



# CHAPTER 3

## Setting Up Logical Inventory

### 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.

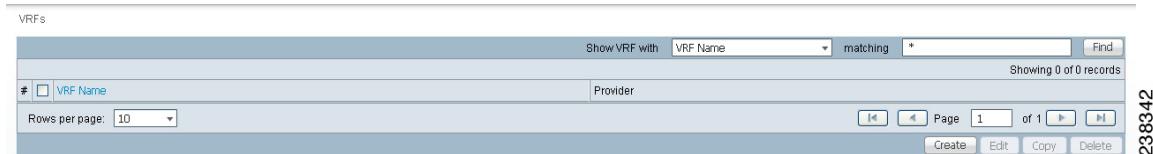
This section describes how you can create and manage independent VRF objects. This section includes the following:

- [Accessing the VRFs Window, page 3-1](#)
- [Creating a VRF, page 3-2](#)
- [Editing VRFs, page 3-5](#)

### Accessing the VRFs Window

The VRF feature is used to create and manage various types of VRFs.

Choose **Inventory > Logical Inventory > VRF** to access the VRF window shown in [Figure 3-1](#).

**Figure 3-1** 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 3-2.
- **Edit**—Check the corresponding check box(es) for VRFs and then click **Edit**. Then proceed to the “[Editing VRFs](#)” section on page 3-5.
- **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 3-2](#).
- **Delete**—Check the corresponding check box(es) for one or more VRFs you want to delete. Then proceed to the “[Deleting VRFs](#)” section on page 3-6.

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## Creating a VRF

After you create a VRF object, you can provision it using a VRF service request, as explained in the [Cisco Prime Fulfillment User Guide 6.1](#).

To create a VRF, follow these steps:

- 
- Step 1** Choose **Inventory > Logical Inventory > VRF**.
  - Step 2** Click **Create**.

The Create VRF window appears, as shown in [Figure 3-2](#).

**Figure 3-2 Create VRF Window**

Create New VRF

VRF Information									
Name *	<input type="text"/>								
Provider *	<input type="button" value="Select"/>								
Description:	<input type="text"/>								
VRF Attributes									
Route Target(s) *	<input type="button" value="Select"/>								
Import RT List:	<input type="text"/>								
Export RT List:	<input type="text"/>								
Import Route Map:	<input type="text"/>								
Export Route Map:	<input type="text"/>								
Maximum Routes (1 - 4294967295):	<input type="text"/>								
Threshold (1 - 100):	<input type="text"/>								
RD Format:	<input type="button" value="RD_AS"/> <input type="checkbox"/>								
RD *:	<input type="text"/> <input type="checkbox"/> Autopick RD								
OSPF Domain ID:	<input type="text"/> Hex value: <input type="text"/>								
Enable IPv4 Multicast:	<input type="checkbox"/>								
Enable IPv6 Multicast:	<input type="checkbox"/>								
Enable Auto Pick MDT Addresses:	<input checked="" type="checkbox"/>								
Default MDT Address (a.b.c.d) *:	<input type="text"/>								
Data MDT Subnet (a.b.c.d) *:	<input type="text"/>								
Data MDT Size:	<input type="button" value="1"/>								
Data MDT Threshold (1 - 4294967):	<input type="text"/> (kilobits/sec)								
Default PIM Mode:	<input type="button" value="SPARSE_DENSE_MODE"/>								
MDT MTU (576 - 65535):	<input type="text"/>								
Enable PIM SSM:	<input type="button" value="DEFAULT"/> <input type="checkbox"/>								
SSM List Name *:	<input type="text"/>								
Multicast Route Limit (1 - 2147483647):	<input type="text"/>								
Enable Auto RP Listener:	<input type="checkbox"/>								
Configure Static-RP:	<input type="checkbox"/>								
PIM Static-RPs *	<input type="button" value="Edit"/> <table border="1"> <thead> <tr> <th>#</th> <th>Static-RP Unicast Address</th> <th>Multicast-Group List Name</th> <th>Override</th> </tr> </thead> <tbody> <tr> <td colspan="4">Showing 0 of 0 records</td> </tr> </tbody></table>	#	Static-RP Unicast Address	Multicast-Group List Name	Override	Showing 0 of 0 records			
#	Static-RP Unicast Address	Multicast-Group List Name	Override						
Showing 0 of 0 records									
	Rows per page: <input type="button" value="10"/> <input type="button"/> <input type="button"/> Page <input type="button" value="1"/> of 1 <input type="button"/> <input type="button"/>								
<input type="button" value="Save"/> <input type="button" value="Cancel"/> <small>Note: * - Required Field</small>									

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**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. **Route Targets** (required)—Click the **Select** button.
- f. From the list of Route Targets, choose only one appropriate Route Target, 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. Prime Fulfillment 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. Prime Fulfillment 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 Prime Fulfillment 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. Route Target 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. Route Target 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 MDT 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.

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## Editing VRFs

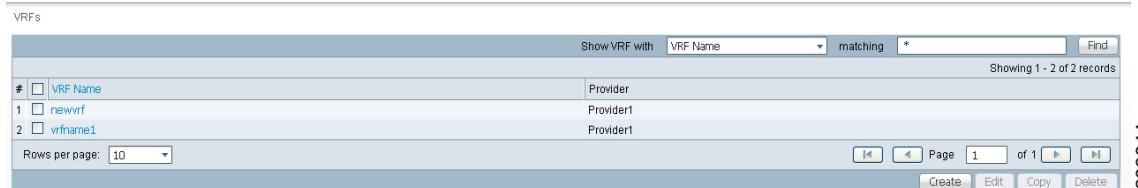
From the VRFs window, you can edit one or more VRFs.

To edit VRF(s), follow these steps:

**Step 1** Choose **Inventory > Logical Inventory > VRF**.

**Step 2** Check the check box(es) for all the VRFs you want to edit, as shown in [Figure 3-3](#), and then click **Edit**.

**Figure 3-3** Choosing VRF(s) to Edit



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**Step 3** If you check only one check box for one VRF, you receive a window similar to [Figure 3-2](#), 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 3-4](#).

**Figure 3-4** Edit VRFs

Edit Multiple VRFs

VRF'S Affecting			
VRF Details	newvrf,vrfname1		
Route Attributes			
Import Targets		Export Targets	
Add			
Remove			
Provider:	Provider1		
CE Routing Communities:	Select		
Import Route Map:			
Export Route Map:			
Multicast Attributes			
Enable IPv4 Multicast:	<input type="checkbox"/>		
Enable IPv6 Multicast:	<input type="checkbox"/>		
Data MDT Size:	1	(1 - 4294967 kilobits/sec)	
Data MDT Threshold:			
Default PIM Mode:	SPARSE_DENSE_MODE		
MDT MTU:	(576 - 65535)		
Enable PIM SSM:	DEFAULT	<input type="checkbox"/>	
SSM List Name *:			
Multicast Route Limit:	(1 - 2147483647)		
Enable Auto RP Listener:	<input type="checkbox"/>		
Save Cancel			
Note: * - Required Field			

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- Step 5** In the **VRFs Affecting** section of [Figure 3-4](#), 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 3-4](#), 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 3-2. See the “[Creating a VRF](#)” section on page 3-2 for information about the remaining fields you want to edit.
- Step 7** In the **Multicast Attributes** section of [Figure 3-4](#), you can edit the fields. See the “[Creating a VRF](#)” section on page 3-2 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 **Inventory > Logical Inventory > 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 3-7](#)
- [Creating a VPN, page 3-8](#)
- [Deleting VPNs, page 3-11](#)

## Accessing the VPNs Window

The VPN feature is used to create and manage various types of VPNs.

Choose **Inventory > Logical Inventory > VPN** to access the VPN window shown in [Figure 3-5](#).

**Figure 3-5** VPNs Window


The screenshot shows a table titled "VPNs" with two columns: "VPN Name" and "Customer Name". The "VPN Name" column lists entries from vpn1 to vpn15. The "Customer Name" column lists "Customer1" for most entries, except for vpn15 which is listed as "Customer2". The table includes a header row with a checkbox, a search bar at the top right, and navigation buttons at the bottom right.

#	VPN Name	Customer Name
1	vpn1	Customer1
2	vpn10	Customer1
3	vpn11	Customer1
4	vpn12	Customer1
5	vpn14	Customer1
6	vpn15	Customer2
7	vpn2	Customer1
8	vpn3	Customer1
9	vpn4	Customer1
10	vpn5	Customer1

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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 3-8.
- **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 3-6 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 3-11.

## Creating a VPN

To create a VPN, follow these steps:

**Step 1** Choose **Inventory > Logical Inventory > VPN**.

**Step 2** Click **Create**.

The Create VPN window appears, as shown in Figure 3-6.

**Figure 3-6** Create VPN Window

Create New VPN

<b>VPN Information</b>
Name*: <input type="text"/>
Customer*: <input type="button" value="Select"/>
<b>MPLS Attributes</b>
Create Default Route Target(s): <input type="checkbox"/> Select Provider
Enable Unique Route Distinguisher: <input type="checkbox"/>
OSPF Domain ID: <input type="text"/> Hex value: <input type="text"/>
Enable IPv4 Multicast: <input type="checkbox"/>
Enable IPv6 Multicast: <input type="checkbox"/>
Enable Auto Pick MDT Addresses: <input checked="" type="checkbox"/>
Default MDT Address (a.b.c.d)*: <input type="text"/>
Data MDT Subnet (a.b.c.d)*: <input type="text"/>
Data MDT Size: <input type="text"/>
Data MDT Threshold (1 - 4294967): <input type="text"/> (kilobits/sec)
Default PIM Mode: SPARSE_DENSE_MODE
MDT MTU (576 - 65535): <input type="text"/>
Enable PIM SSM: DEFAULT
SSM List Name*: <input type="text"/>
Multicast Route Limit (1 - 2147483647): <input type="text"/>
Enable Auto RP Listener: <input type="checkbox"/>
Configure Static-RP: <input type="checkbox"/>
<b>PIM Static-RPs</b>
PIM Static-RPs*: <input type="button" value="Edit"/>
# Static-RP Unicast Address Multicast-Group List Name Override
Rows per page: 10 <input type="button" value="Page"/> 1 of 1 <input type="button" value="Next"/>
Route Target(s): <input type="button" value="Select"/> <input type="button" value="Remove"/>
<b>VPLS Attributes</b>
Enable VPLS: <input type="checkbox"/>
VPLS VPN Id (1-2147483646): <input type="text"/>
Service Type: ERS
Topology: Full Mesh
<input type="button" value="Save"/> <input type="button" value="Cancel"/>
Note: * - Required Field

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**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 Route Targets** (optional)—To create a default Route Targets, check the **Create Default Route Targets** 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 MDT 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. **Route Targets** (optional)—If **Enable Multicast** is set on, **Route Targets** is required. If you do not choose to enable the default Route Target, you can select a customized Route Target that you have already created in Prime Fulfillment. From the Route Targets pane, click **Select**.  
The Select Route Targets window is displayed.
- v. Check the check box for the Route Target you want used for this service policy, then click **Select**. You return to the Create VPN window, where the new Route Target 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 **Inventory > Logical Inventory > VPN**.

## ■ Named Physical Circuits

**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.

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## 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 Prime Fulfillment software, the device you select can be any node in the link. The Prime Fulfillment 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.

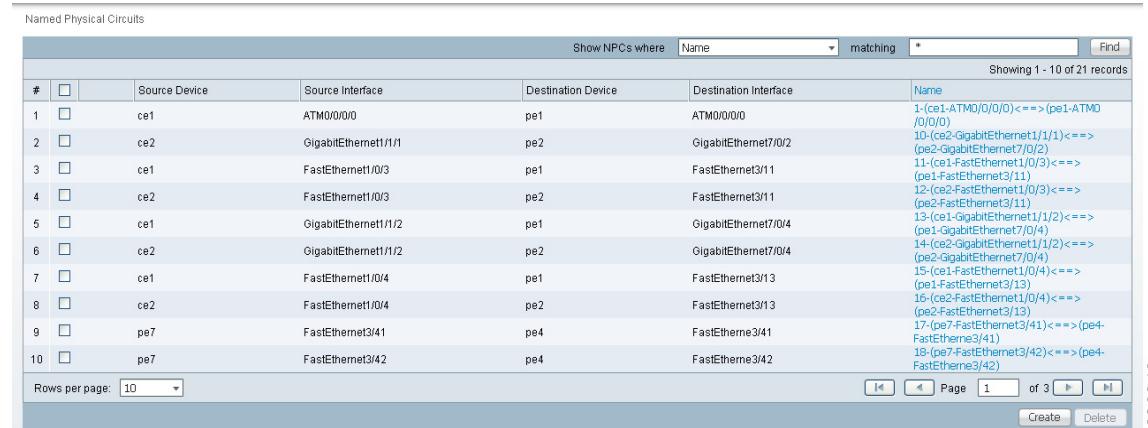
This section describes how you can create and delete NPCs and create, edit, and delete NPC Rings. This section includes the following:

- [Accessing the Named Physical Circuits Window, page 3-12](#)
- [Creating a Named Physical Circuit, page 3-13](#)
- [Deleting Named Physical Circuits, page 3-15](#)
- [Creating Physical Rings, page 3-16](#)
- [Editing Physical Rings, page 3-19](#)
- [Deleting Physical Rings, page 3-19](#)

## Accessing the Named Physical Circuits Window

The Named Physical Circuits feature is used to create and delete NPCs. You cannot edit or modify.

Choose **Inventory > Logical Inventory > Named Physical Circuits** to access the window shown in Figure 3-7.

**Figure 3-7** Named Physical Circuits Window


#	Device	Source Interface	Destination Device	Destination Interface	Name
1	ce1	ATM0/0/0/0	pe1	ATM0/0/0/0	1-(ce1-ATM0/0/0)<==>(pe1-ATM0/0/0)
2	ce2	GigabitEthernet1/1/1	pe2	GigabitEthernet7/0/2	10-(ce2-GigabitEthernet1/1/1)<==>(pe2-GigabitEthernet7/0/2)
3	ce1	FastEthernet1/0/3	pe1	FastEthernet3/1/1	11-(ce1-FastEthernet1/0/3)<==>(pe1-FastEthernet3/1/1)
4	ce2	FastEthernet1/0/3	pe2	FastEthernet3/1/1	12-(ce2-FastEthernet1/0/3)<==>(pe2-FastEthernet3/1/1)
5	ce1	GigabitEthernet1/1/2	pe1	GigabitEthernet7/0/4	13-(ce1-GigabitEthernet1/1/2)<==>(pe1-GigabitEthernet7/0/4)
6	ce2	GigabitEthernet1/1/2	pe2	GigabitEthernet7/0/4	14-(ce2-GigabitEthernet1/1/2)<==>(pe2-GigabitEthernet7/0/4)
7	ce1	FastEthernet1/0/4	pe1	FastEthernet3/1/3	15-(ce1-FastEthernet1/0/4)<==>(pe1-FastEthernet3/1/3)
8	ce2	FastEthernet1/0/4	pe2	FastEthernet3/1/3	16-(ce2-FastEthernet1/0/4)<==>(pe2-FastEthernet3/1/3)
9	pe7	FastEthernet3/4/1	pe4	FastEthernet3/4/1	17-(ce7-FastEthernet3/4/1)<==>(pe4-FastEthernet3/4/1)
10	pe7	FastEthernet3/4/2	pe4	FastEthernet3/4/2	18-(ce7-FastEthernet3/4/2)<==>(pe4-FastEthernet3/4/2)

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. Then proceed to the “[Creating a Named Physical Circuit](#)” section on page 3-13
- **Delete**—Click to delete selected NPC(s) (select by checking the corresponding box(es)). Enabled only if one or more NPCs are selected. Then proceed to the “[Deleting Named Physical Circuits](#)” section on page 3-15

## Creating a Named Physical Circuit

To add an NPC physical link, follow these steps:

**Step 1** Choose **Inventory > Logical Inventory > Named Physical Circuit**.

**Step 2** Click the **Create** button in [Figure 3-7](#), and a window, as shown in [Figure 3-8](#), appears.

**Figure 3-8** Create a Named Physical Circuit Window


Create Named Physical Circuits					
Named Physical Circuit Information					
#	Device	Incoming Interface	Outgoing Interface	Ring	
					<input type="button" value="Insert Device"/> <input type="button" value="Insert Ring"/> <input type="button" value="Add Device"/> <input type="button" value="Add Ring"/> <input type="button" value="Save"/> <input type="button" value="Cancel"/>

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 Physical Rings](#)” section on page 3-16.

**Named Physical Circuits**

**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 3-9](#), appears.

**Figure 3-9 Select Device Window**

#	Device Name	Customer Name	Site Name	Management Type
1	ce1	Customer1	site1	MANAGED
2	ce10	Customer1	site3	MULTI_VRF
3	ce11	Customer1	site4	MULTI_VRF
4	ce12	Customer1	site4	MULTI_VRF
5	ce2	Customer1	site2	MANAGED
6	ce3	Customer1	site3	MANAGED
7	ce4	Customer1	site4	MANAGED
8	ce5	Customer1	site1	MULTI_VRF
9	ce6	Customer1	site3	MULTI_VRF
10	ce7	Customer1	site4	MULTI_VRF

Showing 1 - 10 of 12 records

Rows per page: 10

Select Cancel

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- 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 3-8](#), “Create a Named Physical Circuit Window,” reappears with the chosen **Device**.

**Figure 3-10 Create Named Physical Circuit Window**

Create Named Physical Circuits				
Named Physical Circuit Information				
#	Device	Incoming Interface	Outgoing Interface	Ring
1	<input type="checkbox"/> ce1	Select incoming interface	Select outgoing interface	
2	<input type="checkbox"/> ce5			

Insert Device Insert Ring Add Device Add Ring Delete Save Cancel

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- 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 3-8](#) 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 3-8](#) 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 3-8](#), click **Select outgoing interface** and a window appears with a list of interfaces.

- Step 8** Click a radio button next to the interface to be the source interface for this NPC and then click **Select**. [Figure 3-8](#), reappears with the chosen **Interface**.

- Step 9** In the **Incoming Interface** column in this new version of [Figure 3-8](#), click **Select incoming interface** and a window appears with a list of interfaces.

- Step 10** Click a radio button next to the interface to be the incoming interface for this NPC and then click **Select**. [Figure 3-8](#), 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 Physical Rings](#)” section on page 3-16, 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**.



**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](#).

- Step 12** Click a radio button next to the ring you choose and then click **Select**. [Figure 3-8](#), reappears with the chosen **Ring**.
- Step 13** Select the missing devices and interfaces as explained in the “[Creating Physical Rings](#)” section on page 3-16.
- 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 3-8](#), reappears with the new NPC listed.

## Deleting Named Physical Circuits

To delete NPC(s), follow these steps:

- Step 1** Choose **Inventory > Logical Inventory > Named Physical Circuits** to access the window shown in [Figure 3-7](#).

- 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 3-7](#), reappears with the specified NPCs deleted.

## Physical Rings

The Physical Rings feature is used to create, edit, delete, and cancel the Physical Rings.

This section describes how you can create, edit and delete Physical Rings. This section includes the following:

- [Accessing the Physical Rings Window, page 3-16](#)
- [Creating Physical Rings, page 3-16](#)

## Physical Rings

- Deleting Physical Rings, page 3-19
- Deleting Physical Rings, page 3-19

## Accessing the Physical Rings Window

The Physical Rings feature is used to create, edit, and delete Physical Rings.

Choose **Inventory > Logical Inventory > Physical Rings** to access the window shown in [Figure 3-11](#).

**Figure 3-11 Physical Rings Window**

The screenshot shows a software interface titled "Physical Rings". At the top right is a search bar labeled "Show Physical Rings with name matching" with a placeholder "\*". Below it is a button labeled "Find". To the right of the search bar, it says "Showing 1 - 4 of 4 records". The main area contains a table with four rows, each representing a physical ring. The columns are labeled "#", "Name", and "Actions". Row 1: #1, Name 1-pe3-FastEthernet3/31, Actions Create, Edit, Delete, Cancel. Row 2: #2, Name 2-pe3-FastEthernet3/22, Actions Create, Edit, Delete, Cancel. Row 3: #3, Name 3-pe5-FastEthernet3/13, Actions Create, Edit, Delete, Cancel. Row 4: #4, Name 4-pe1-GigabitEthernet1/0/2, Actions Create, Edit, Delete, Cancel. Below the table is a dropdown menu "Rows per page" set to 10. At the bottom right are navigation buttons: back, forward, page number (1), of 1, and next. A timestamp "238352" is visible on the far right.

From the Physical Circuits window, you can create, edit, or delete Physical Rings using the following buttons:

- **Create**—Click to create new Physical Rings. Enabled only if no Physical Rings is selected. Then proceed to the “[Creating Physical Rings](#)” section on page 3-16.
- **Edit**—Check the corresponding check box(es) for Physical Rings and then click **Edit**. Then proceed to the “[Editing Physical Rings](#)” section on page 3-19.
- **Delete**—Check the corresponding check box(es) for one or more Physical Rings you want to delete. Then proceed to the “[Deleting Physical Rings](#)” section on page 3-19.

## Creating Physical Rings

To create physical rings, follow these steps:

**Step 1** Choose **Inventory > Logical Inventory > Physical Rings** and a window as shown in [Figure 3-11](#).

**Step 2** Click the **Create** button and a window as shown in [Figure 3-12](#).

A ring has a minimum of three physical links that form a ring.

**Figure 3-12 Create Ring Window**

The screenshot shows a software interface titled "Create New Physical Ring". At the top left is the title "Create New Physical Ring". Below it is a table with four columns: "#", "Source Device", "Source Interface", "Destination Device", and "Destination Interface". There are three rows, each starting with a checkbox labeled "Select source device". The "Source Interface" column contains "Select source interface" repeated three times. The "Destination Device" and "Destination Interface" columns also contain "Select destination device" repeated three times. At the bottom right are buttons: "Edit Cross Links", "Insert", "Delete", "Save", and "Cancel". A timestamp "238353" is visible on the far right.



**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 3-13](#).



**Note** The CPE you choose *must* be a Multi-VRF CE.

**Figure 3-13 Select Source Device – CPE/PE Window**

#	Device Name	Customer Name	Site Name	Management Type
1	ce1	Customer1	site1	MANAGED
2	ce10	Customer1	site3	MULTI_VRF
3	ce11	Customer1	site4	MULTI_VRF
4	ce12	Customer1	site4	MULTI_VRF
5	ce2	Customer1	site2	MANAGED
6	ce3	Customer1	site3	MANAGED
7	ce4	Customer1	site4	MANAGED
8	ce5	Customer1	site1	MULTI_VRF
9	ce6	Customer1	site3	MULTI_VRF
10	ce7	Customer1	site4	MULTI_VRF

Rows per page: 10      Page 1 of 2      Select      Cancel

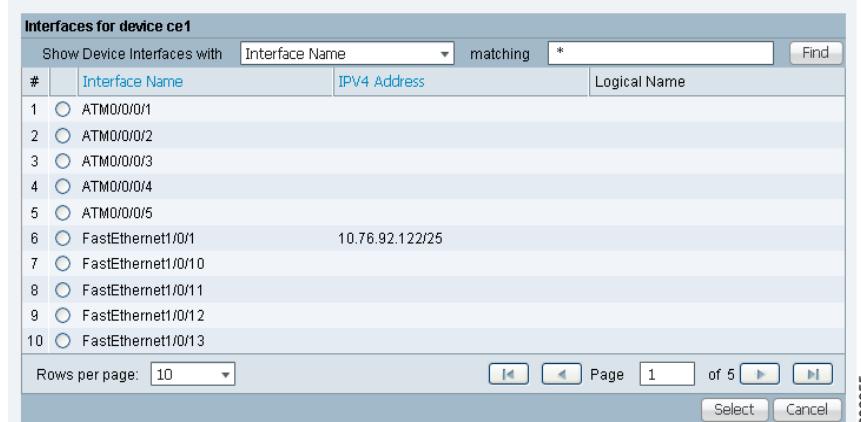
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**Step 5** Click a radio button next to the device to be the source device for this physical link and then click **Select**. [Figure 3-12](#), reappears with the chosen **Source Device**.



**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 3-12](#), click **Select source interface** and a window as shown in [Figure 3-14](#), appears with a list of interfaces.

**Figure 3-14 Select Source Interface Window**

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- Step 7** Click a radio button next to the interface to be the source interface for this physical link and then click **Select**. [Figure 3-12](#), reappears with the chosen **Source Interface**.
- Step 8** In the **Destination Device** column in this new version of [Figure 3-12](#), click **Select destination device** and a window as shown in [Figure 3-13](#), appears.
- Step 9** Click a radio button next to the device to be the destination device for this physical link and then click **Select**.

[Figure 3-12](#), 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 3-12](#), click **Select destination interface** and a window as shown in [Figure 3-14](#), appears with a list of interfaces.
- Step 11** Click a radio button next to the interface to be the destination interface for this NPC and then click **Select**. [Figure 3-12](#), 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 3-12](#), and you then view a new window like [Figure 3-12](#) 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 3-12](#) 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 3-11](#), 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 3-12](#) to which you want to insert and the **Insert** button is then enabled. Proceed in adding links as explained in this section.

## Editing Physical Rings

To edit physical rings, follow these steps:



**Note**

If the specified Physical 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 **Inventory > Logical Inventory > Physical Rings** and a window appears.
- 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 3-12](#), appears with all the data for this ring. Proceed as in the “[Creating Physical Rings](#)” section on page 3-16 to make any changes you want.
- Step 3** When you have the ring as you want it, click **Save**. [Figure 3-11](#), appears with the appropriate name (source device-source interface) and a green check for Succeeded appears.

## Deleting Physical Rings

To delete physical 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 **Inventory > Logical Inventory > Physical Rings** and a window appears.
- 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**.
- Step 3** Click **Cancel** if you change your mind about deleting the chosen ring(s) or click **Delete** to actually delete the ring.

[Figure 3-11](#), appears with the remaining ring names and a green check for Succeeded appears.

# Pseudo Wire 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 Prime Fulfillment 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:

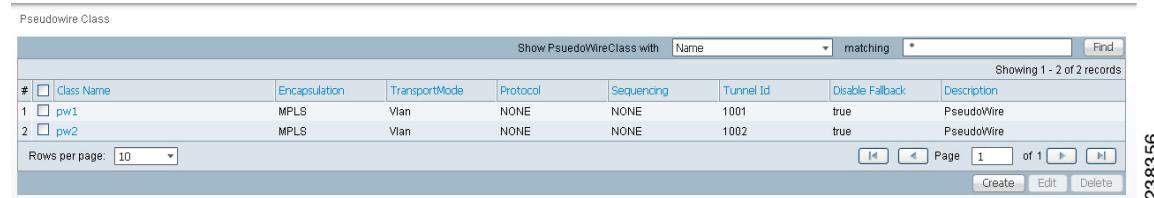
- [Accessing the PseudoWire Class Window, page 3-20](#)
- [Creating a PseudoWire Class, page 3-20](#)
- [Editing a PseudoWire Class, page 3-22](#)
- [Deleting a PseudoWire Class, page 3-22](#)

## Accessing the PseudoWire Class Window

The PseudoWire Class feature is used to create, edit, and delete pseudowire classes.

Choose **Inventory > Logical Inventory > PseudoWire Class** to access the window shown in [Figure 3-15](#).

**Figure 3-15 PseudoWire Classes Window**



#	Class Name	Encapsulation	TransportMode	Protocol	Sequencing	Tunnel Id	Disable Fallback	Description
1	pw1	MPLS	Vlan	NONE	NONE	1001	true	PseudoWire
2	pw2	MPLS	Vlan	NONE	NONE	1002	true	PseudoWire

From [Figure 3-15](#), 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 3-20.
- **Edit**—Choose one pseudowire class to edit and then click this button, as explained in the “[Editing a PseudoWire Class](#)” section on page 3-22.
- **Delete**—Choose one or more pseudowire classes and then click this button, as explained in the “[Deleting a PseudoWire Class](#)” section on page 3-22.

## Creating a PseudoWire Class

To create the PseudoWire Classes window, follow these steps:

- 
- Step 1** Choose **Inventory > Logical Inventory > PseudoWire Class**.

**Step 2** Click the **Create** button in Figure 3-15 and a window as shown in Figure 3-16 appears.

**Figure 3-16 Create PseudoWire Class**

The screenshot shows the 'Create Pseudowire Class' dialog box. The 'PseudoWireClass Information' section contains the following fields:

- Name\***: A text input field.
- Description**: A large text area for notes.
- Encapsulation**: A dropdown menu set to **MPLS**.
- TransportMode**: A dropdown menu set to **NONE**.
- Protocol**: A dropdown menu set to **NONE**.
- Sequencing**: A dropdown menu set to **NONE**.
- Tunnel Id**: A dropdown menu labeled 'Select TE Tunnel' with a value '(0-65535)'.
- Disable Fallback**: A checkbox.

At the bottom right are 'Save' and 'Cancel' buttons. Below the dialog is a note: 'Note: \* - Required Field'.

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**Step 3** In Figure 3-16, 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 B, “Property Settings”](#)) **Services\Common\transportVlanMode** is set to **true**. In that case, the default value is **Vlan**.



Prime Fulfillment GUI does not support Transport Mode VLAN. You must use the Dynamic Component Properties Library (DCPL) property (see [Appendix B, “Property Settings”](#)) **Services\Common\pseudoWireVlanMode** and set it to **true**. Prime Fulfillment 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 Prime Fulfillment 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 Prime Fulfillment.



**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 B, “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 3-15](#) with a new row of information for the newly created pseudowire class.
- Step 5** Click **Cancel** if you want to return to [Figure 3-15](#) 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 Prime Fulfillment User Guide 6.1](#).
- 

## Editing a PseudoWire Class

To edit the PseudoWire Classes window, follow these steps:

- 
- Step 1** Choose **Inventory > Logical Inventory > PseudoWire Class**.
- Step 2** In [Figure 3-15](#), check the check box next to the one pseudowire class you want to edit.
- Step 3** Click the **Edit** button in [Figure 3-15](#) and a window appears with the information of the selected 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 Prime Fulfillment User Guide 6.1](#).

- 
- Step 5** Click the **Save** button to save your chosen information and you return to [Figure 3-15](#) with the row of information for the selected pseudowire class updated.
- Step 6** Click **Cancel** if you want to return to [Figure 3-15](#) 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 **Inventory > Logical Inventory > 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 3-15](#) and a window appears with the selected pseudowire class name.
- Step 4** Click the **Delete** button to confirm that you want to delete the specified pseudowire class(es) and you return to [Figure 3-15](#) with the row(s) of information for the selected pseudowire class(es) deleted.
- Step 5** Click **Cancel** if you want to return to [Figure 3-15](#) without deleting the selected pseudowire class(es).

■ Pseudo Wire Class