VRF, as shown in the **Status** display in the lower left corner of the VRFs window.

# Editing VRFs

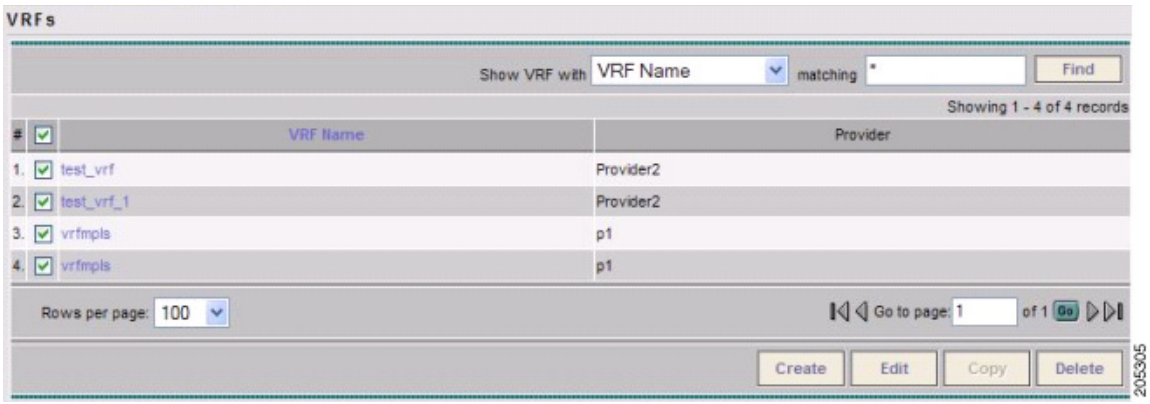
From the VRFs window, you can edit one or more VRFs.

To edit VRF(s), follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > VRF**.

**Step 2** Check the check box(es) for all the VRFs you want to edit, as shown in Figure 3-127, and then click **Edit**.

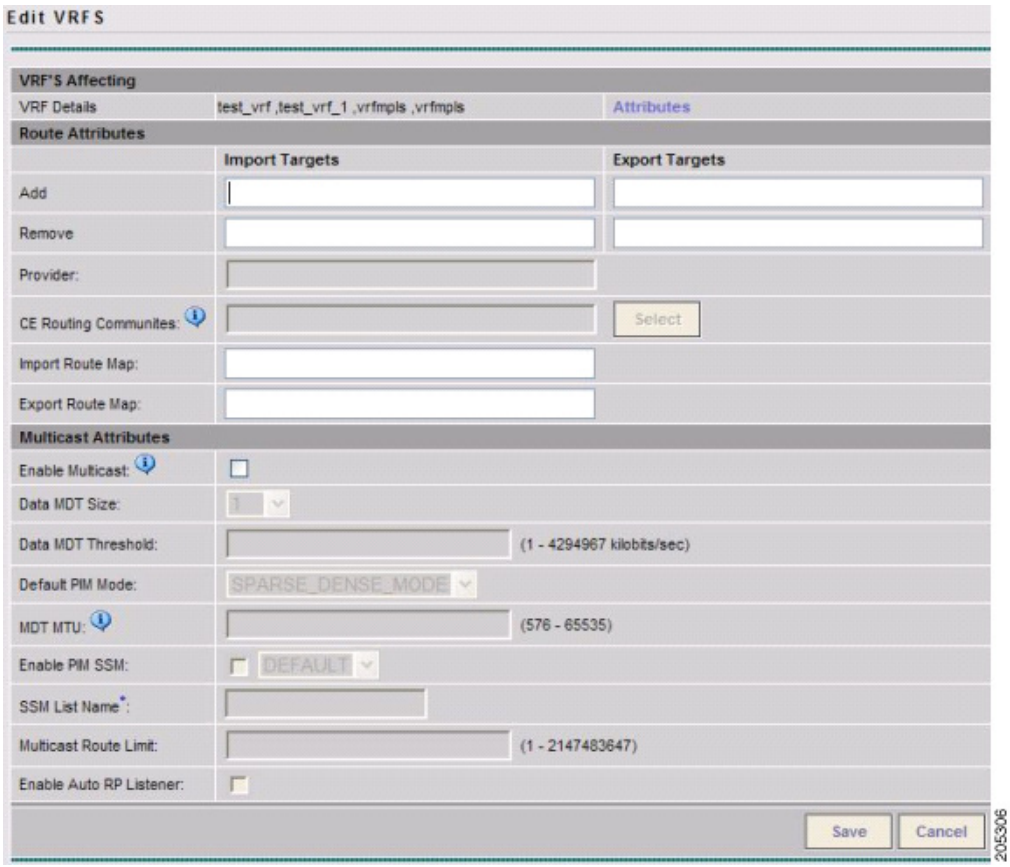
*Figure 3-127 Choosing VRF(s) to Edit*




**Step 3** If you check only one check box for one VRF, you receive a window similar to Figure 3-126, except that the title of the window is **Edit VRF**, the **Name** field has the name of the VRF you selected, and the **Provider** field already has the name of the provider for the VRF you selected. After you make your changes, you proceed to Step 8.

**Step 4** If you check multiple check boxes, you receive a window similar to the sample window in Figure 3-128.

*Figure 3-128 Edit VRFs*



**Step 5** In the **VRFs Affecting** section of Figure 3-128, the names of the VRFs you chose are given. If you click on **Attributes**, you receive a window with the currently configured attributes of all the selected VRFs.

**Step 6** In the **Route Attributes** section of Figure 3-128, specify the **Import Targets** and **Export Targets** you want to **Add** and **Remove.** These lists of Route Targets (RTs) should be separated by commas, as indicated in **Import RT List** and **Export RT List** in the "Creating a VRF" section on page 3-140. See the "Creating a VRF" section on page 3-140 for information about the remaining fields you want to edit.

**Step 7** In the **Multicast Attributes** section of Figure 3-128, you can edit the fields. See the "Creating a VRF" section on page 3-140 for information about the fields you want to edit.

**Step 8** Click **Save** and the VRFs will be updated.

## Deleting VRFs

From the VRFs window, you can delete specific VRF(s).

**Note** Only VRFs not associated with VRF service requests can be deleted.

To delete VRF(s), follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > VRF**.

**Step 2** Select VRF(s) to delete by checking the check box(es) to the left of the VRF name(s).

**Step 3** Click the **Delete** button.

The Confirm Delete window appears.

**Step 4** Click **OK** to confirm that you want to delete the VRF(s) listed.

The VRFs window reappears with the specified VRF(s) deleted.

# VPNs

At its simplest, a virtual private network (VPN) is a collection of sites that share the same routing table. A VPN is also a framework that provides private IP networking over a public infrastructure such as the Internet. In Cisco IP Solution Center: MPLS VPN Management, a VPN is a set of customer sites that are configured to communicate through a VPN service. A VPN is defined by a set of administrative policies.

A VPN is a network in which two sites can communicate over the provider's network in a private manner; that is, no site outside the VPN can intercept their packets or inject new packets. The provider network is configured such that only one VPN's packets can be transmitted through that VPN—that is, no data can come in or out of the VPN unless it is specifically configured to allow it. There is a physical connection from the provider edge network to the customer edge network, so authentication in the conventional sense is not required.

This section describes how you can create and manage pools for various types of resources. This section includes the following:

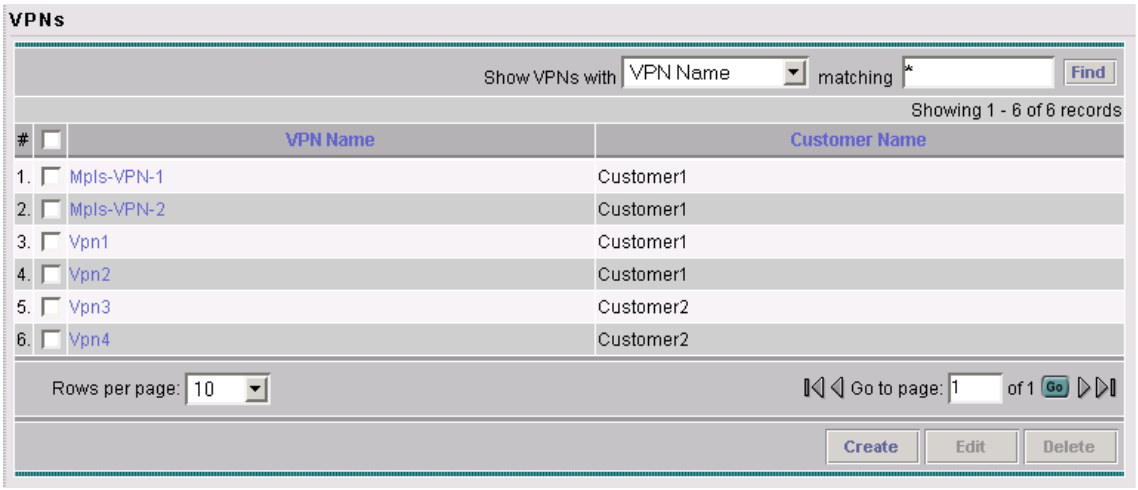
- Accessing the VPNs Window, page 3-146

# Accessing the VPNs Window

The VPN feature is used to create and manage various types of VPNs.

Choose **Service Inventory > Inventory and Connection Manager > VPN** to access the VPN window shown in Figure 3-129.

***Figure 3-129 VPNs Window***




From the VPNs window, you can create, edit, or delete VPNs using the following buttons:

- **Create**—Click to create a new VPN. This is enabled only if no VPN is selected. Then proceed to the "Creating a VPN" section on page 3-146.
- **Edit**—Check the corresponding check box for one VPN and then click **Edit**. You can then edit the information that appears as in a window similar to Figure 3-130 but titled **Edit VPN**.
- **Delete**—Check the corresponding check box(es) for one or more VPNs you want to delete. Then proceed to the "Deleting VPNs" section on page 3-149.

# Creating a VPN

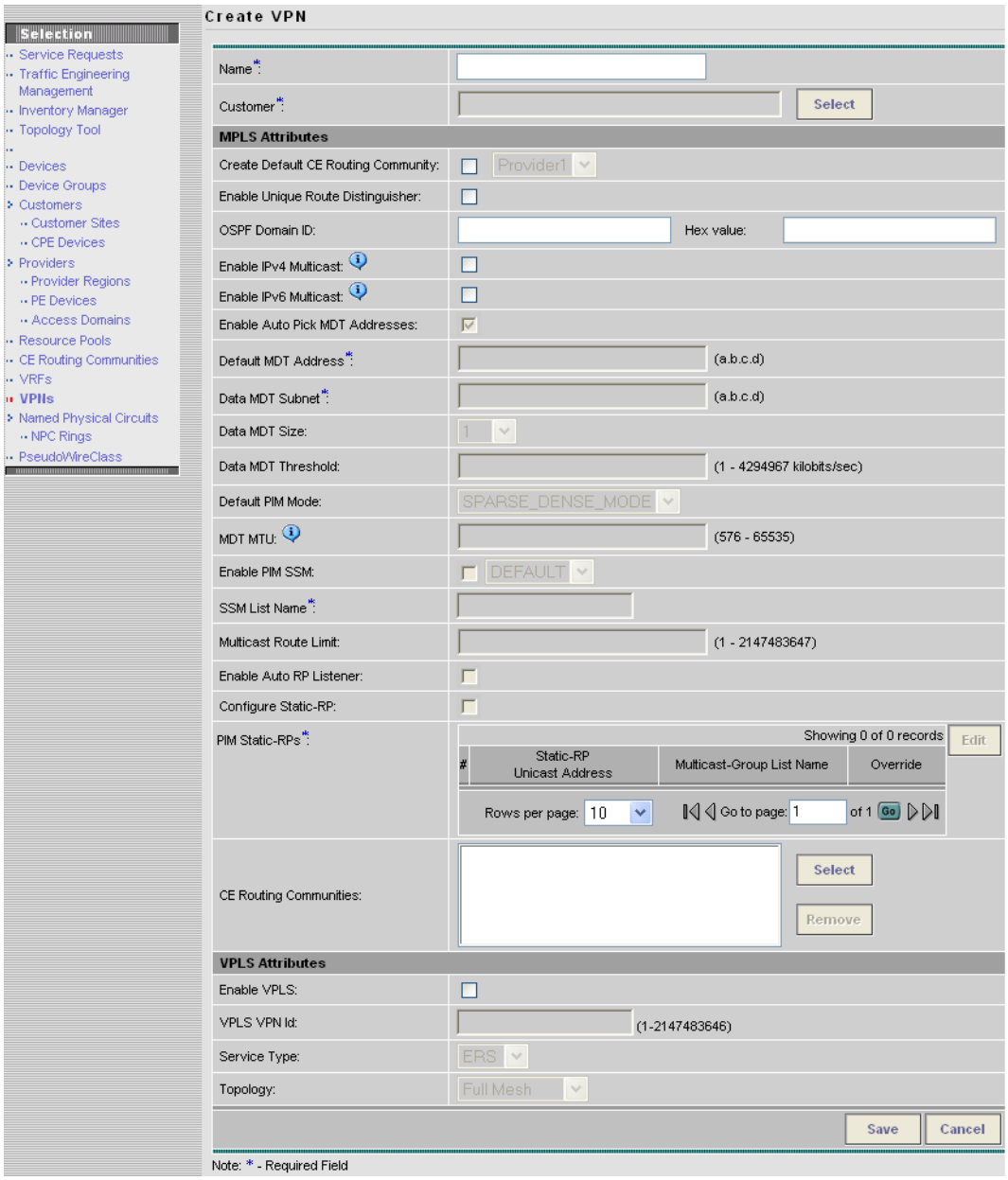
To create a VPN, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > VPN**.

**Step 2** Click **Create**.

The Create VPN window appears, as shown in Figure 3-130.

*Figure 3-130 Create VPN Window*




**Step 3** Complete the fields as required for the VPN:

a. **Name** (required)—Enter the name of the VPN, any name of your choice.

b. **Customer** (required)—To select the customer associated with this VPN, choose **Select**.

c. From the list of customers, select the appropriate customer, then click **Select**.

d. If you want MPLS attributes, complete the fields in the MPLS Attributes section of the window. For VPLS, skip to step **w.**

e. **Create Default CE Routing Community** (optional)—To create a default CE routing community, check the **Create Default CE Routing Community** check box and select a provider.

f. **Enable Unique Route Distinguisher**—The BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS VPN feature is enabled only under the IPv4 VRF address family configuration mode. When enabled, this feature can perform load balancing on eBGP and/or iBGP paths that are imported into the VRF.

g. **Enable IPv4 Multicast** —To enable multicast IPv4 VPN routing, check the **Enable IPv4 Multicast** check box.

   An IP address that starts with the binary prefix *1110* is identified as a *multicast group address*. There can be more than one sender and receiver at any time for a given multicast group address. The senders send their data by setting the group address as the destination IP address. It is the responsibility of the network to deliver this data to all the receivers in the network who are listening to that group address.

   **Note** Before you can create a VPN with multicast enabled, you must define one or more multicast resource pools.

h. **Enable IPv6 Multicast** —To enable multicast IPv6 VPN routing, check the **Enable IPv6 Multicast** check box.

   An IP address that starts with the binary prefix *1110* is identified as a *multicast group address*. There can be more than one sender and receiver at any time for a given multicast group address. The senders send their data by setting the group address as the destination IP address. It is the responsibility of the network to deliver this data to all the receivers in the network who are listening to that group address.

   **Note** Before you can create a VPN with multicast enabled, you must define one or more multicast resource pools.

i. **Enable Auto Pick MDT Addresses** (optional)—Check this check box to use **Default MDE Address** and **Default MDT Subnet** values from a multicast resource pool.

j. **Default MDT Address**—If **Enable Auto Pick MDT Addresses** is set on, **Default MDT Address** is required.

k. **Data MDT Subnet** (optional)—If **Enable Auto Pick MDT Addresses** is not checked (set on), you can provide the **Default MDT Subnet**.

l. **Data MDT Size** (optional)—If **Enable Multicast** is set on, **Data MDT Size** is required. From the drop-down list, select the data MDT size.

   MDT refers to a *multicast distribution tree* (MDT). The MDT defined here carries multicast traffic from customer sites associated with the multicast domain.

m. **Data MDT Threshold** (optional)—If **Enable Multicast** is set on, **Data MDT Threshold** is required. Enter the bandwidth threshold for the data multicast distribution tree.

   The *data MDT* contains a range of multicast group addresses and a bandwidth threshold. Thus, whenever a CE behind a multicast-VRF exceeds that bandwidth threshold while sending multicast traffic, the PE sets up a new data MDT for the multicast traffic from that source. The PE informs the other PEs about this data MDT and, if they have receivers for the corresponding group, the other PEs join this data MDT.

n. **Default PIM Mode** (optional)—For Default Protocol Independent Multicast (PIM) mode, click the drop-down list and choose **SPARSE_MODE** or **SPARSE_DENSE_MODE**. For IOS XR devices, no configlet is generated for either mode.

o. **Enable PIM SSM** (optional)—Check this check box for PIM Source Specific Multicast (SSM).

p. **SSM List Name** (optional)—Choose **DEFAULT** from the drop-down list and you create the following CLI: **ip pim vpn** <*vpnName*> **ssm default**. No configlet is generated for IOS XR devices, because they are using the standard SSM range 232.0.0.0/8. Choose **RANGE** from the drop-down list to associate an access-list number or a named access-list with the SSM configuration. This creates the following CLI: **ip pim vpn** <*vpnName*> **ssm range {ACL#!named-ACL-name}**.

q. **Multicast Route Limit** (optional)—Enter a valid value of 1 to 2147483647. For IOS XR devices, no configlet is generated.

r. **Enable Auto RP Listener** (optional)—Check this check box to enable the Rendezvous Point (RP) listener function. By default, this feature is running on IOS XR devices and no configlet is generated for this attribute.

s. **Configure Static-RP** (optional)—To configure Static RPs, check the associated check box. The Edit option for **PIM Static-RPs** then goes active.

t. **PIM Static-RPs**—To edit or add PIM Static-RPs, click **Edit**. The Edit PIM Static RPs window appears. Then click **OK.**

u. **CE Routing Communities** (optional)—If **Enable Multicast** is set on, **CE Routing Communities** is required. If you do not choose to enable the default CERC, you can select a customized CERC that you have already created in ISC. From the CE Routing Communities pane, click **Select**.

The Select CE Routing Communities window is displayed.

v. Check the check box for the CERC you want used for this service policy, then click **Select**.

You return to the Create VPN window, where the new CERC selection is displayed, along with its hub route target (HRT) and spoke route target (SRT) values.

w. If you want VPLS attributes, the optional fields for that are in x. to aa.

x. **Enable VPLS** (optional)—Check this check box to enable VPLS.

y. **VPLS VPN ID** (optional)—Enter an integer in the range of 1 to 2147483646.

z. **Service Type** (optional)—Click the drop-down list and choose from **ERS** (Ethernet Relay Service) or **EWS** (Ethernet Wire Service).

aa. **Topology** (optional)—Choose the VPLS topology from the drop-down list: **Full Mesh** (each CE has direct connections to every other CE) or **Hub and Spoke** (only the Hub CE has connection to each Spoke CE and the Spoke CEs do not have direct connection to each other).

**Step 4** When you are satisfied with the settings for this VPN, click **Save**.

You have successfully created a VPN, as shown in the **Status** display in the lower left corner of the VPNs window.

# Deleting VPNs

From the VPNs window, you can delete specific VPNs.

**Note** Only VPNs not associated with MPLS service requests can be deleted.

To delete VPN(s), follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > VPN**.

**Step 2** Select VPN(s) to delete by checking the check box(es) to the left of the VPN name.

**Step 3** Click the **Delete** button.

The Confirm Delete window appears.

**Step 4** Click **OK** to confirm that you want to delete the VPN(s) listed.

The VPNs window reappears with the specified VPN(s) deleted.

# Named Physical Circuits

Named physical circuits (NPCs) are named circuits that describe a physical connection between a CPE or U-PE and an N-PE. The intermediate nodes of the NPCs can either be CPE or PE. They can be connected in a circular fashion forming a ring of devices, which is represented by an entity known as NPC Rings. NPC Rings represent the circular topology between devices (CPE or PE) to the Named Physical Circuits. To create an NPC, you must specify how the source CPE/U-PE and the destination N-PE are connected and specify the intermediate nodes.

The connectivity of the NPCs is defined by specifying a set of devices serving as physical links; each device has two interfaces that are part of the NPC connections. The Incoming Interface defines the interface from the CE direction. The Outgoing Interface defines the interface toward the PE direction.

You can also add (meaning after the chosen device) or insert (meaning before the chosen device) an NPC Ring in the link.

Keep in mind the following when you are creating an NPC:

- In the ISC software, the device you select can be any node in the link. The ISC software only shows the appropriate devices. The first device *must* be a CPE or U-PE and the last device *must* be an N-PE.
- NPCs should be created before the MPLS multi-device, VPLS, or L2VPN service request is created with cpe1 and pe1. So when you create the SR, you would select the policy, cpe1, pe1, and the NPC that defines the link between cpe1 and pe1.

This section describes how you can create and delete NPCs and create, edit, and delete NPC Rings. This section includes the following:

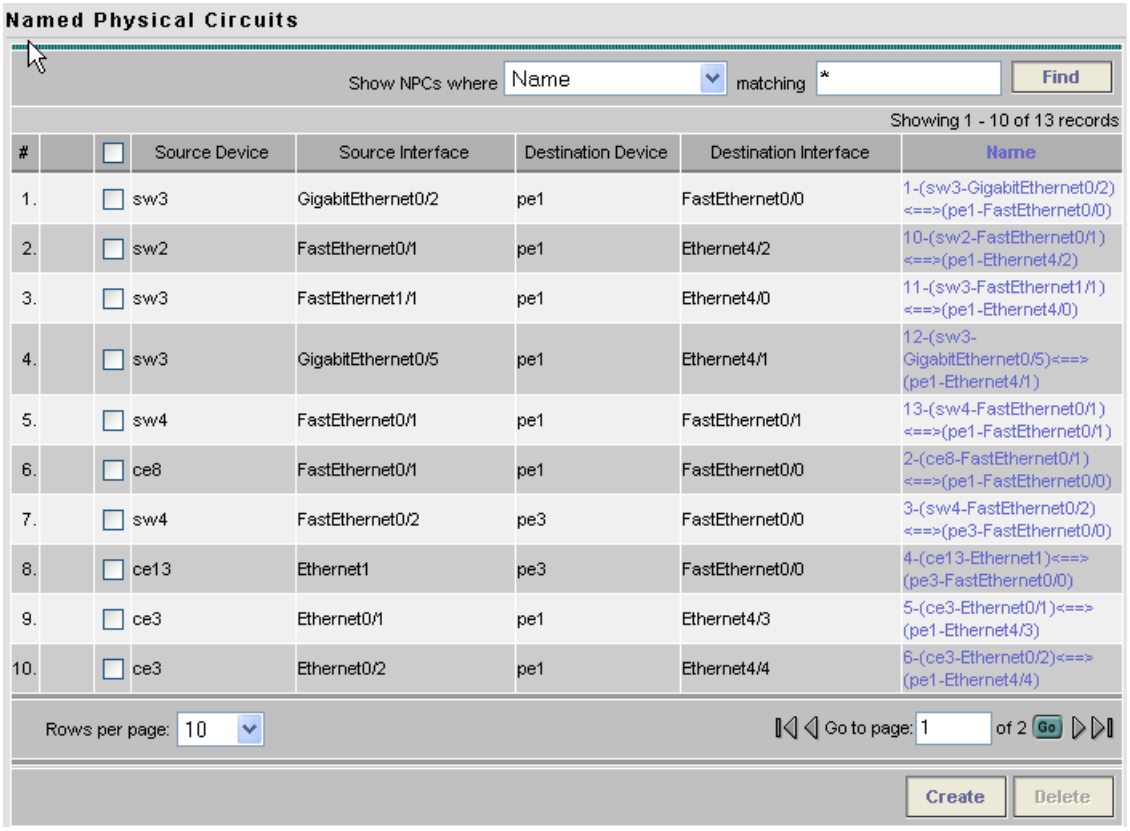


## Accessing the Named Physical Circuits Window

The Named Physical Circuits feature is used to create and delete NPCs. You cannot edit or modify.

Choose **Service Inventory > Inventory and Connection Manager > Named Physical Circuits** to access the window shown in Figure 3-131, "Named Physical Circuits Window."

***Figure 3-131 Named Physical Circuits Window***




From the Named Physical Circuits window, you can create or delete NPCs using the following buttons:

- **Create** Click to create new NPCs. Enabled only if no NPC is selected.
- **Delete** Click to delete selected NPC(s) (select by checking the corresponding box(es)). Enabled only if one or more NPCs are selected.

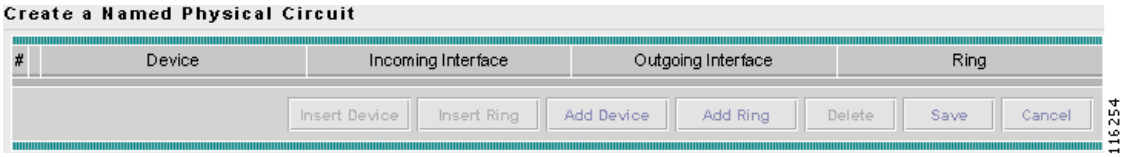
# Creating a Named Physical Circuit

To add an NPC physical link, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Named Physical Circuit**.

**Step 2** Click the **Create** button in Figure 3-131, "Named Physical Circuits Window," and a window, as shown in Figure 3-132, "Create a Named Physical Circuit Window," appears.

*Figure 3-132 Create a Named Physical Circuit Window*




Each line represents a physical link and each physical link contains the following attributes:

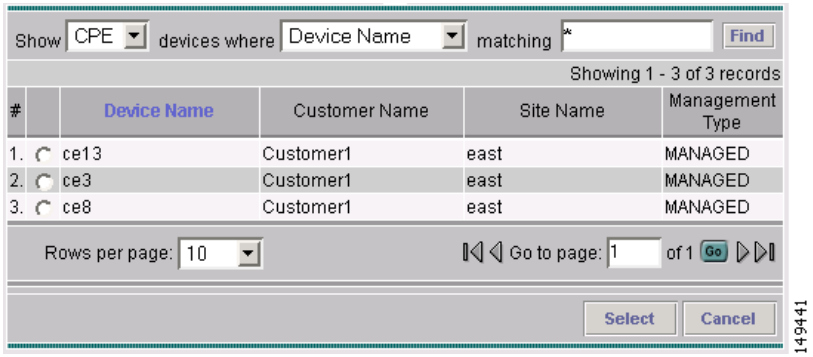
- **Device**
- **Incoming Interface**
- **Outgoing Interface**
- **Ring** (optional)

**Note** Before adding a ring in an NPC, create a ring and save it in the repository, as explained in the "Creating NPC Rings" section on page 3-155.

**Note** An NPC must have at least one link defined. The link must have two Devices, an Incoming Interface, and an Outgoing Interface.

**Step 3** Click **Add Device** or **Insert Device** and a window as shown in Figure 3-133, "Select Device Window," appears.

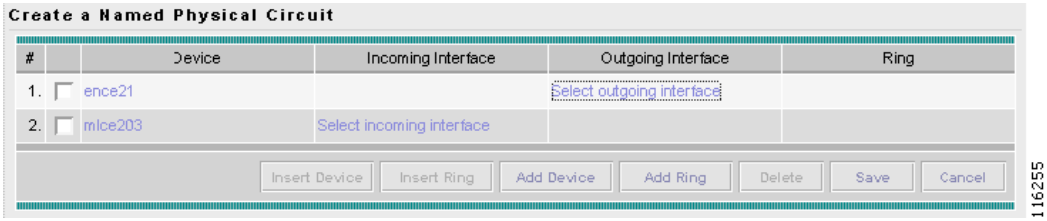
*Figure 3-133 Select Device Window*




**Step 4** Be sure that the drop-down list in **Show** is **CPE or PE**.

**Step 5** Click a radio button next to a device and then click **Select**. Figure 3-132, "Create a Named Physical Circuit Window," reappears with the chosen **Device**.

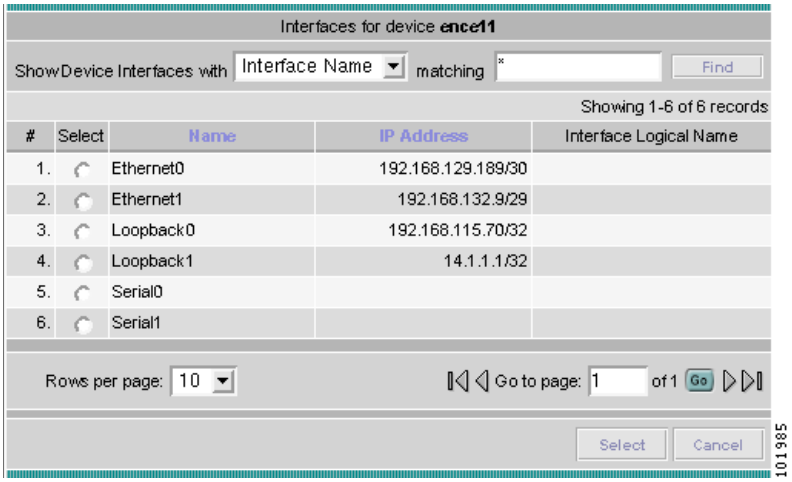
*Figure 3-134 Create Named Physical Circuit Window*




**Step 6** If you want to add a device to your NPC as the last item or after the item checked in the check box, click the **Add Device** button in Figure 3-132 on page 3-152 and then add device and interface information as explained in the previous steps. If you want to insert a device to your NPC as the first item or before the item checked in the check box, click the **Insert Device** button in Figure 3-132 on page 3-152 and then add device and interface information as explained in the previous steps.

**Step 7** In the **Outgoing Interface** column in this new version of Figure 3-132, "Create a Named Physical Circuit Window," click **Select outgoing interface** and a window as shown in Figure 3-135, "Select Outgoing Interface Window," appears with a list of interfaces.

*Figure 3-135 Select Outgoing Interface Window*

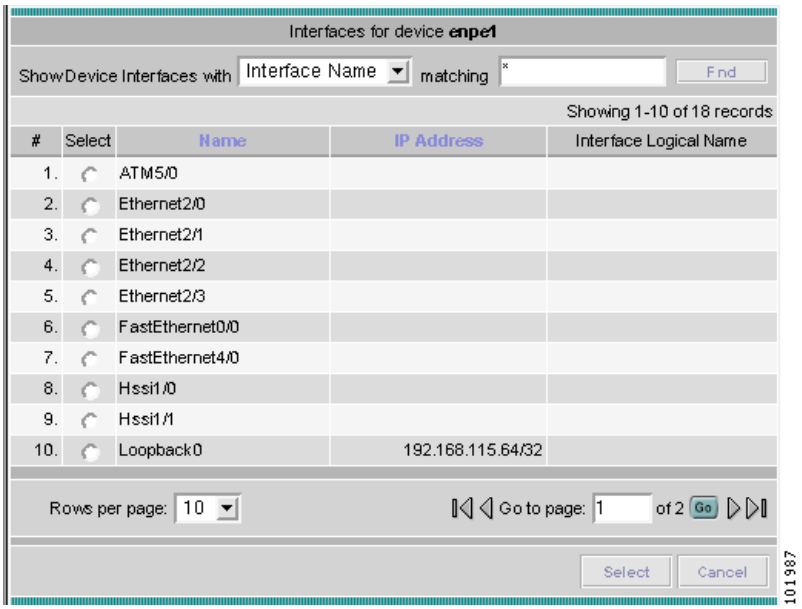



**Step 8** Click a radio button next to the interface to be the source interface for this NPC and then click **Select**.

Figure 3-132, "Create a Named Physical Circuit Window," reappears with the chosen **Interface**.

**Step 9** In the **Incoming Interface** column in this new version of Figure 3-132, "Create a Named Physical Circuit Window," click **Select incoming interface** and a window as shown in Figure 3-136, "Select Incoming Interface Window," appears with a list of interfaces.

*Figure 3-136 Select Incoming Interface Window*



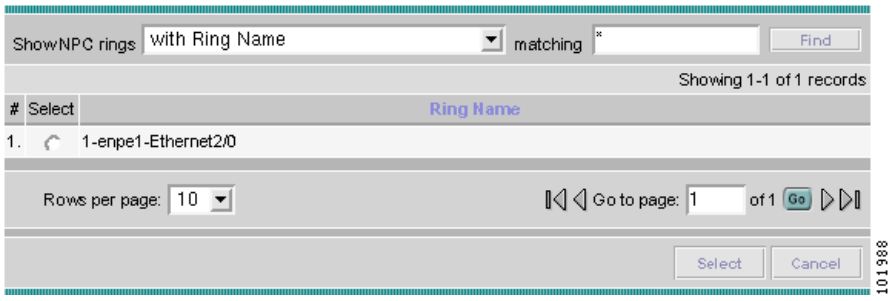

**Step 10** Click a radio button next to the interface to be the incoming interface for this NPC and then click **Select**. Figure 3-132, "Create a Named Physical Circuit Window," reappears with the chosen **Incoming Interface**.

**Step 11** If you created an NPC ring that you want to insert or add into this NPC, as explained in the "Creating NPC Rings" section on page 3-155, you can click **Insert Ring** or **Add Ring** and the ring appears at the beginning or before the item checked in the check box for **Insert Ring** or the ring appears at the end or after the item checked in the check box for **Add Ring**, as shown in Figure 3-137, "Select NPC Ring Window."

**Note** When inserting a ring, select the source device of the ring that connects to a source device or an NPC and the destination device of the ring that connects to the destination device of the NPC.

If you have not created an NPC ring that you want to insert into this NPC, proceed to Step 14.

*Figure 3-137 Select NPC Ring Window*




**Step 12** Click a radio button next to the ring you choose and then click **Select**. Figure 3-132, "Create a Named Physical Circuit Window," reappears with the chosen **Ring**.

**Step 13** Select the missing devices and interfaces as explained in the "Creating NPC Rings" section on page 3-155.

**Step 14** Click **Cancel** if you do not want to save this information, and you will proceed to the previous window.

Otherwise, click **Save**. Figure 3-132, "Create a Named Physical Circuit Window," reappears with the new NPC listed.

# Deleting Named Physical Circuits

To delete NPC(s), follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > Named Physical Circuits** to access the window shown in Figure 3-131, "Named Physical Circuits Window."

**Step 2** Select one or more NPCs to delete by checking the check box(es) on the left.

**Step 3** Click the **Delete** button.

The Delete NPC window appears.

**Note** If the specified NPC is being used by any of the Service Requests, you will not be allowed to delete it. An error message appears explaining this.

**Step 4** Click the **Delete** button to confirm that you want to delete the NPCs listed.

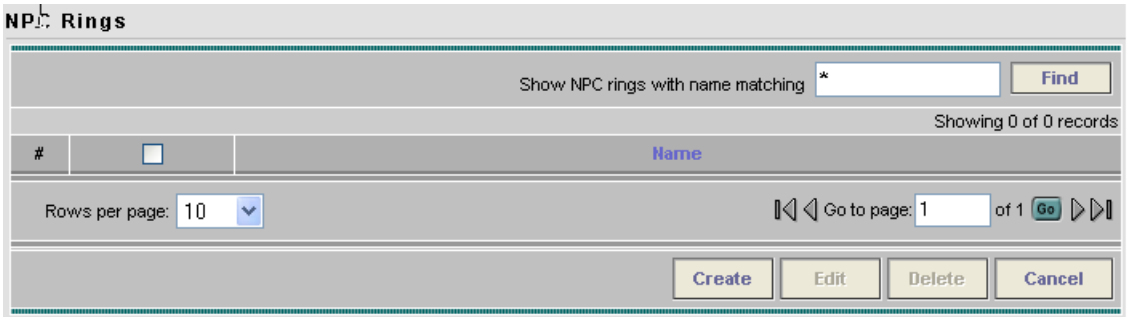
Figure 3-131, "Named Physical Circuits Window," reappears with the specified NPCs deleted.

# Creating NPC Rings

To create NPC rings, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > NPC Rings** and a window as shown in Figure 3-138, "NPC Rings Window," appears.

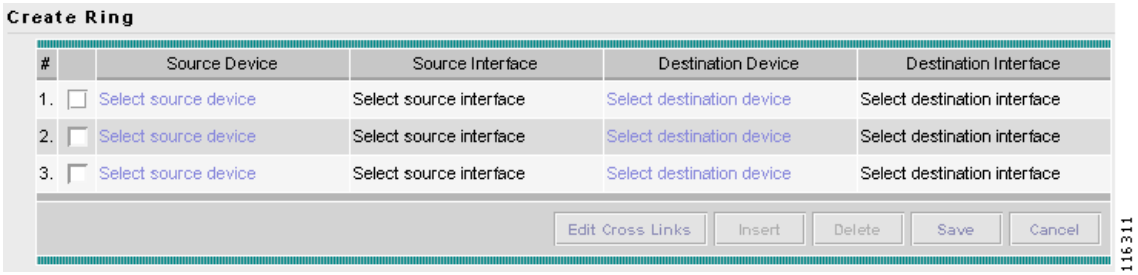
***Figure 3-138 NPC Rings Window***



**Step 2** Click the **Create** button and a window as shown in Figure 3-139, "Create Ring Window," appears.

A ring has a minimum of three physical links that form a ring.

***Figure 3-139 Create Ring Window***



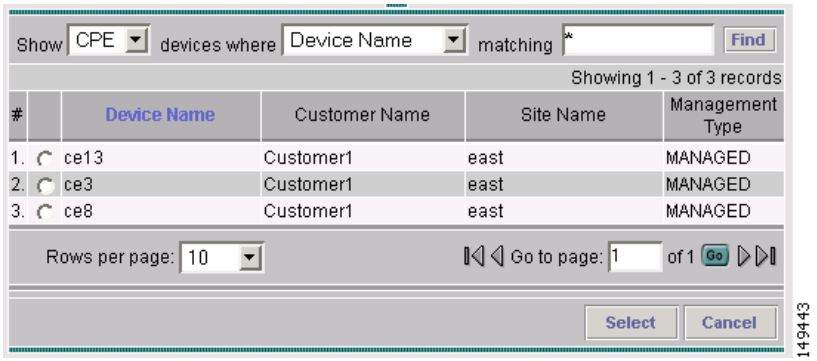

**Note** At any time, if you click **Cancel**, everything you have chosen disappears.

**Step 3** Start with the first line, which represents the first physical link.

**Step 4** In the **Source Device** column, click **Select source device** and a window as shown in Figure 3-140, "Select Source Device — CPE/PE Window," appears.

**Note** The CPE you choose *must* be a Multi-VRF CE.

***Figure 3-140 Select Source Device — CPE/PE Window***

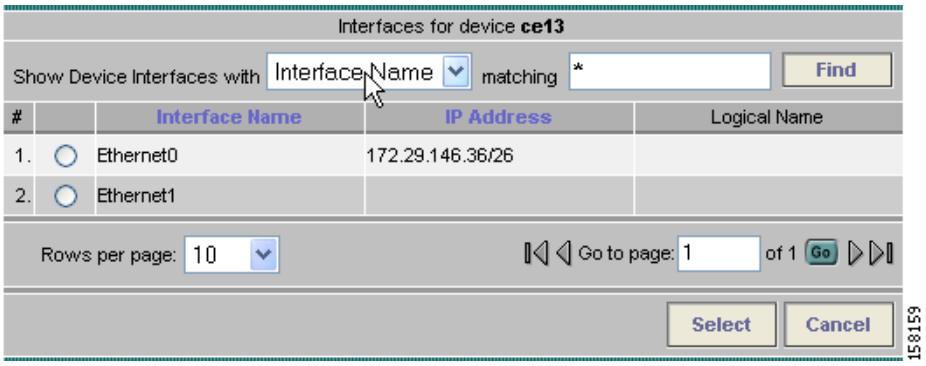



**Step 5** Click a radio button next to the device to be the source device for this physical link and then click **Select**. Figure 3-139, "Create Ring Window," reappears with the chosen **Source Device**.

**Note** When choosing the **Source Device** for a physical link, this same choice is made for the **Destination Device** for the previous physical link (or the last physical link if you are choosing for the first physical link). For a selected device, do not select the same interface for the source and destination interface.

**Step 6** In the **Source Interface** column in this new version of Figure 3-139, "Create Ring Window," click **Select source interface** and a window as shown in Figure 3-141, "Select Source Interface Window," appears with a list of interfaces.

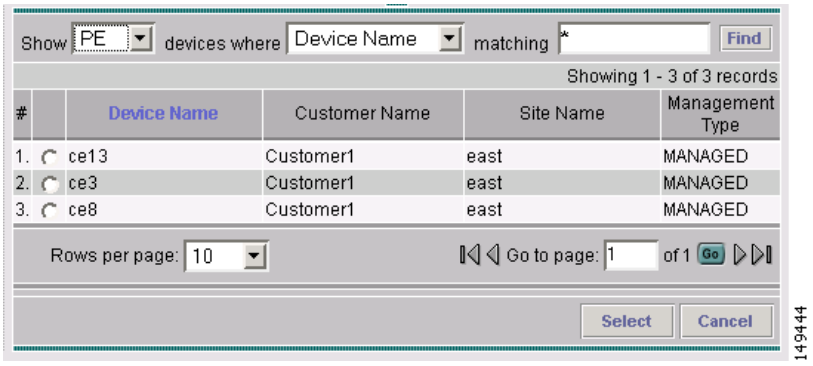
*Figure 3-141 Select Source Interface Window*




**Step 7** Click a radio button next to the interface to be the source interface for this physical link and then click **Select**. Figure 3-139, "Create Ring Window," reappears with the chosen **Source Interface**.

**Step 8** In the **Destination Device** column in this new version of Figure 3-139, "Create Ring Window," click **Select destination device** and a window as shown in Figure 3-142, "Select Destination Device — CPE/PE Window," appears.

*Figure 3-142 Select Destination Device — CPE/PE Window*



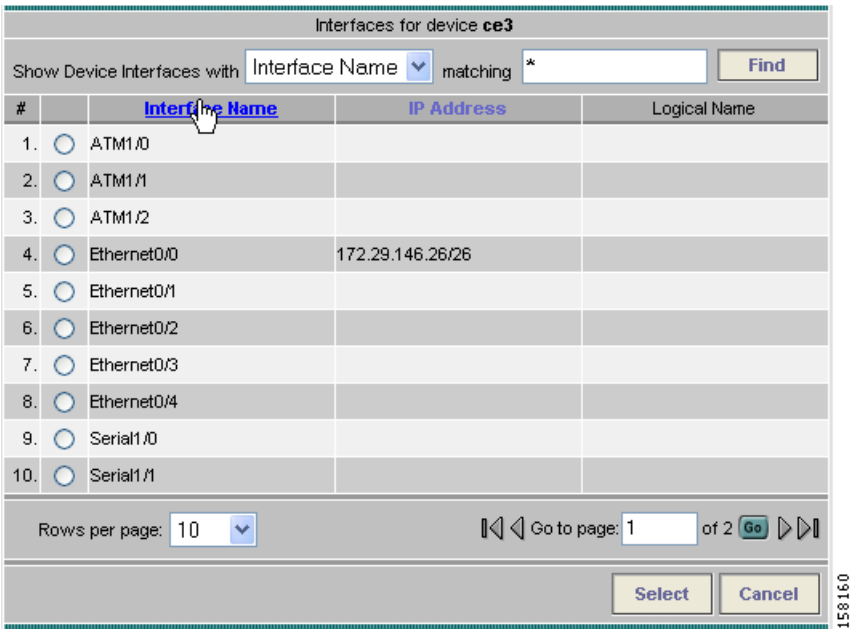

**Step 9** Click a radio button next to the device to be the destination device for this physical link and then click **Select**.

Figure 3-139, "Create Ring Window," reappears with the chosen **Destination Device**.

**Note** When choosing the **Destination Device** for the a physical link, this same choice is made for the next **Source Device**. Do not choose the same Interface for these devices.

**Step 10** In the **Destination Interface** column in this new version of Figure 3-139, "Create Ring Window," click **Select destination interface** and a window as shown in Figure 3-143, "Select Destination Interface Window," appears with a list of interfaces.

*Figure 3-143 Select Destination Interface Window*




**Step 11** Click a radio button next to the interface to be the destination interface for this NPC and then click **Select**

Figure 3-139, "Create Ring Window," reappears with the chosen **Destination Interface**.

**Step 12** Repeat Step 4 to  for the middle physical links and Step 4 to Step 7 for the last physical link.

**Step 13** If you want to insert an extra physical link in the ring, check the check box for the line that represents the physical link you want the new physical link to follow and click **Insert**. Implement Step 4 to  to fill in the remaining entries in this new physical link.

**Step 14** If you want to delete a physical link in the ring but a minimum of three physical links will remain, check the check box for the line that represents the physical link you want to delete and click **Delete**.

**Step 15** If you want to establish additional cross links between non-adjacent devices in this ring, you can click **Edit Cross Links** in Figure 3-139, "Create Ring Window," and you then view a new window like Figure 3-139 with no entry. Click the **Add** button and you can choose from the devices already in your ring. The result is a new entry in Figure 3-139 with this device as the **Source Device**. Establish the Destination Device and Source and Destination Interfaces as you did when creating the ring. The choices of devices and interfaces is limited to those already established in your ring.

**Note** To **Edit Cross Links**, a minimum of four devices is needed to form this ring.

**Step 16** Click **Cancel** if you do not want to save this information, and you will proceed to the previous window.

Otherwise, when you have completed setting up your ring click **Save**. The new ring is added in Figure 3-138, "NPC Rings Window," and a green check for Succeeded appears. The new ring is identified by the source device-source interface.

**Step 17** To create a ring with more than three physical links, check the check box for the link in Figure 3-139 on page 3-156 to which you want to insert and the **Insert** button is then enabled. Proceed in adding links as explained in this section.

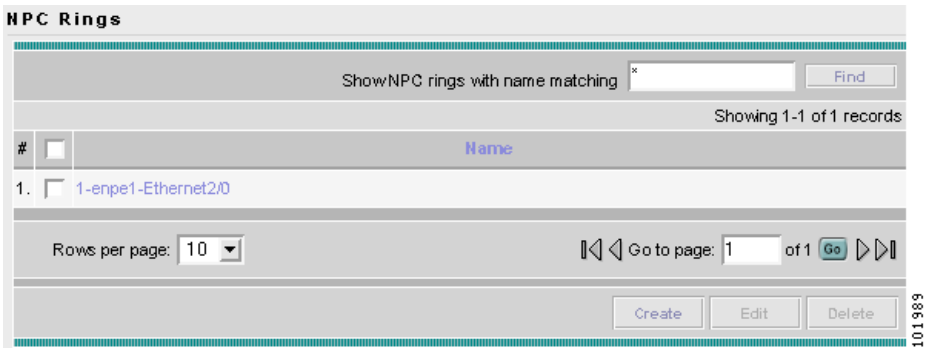
# Editing NPC Rings

To edit NPC rings, follow these steps:

**Note** If the specified NPC Ring is participating in any of the Named Physical Circuits, then you can not edit the ring. An error message appears containing IDs of the NPCs that contain the NPC Ring.

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > NPC Rings** and a window as shown in Figure 3-144, "NPC Rings Window," appears.

***Figure 3-144 NPC Rings Window***




**Step 2** Check the **check box next to the line that represents an NPC ring and then click Edit.**

A window as shown in Figure 3-139, "Create Ring Window," appears with all the data for this ring. Proceed as in the "Creating NPC Rings" section on page 3-155 to make any changes you want.

**Step 3** When you have the ring as you want it, click **Save**. Figure 3-138, "NPC Rings Window," appears with the appropriate name (source device-source interface) and a green check for Succeeded appears.

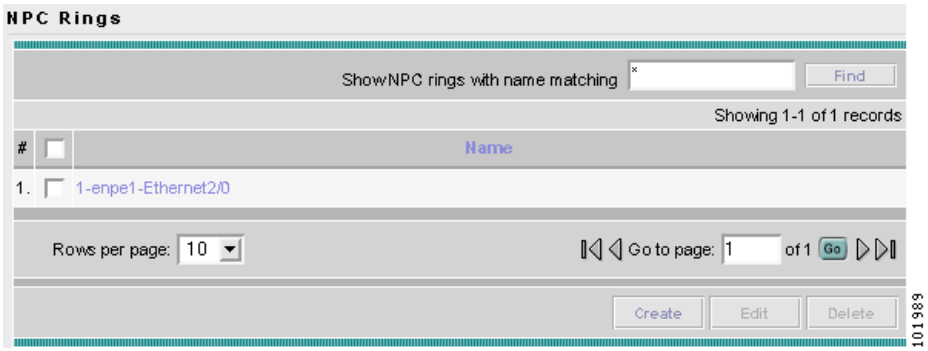
# Deleting NPC Rings

To delete NPC rings, follow these steps:

**Note** If the specified NPC Ring is participating in any of the Named Physical Circuits, then you can not delete the ring. An error message appears containing IDs of the NPCs that contain the NPC Ring.

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > NPC Rings** and a window as shown in Figure 3-145, "NPC Rings Window," appears.

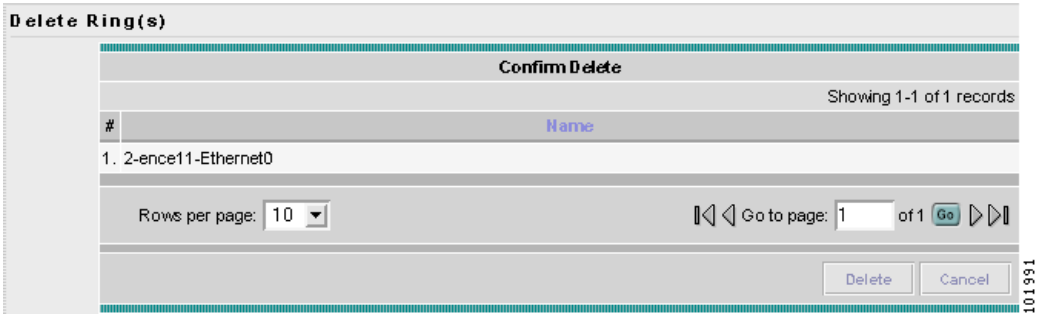
*Figure 3-145 NPC Rings Window*




**Step 2** Check the check box(es) next to the line(s) that represent(s) NPC ring(s) that you want to delete and then click Delete.

A window as shown in Figure 3-146, "Delete Rings Window," appears with the chosen ring(s) for deletion.

*Figure 3-146 Delete Rings Window*




**Step 3** Click **Cancel** if you change your mind about deleting the chosen ring(s) or click **Delete** to actually delete the ring.

Figure 3-145, "NPC Rings Window," appears with the remaining ring names and a green check for Succeeded appears.

# PseudoWire Class

The PseudoWire Class feature allows you to configure various attributes associated with a pseudowire that is deployed as part of an L2VPN service request on IOS XR capable devices. The pseudowire class feature supports configuration of the Encapsulation, Transport Mode, and Disable Fallback options, and selection of a traffic engineering tunnel down which the pseudowire can be directed. For tunnel selection, you can use the ISC Traffic Engineering Management application. Otherwise, you can specify the identifier of a tunnel that is already provisioned within the network.

This section describes how you can access, create, edit, and delete pseudowire classes. This section includes the following:

- Accessing the PseudoWire Class Window, page 3-161

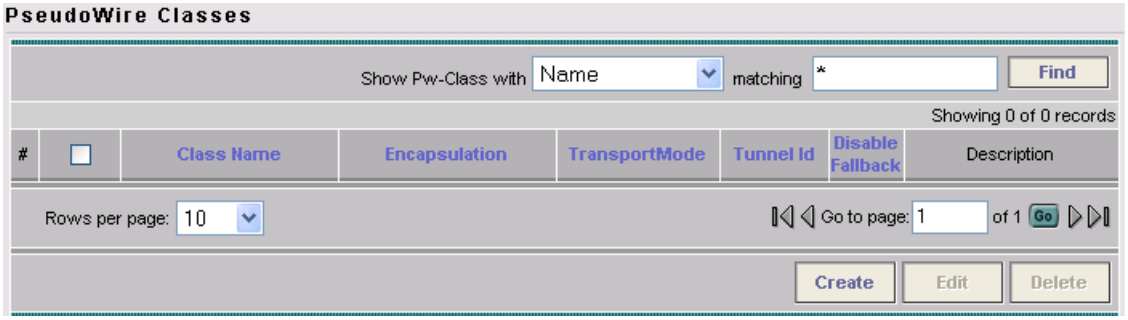
# Accessing the PseudoWire Class Window

The PseudoWire Class feature is used to create, edit, and delete pseudowire classes.

To access the PseudoWire Class window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > PseudoWire Class** to access the window shown in Figure 3-147, "PseudoWire Classes Window."

***Figure 3-147 PseudoWire Classes Window***




**Step 2** From Figure 3-147, you can use the following buttons:

- **Create**—Click this button to create a new pseudowire class, as explained in the "Creating a PseudoWire Class" section on page 3-161.
- **Edit**—Choose one pseudowire class to edit and then click this button, as explained in the "Editing a PseudoWire Class" section on page 3-163.
- **Delete**—Choose one or more pseudowire classes and then click this button, as explained in the "Deleting a PseudoWire Class" section on page 3-164.

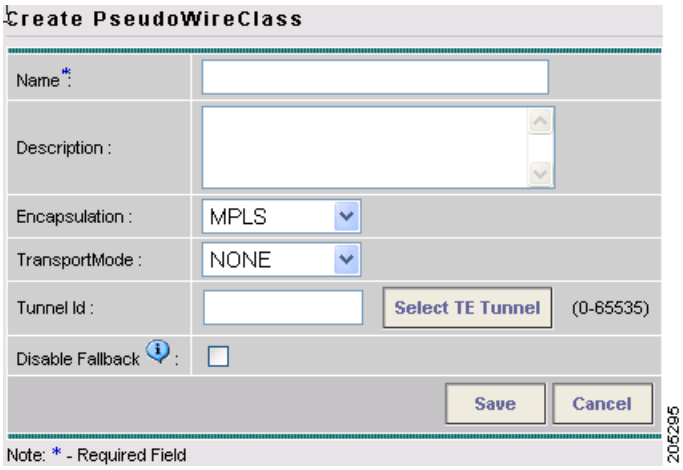
# Creating a PseudoWire Class

To create the PseudoWire Classes window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > PseudoWire Class**.

**Step 2** Click the **Create** button in Figure 3-147 and a window, as shown in Figure 3-148, "Create PseudoWire Class", appears.

*Figure 3-148 Create PseudoWire Class*




**Step 3** In Figure 3-148, specify the following:

- **Name** (required)—Enter a valid PseudoWire Class name of less than 32 characters.
- **Description** (optional)—Enter a meaningful description of less than 128 characters.
- **Encapsulation**—The drop-down list defaults to the only choice, **MPLS**.
- **TransportMode**—From the drop-down list, you can choose **NONE**, **Vlan,** or **Ethernet**.

**Note** The default in the drop-down list is **NONE** unless the Dynamic Component Properties Library (DCPL) property (see Appendix C, "Property Settings") **Services\Common\transportVlanMode** is set to **true**. In that case, the default value is **Vlan**.

**Note** ISC GUI does not support Transport Mode VLAN. You must use the Dynamic Component Properties Library (DCPL) property (see Appendix C, "Property Settings") **Services\Common\pseudoWireVlanMode** and set it to **true**. ISC then generates VLAN transport mode configuration for the pseudowire. The value of this property should *not* be changed during the life of a service request.

The **transport-mode vlan** command is not generated when this DCPL property is set to **false**. PseudoWireClass and the **transport-mode vlan** command do not co-exist.

- **Tunnel Id** (optional)—You can manually enter in this field the identifier of a TE tunnel that has already been provisioned by ISC or that has been manually provisioned on the device (range: 0-65535). Otherwise, you can click on **Select TE Tunnel** and from the pop-up window, you can automatically populate the field by selecting a TE tunnel that has already been provisioned by ISC.

**Note** You cannot use **Service Inventory > Inventory and Connection Manager > Traffic Engineering Management** to delete a chosen TE tunnel.

- **Disable Fallback** (required for IOS XR 3.6.1 and 3.6.2; optional for IOS XR 3.7.0 and 3.7.1)—Choose this option, dependent on your version of IOS XR.

**Note** If the Dynamic Component Properties Library (DCPL) property (see Appendix C, "Property Settings") **Services\Common\disableFallBack** and set it to **true**, the default is that this check box is checked and **Disable Fallback** is available. If this property is set to **false**, the default is that this check box is not checked and **Disable Fallback** is not available.

**Step 4** Click the **Save** button to save your chosen information and you return to Figure 3-147 with a new row of information for the newly created pseudowire class.

**Step 5** Click **Cancel** if you want to return to Figure 3-147 without creating a new pseudowire class.

**Step 6** To use the GUI to associate a pseudowire class to an L2VPN policy or through an L2VPN service request, see the *Cisco IP Solution L2VPN and Center Carrier Ethernet User Guide, 5.2*.

# Editing a PseudoWire Class

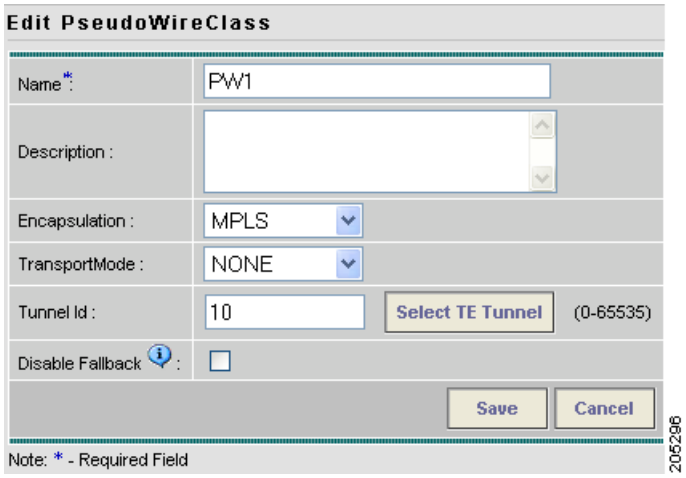
To edit the PseudoWire Classes window, follow these steps:

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > PseudoWire Class**.

**Step 2** In Figure 3-147, check the check box next to the one pseudowire class you want to edit.

**Step 3** Click the **Edit** button in Figure 3-147 and a window, as shown in Figure 3-149, appears with the information of the selected pseudowire class.

***Figure 3-149 Edit PseudoWire Class***




**Step 4** Update the information you want to edit.

**Note** Editing and saving a PseudoWire Class that is in use with a service request shows a new Affected Jobs window that allows you to **Save** or **Save and Deploy** the affected service request. For more details, see the *Cisco IP Solution L2VPN and Center Carrier Ethernet User Guide, 5.2.*

**Step 5** Click the **Save** button to save your chosen information and you return to Figure 3-147 with the row of information for the selected pseudowire class updated.

**Step 6** Click **Cancel** if you want to return to Figure 3-147 without editing your selected pseudowire class.

# Deleting a PseudoWire Class

To delete the PseudoWire Classes window, follow these steps:

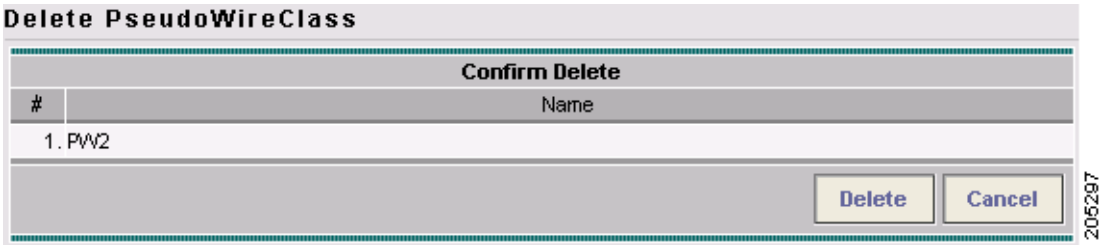
**Note** A PseudoWire Class that is in use with a service request or policy cannot be deleted.

**Step 1** Choose **Service Inventory > Inventory and Connection Manager > PseudoWire Class**.

**Step 2** Check the check box(es) next to the pseudowire class(es) you want to delete.

**Step 3** Click the **Delete** button in Figure 3-147 and a window, as shown in Figure 3-150, appears with the selected pseudowire class name.

*Figure 3-150 Delete PseudoWire Class*




**Step 4** Click the **Delete** button to confirm that you want to delete the specified pseudowire class(es) and you return to Figure 3-147 with the row(s) of information for the selected pseudowire class(es) deleted.

**Step 5** Click **Cancel** if you want to return to Figure 3-147 without deleting the selected pseudowire class(es).