



Provisioning MPLS VPN Cable Services

This chapter provides a conceptual summary of the MPLS VPN Cable feature as implemented through the VPN Solutions software. It also describes how to use VPN Solutions software to provision cable services. The main topics presented in this chapter are as follows:

- MPLS VPN Cable Feature Overview, page 7-1
- Creating a Cable-CE in VPNSC Software, page 7-5
- Provisioning the Cable Maintenance Subinterface, page 7-9
- Provisioning the Cable Link, page 7-18

MPLS VPN Cable Feature Overview

Using MPLS VPN technology, service providers can create scalable and efficient private networks using a shared Hybrid Fiber Coaxial (HFC) network and Internet Protocol (IP) infrastructure. The cable MPLS VPN network consists of the following two major elements:

- The Multiple Service Operator (MSO) or cable company that owns the physical infrastructure and builds VPNs for the Internet Service Providers (ISPs) to move traffic over the cable and IP backbone.
- ISPs that use the HFC network and IP infrastructure to supply Internet service to cable customers.

The Cable MPLS VPN Network

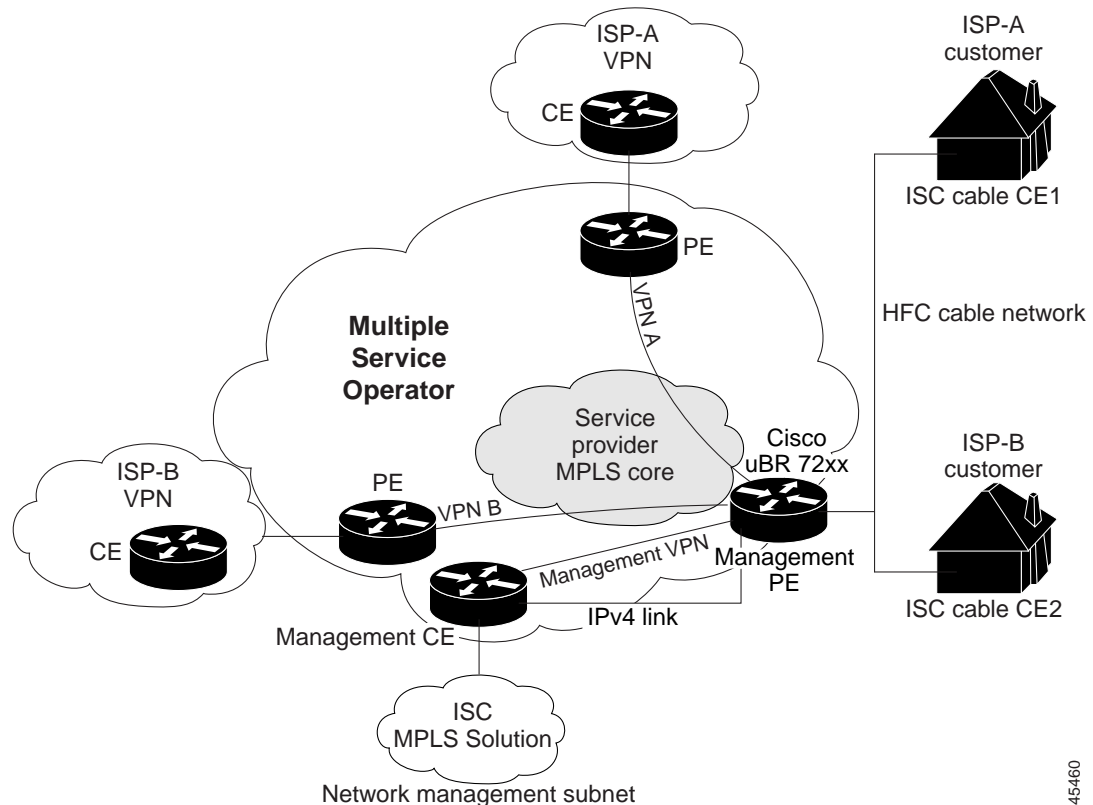
As shown in Figure 7-1, each ISP moves traffic to and from a subscriber's PC, through the MSO's physical network infrastructure, to the ISP's network. MPLS VPNs, created in Layer 3, provide privacy and security by constraining the distribution of a VPN's routes only to the routers that belong to its network. Thus, each ISP's VPN is insulated from other ISPs that use the same MSO infrastructure.

In the MPLS-based cable scheme, a VPN is a private network built over a shared cable plant and MPLS-core backbone. The public network is the shared cable plant or backbone connection points. A cable plant can support Internet access services and carry traffic for an MSO and its subscribers, as well as for multiple Internet Service Providers (ISPs) and their subscribers.

An MPLS VPN assigns a unique VPN Routing/Forwarding (VRF) instance to each VPN. A VRF instance consists of an IP routing table, a derived forwarding table, a set of interfaces that use the forwarding table, and a set of rules and routing protocols that determine the contents of the forwarding table.

Each PE router maintains one or more VRF tables. If a packet arrives directly through an interface associated with a particular VRF, the PE looks up a packet's IP destination address in the appropriate VRF table. MPLS VPNs use a combination of BGP and IP address resolution to ensure security.

Figure 7-1 Example of an MPLS VPN Cable Network



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The routers in the cable network are as follows:

- **Provider (P) router**—Routers in the MPLS core of the service provider network. P routers run MPLS switching, and do not attach VPN labels (MPLS labels in each route assigned by the PE router) to routed packets. VPN labels direct data packets to the correct egress router.
- **Provider Edge (PE) router**—A router that attaches the VPN label to incoming packets based on the interface or subinterface on which they are received. A PE router attaches directly to a CE router. In the MPLS-VPN approach, each Cisco uBR7200 series router acts as a PE router.
- **Customer (C) router**—A router in the ISP or enterprise network.
- **Customer Edge (CE) router**—Edge router on the ISP's network that connects to the PE router on the MSO's network. A CE router must interface with a PE router.
- **Cable CE**—The cable CE is an object with the VPN Solutions Center only. In the VPN Solutions Center software, the cable CE represents the cable modem and its associated hosts for a particular site (see the "Creating a Cable-CE in VPNSC Software" section on page 7-5).
- **Management PE (MPE) router**—The MPE *emulates* the role of a PE in the provider core network. The MPE connects the MCE to the provider core network. An MPE can have a dual role as both a PE and the MPE.

- Management CE (MCE) router—The network management subnet is connected to the Management CE (MCE). The MCE *emulates* the role of a customer edge router (CE), but the MCE is in provider space and serves as a network operations center gateway router. The MCE is part of a management site as defined in the VPN Solutions Center software.

The shared cable plant supports Internet connectivity from ISP A to its subscribers and from ISP B to its subscribers.

The Management VPN in the Cable Network

The MPLS network has a unique VPN that exclusively manages the MSOs devices called the *management VPN*. It contains servers and devices that other VPNs can access. The management VPN connects the Management CE (MCE) router and the management subnet to the MSO PE router (a Cisco uBr72xx router or equivalent). VPN Solutions Center and the management servers, such as Dynamic Host Configuration Protocol (DHCP), Cisco Network Registrar (CNR) Time of Day (ToD) are part of the management subnet and are within the management VPN for ISP connectivity.

As shown in Figure 7-1, the management VPN is comprised of the network management subnet (where the VPN Solutions Center workstation resides), which is directly connected to the Management CE (MCE). The management VPN is a special VPN for the MCE and the cable VPN gateway. The cable VPN gateway is usually a Cisco uBR 72xx router that functions as both a regular PE and a Management PE. Notice that there is also a parallel IPv4 link between the MCE and the MPE.

Cable VPN Configuration Overview

Cable VPN configuration involves the following:

- An MSO domain that requires a direct peering link to each enterprise network (ISP), provisioning servers for residential and commercial subscribers, and dynamic DNS for commercial users. The MSO manages cable interface IP addressing, Data Over Cable Service Interface Specifications (DOCSIS) provisioning, cable modem hostnames, routing modifications, privilege levels, and usernames and passwords.
- An ISP or enterprise domain that includes the DHCP server for subscriber or telecommuter host devices, enterprise gateway within the MSO address space, and static routes back to the telecommuter subnets.



Note

Cisco recommends that the MSO assign all addresses to the end user devices and gateway interfaces. The MSO can also use split management to let the ISP configure tunnels and security.

To configure MPLS VPNs for cable services, the MSO must configure the following:

- Cable Modem Termination System (CMTS)

The CMTS is usually a Cisco uBR72xx series router. The MSO must configure Cisco uBR72xx series routers that serve the ISP.

- PE routers

The MSO must configure PE routers that connect to the ISP as PEs in the VPN.

**Tips**

When configuring MPLS VPNs for cable services, you must configure the cable maintenance subinterface on the PE. The cable maintenance interface is the means by which the cable device retrieves its own IP address. For this reason, the maintenance subinterface must be configured before cable services provisioning can take place. See the “Provisioning the Cable Maintenance Subinterface” section on page 7-9.

- CE routers
- P routers
- One VPN per ISP
- DOCSIS servers for all cable modem customers

The MSO must attach DOCSIS servers to the management VPN and make them visible to the network.

The MSO must determine the *primary IP address range*. The primary IP address range is the MSO’s address range for all cable modems that belong to the ISP subscribers.

The ISP must determine the *secondary IP address range*. The secondary IP address is the ISP’s address range for its subscriber PCs.

To reduce security breaches and differentiate DHCP requests from cable modems in VPNs or under specific ISP management, MSOs can use the **cable helper-address** command in Cisco IOS software. The MSO can specify the host IP address to be accessible only in the ISP’s VPN. This lets the ISP use its DHCP server to allocate IP addresses. Cable modem IP address must be accessible from the management VPN.

In VPN Solutions Center 1.2 software, you specify the maintenance helper address (see the “Specifying the Cable Maintenance Helper Address” section on page 7-14), and the host helper address and the secondary addresses for the cable subinterface (see “Specifying the Cable Helper Addresses” section on page 7-23).

Cable VPN Interfaces and Subinterfaces

In the cable subscriber environment, several thousand subscribers share a single physical interface. Configurations with multiple logical subinterfaces are a vital part of the MPLS VPN network over cable. You can configure multiple subinterfaces and associate a specific VRF with each subinterface. You can split a single physical interface (the cable plant) into multiple subinterfaces, where each subinterface is associated with a specific VRF. Each ISP requires access on a physical interface and is given its own subinterface. The MSO administrator can define subinterfaces on a cable physical interface and assign Layer 3 configurations to each subinterface.

The MPLS VPN approach of creating VPNs for individual ISPs or customers requires subinterfaces to be configured on the cable interface. One subinterface is required for each ISP. The subinterfaces are tied to the VPN Routing/Forwarding (VRF) tables for their respective ISPs.

You must create the *maintenance subinterface* on the cable interface and tie it to the management VPN. The maintenance interface is for the ISP’s use, and it is used for VPN connectivity, as well as the management VPN using an extranet between the ISP and the management VPN (for details, see “Provisioning the Cable Maintenance Subinterface” section on page 7-9).

VPN Solutions Center software automatically selects the subinterface number based on the VRF. If a subinterface that is associated with the current VRF does not yet exist, VPNSC software creates a subinterface and assigns it to the correct VRF. The subinterface number is incremented to 1 greater than the largest subinterface currently assigned for the selected cable interface.

The network management subnet (which includes the CNR, ToD, and VPN Solutions Center) can reply to the cable modem because the management VPN allows connectivity for one filtered route from the ISP's VPN to the Management CE (MCE). Similarly, in order to forward the management requests (such as DHCP renewal to CNR), the ISP VPN must import a route to the MCE in the management VPN.

Cisco uBR7200 series software supports the definition of logical network layer interfaces over a cable physical interface. The system supports subinterface creation on a physical cable interface.

Subinterfaces allow traffic to be differentiated on a single physical interface and associated with multiple VPNs. Each ISP requires access on a physical interface and is given its own subinterface. Using each subinterface associated with a specific VPN (and therefore, ISP) subscribers connect to a logical subinterface, which reflects the ISP that provides their subscribed services. Once properly configured, subscriber traffic enters the appropriate subinterface and VPN.

Creating a Cable-CE in VPNSC Software

The tasks you must complete to provision cable services in VPN Solutions Center software are as follows:

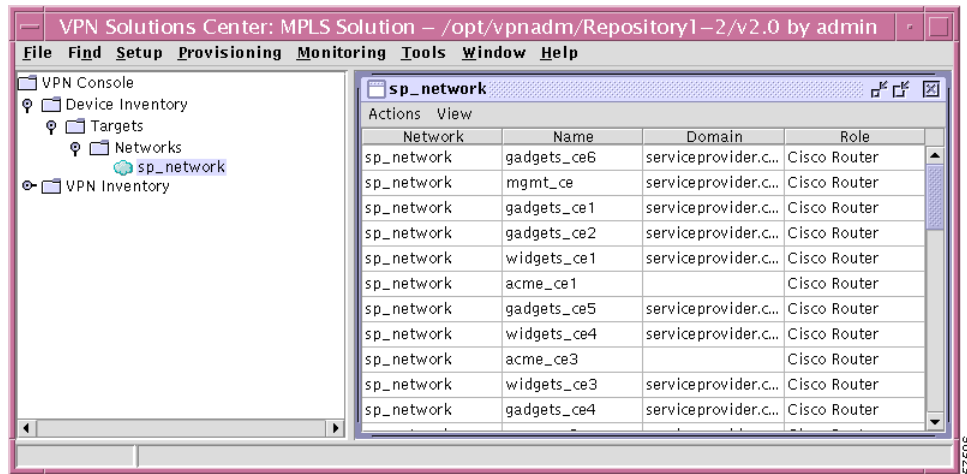
- Create a stand-in cable-CE (described in this section). This cable-CE is an object within VPNSC software only. It represents the cable modem and its associated hosts for a particular site.
- Add the PE that has cable interfaces to the appropriate Provider Administrative Domain region (for procedural details, see the “Adding Provider Edge Routers to a Region” section on page 2-54).
- Generate a service request to provision the cable maintenance interface on the PE (see the “Provisioning the Cable Maintenance Subinterface” section on page 7-9). You need only generate this service request once for each physical cable interface.
- Generate a second service request to provision the MPLS-based cable service (“Provisioning the Cable Link” section on page 7-18). You must generate this cable service request for each VPN.

When using the VPN Solutions Center to provision cable services, there are no CEs in the same sense there are when provisioning a standard MPLS VPN. Thus, you must create an unmanaged *cable-CE* that “stands in” for a CE in the provisioning process. You need define only one cable-CE per customer site.

To create a cable-CE in VPN Solutions Center software, follow these steps.

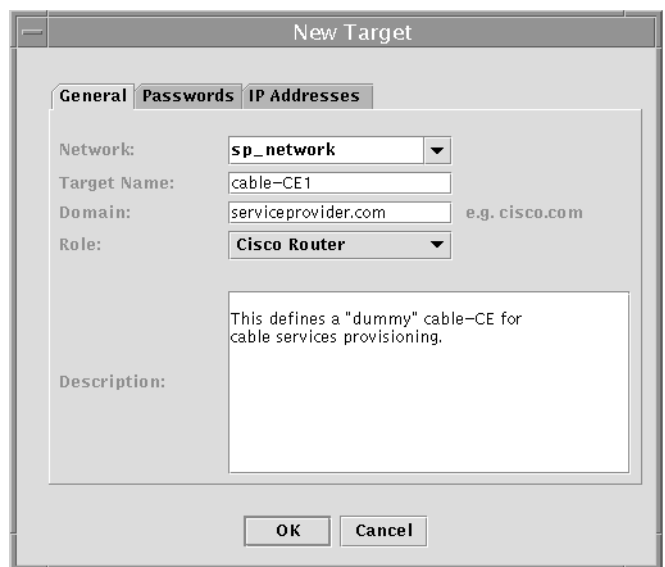
- Step 1** In the VPN Console, open the Networks folder and select the pertinent network. The Network window appears (see Figure 7-2).

Figure 7-2 The Network Window



- Step 2** From the Network window, choose **Actions > New Target**. The New Target dialog box appears (see Figure 7-3).

Figure 7-3 Creating a Cable-CE



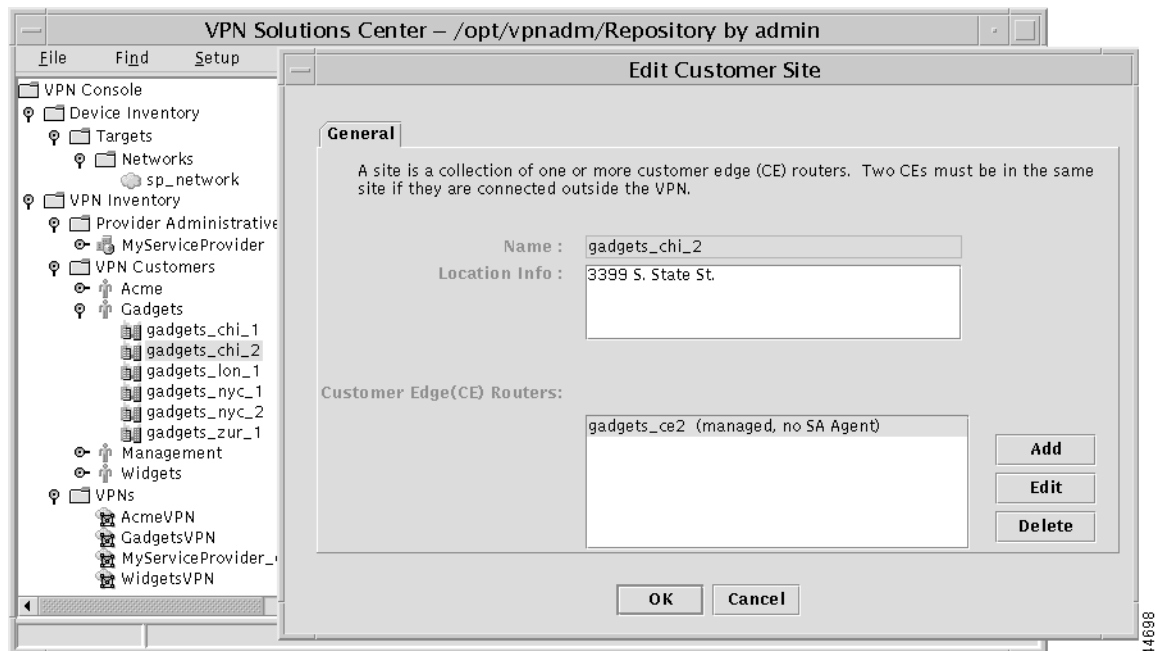
- Step 3** Complete the fields displayed in the General tab. You do not need to complete the fields in the Passwords and IP Addresses tabs.

- a. In the *Target Name* field, enter the name of the cable-CE.

This cable-CE is an object within VPNSC software only. It represents the cable modem and its associated hosts for a particular site.

- b. In the *Domain* field, enter the name of a nonexistent domain.
 - c. Though optional, we recommend that you enter any pertinent information about the cable-CE.
 - d. Click **OK**.
- Step 4** In the VPN Console, open the VPN Customers folder.
- Step 5** Select the appropriate customer, then to display the list of sites for that customer, open the customer icon.
- Step 6** Double-click the customer site where you want to place the cable-CE. The Edit Customer Site dialog box appears (see Figure 7-4).

Figure 7-4 *Editing the Customer Site*



- Step 7** In the Edit Customer Site dialog box, click **Add**.
- The Add Customer Edge Routers dialog box appears. Figure 7-5 shows only the lower portion of this dialog box.

Figure 7-5 Adding the Cable-CE to the Network

sp_network	pe4	serviceprovider....	Cisco Router	PE
sp_network	pe5	serviceprovider....	Cisco Router	PE
sp_network	acme_ce4	serviceprovider....	Cisco Router	CE
sp_network	cable-ce1	serviceprovider....	Cisco Router	

☐ This customer edge router is managed by the provider.
☒ No SA Agent
☐ Regular SA Agent
☐ Shadow SA Agent
☐ Management LAN
☐ Management LAN, SA Agent

OK Cancel

- Step 8** In the Add Customer Edge Routers dialog box, do the following:
- From the list of devices displayed, select the name of the cable-CE.
 - A cable-CE must be an unmanaged CE, so be sure that the **This customer edge router is managed by the provider** check box is *not* checked.
 - Choose the **No SA Agent** option.
SA Agent can gather performance information from managed CEs only.



Note Do *not* choose either of the **Management LAN** options.

- When finished, click **OK**.

Provisioning the Cable Maintenance Subinterface

The cable maintenance subinterface on the PE is the means by which the cable device retrieves its own IP address. For this reason, the maintenance subinterface must be configured before cable services provisioning can take place.

This procedure assumes that the PE configuration files that define the cable maintenance interfaces have been imported into VPN Solutions Center. For a description of this procedure, see the “Importing Router Configuration Files” section on page 2-25.

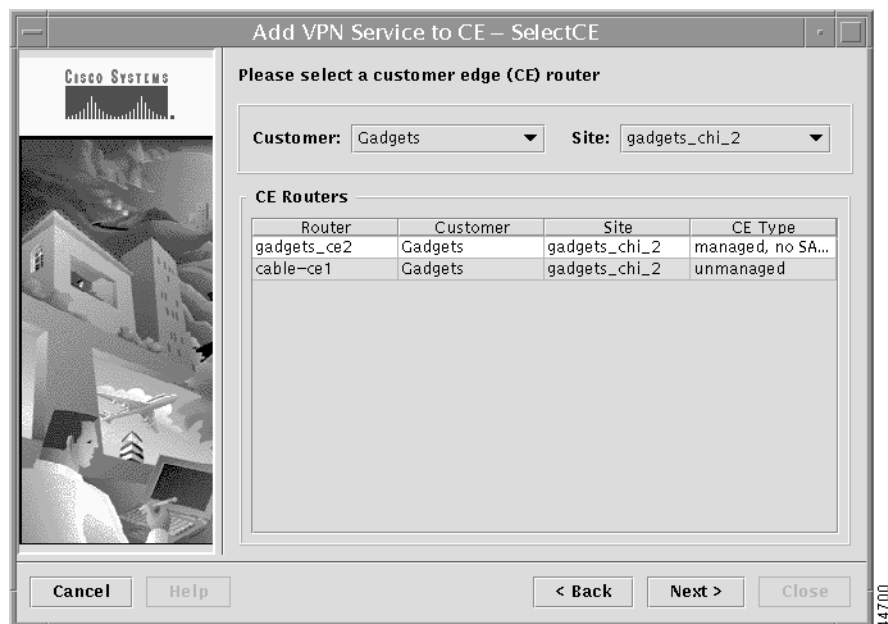
To set up the cable maintenance subinterface on the PE, follow these steps:

Selecting the Cable-CE

When configuring a service for a cable link, the specified CE should be an *unmanaged CE*.

-
- Step 1** From the VPN Console, choose **Provisioning > Add VPN Service to CE**.
- Step 2** Click **Next**. The Select CE dialog box appears (see Figure 7-6).

Figure 7-6 The Select CE Dialog Box

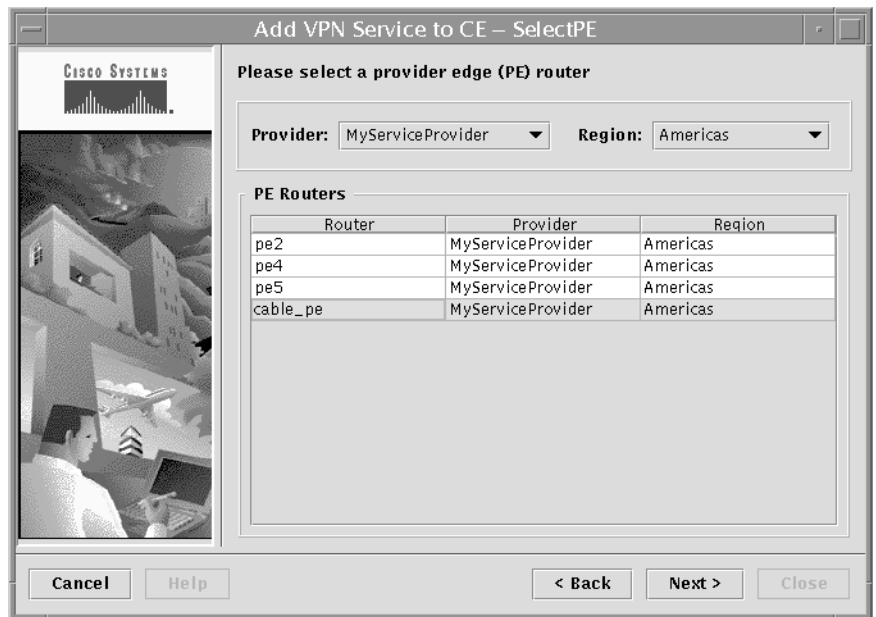


- Step 3** From the Select CE dialog box, do the following:
- From the Customer drop-down list, select the appropriate customer.
 - From the Site drop-down list, select the appropriate site.
 - From the CE Routers list, select the name of the cable-CE.
 - Click **Next**. The Select PE dialog box appears (see Figure 7-7).
-

Selecting the PE for Cable Service

- Step 1** From the Select PE dialog box, select the provider edge router for this cable link.

Figure 7-7 *Selecting the Cable-PE*

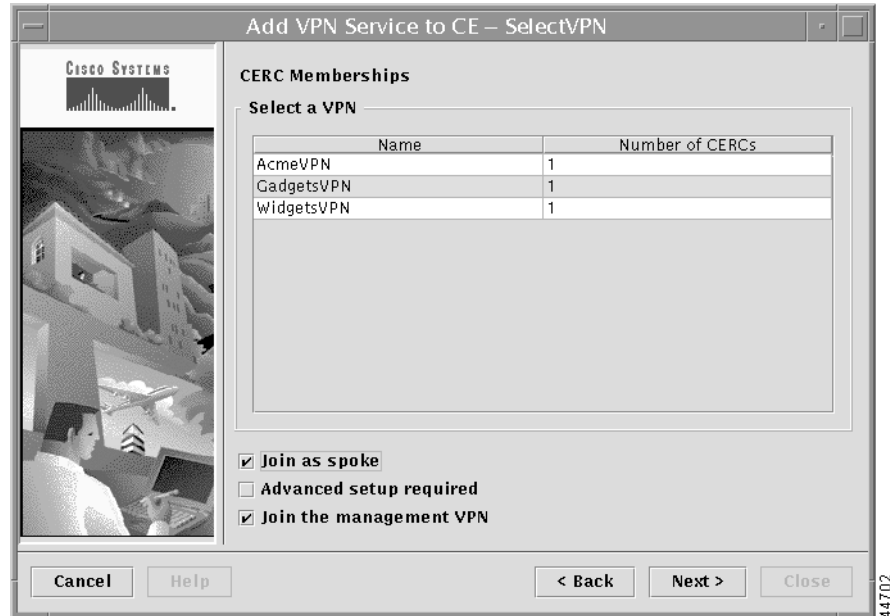


- Step 2** From the Provider drop-down list, select the appropriate provider name.
- Step 3** From the Region drop-down list, select the appropriate region.
- Step 4** From the PE Routers list, select the PE.
- Step 5** When finished entering the necessary information, click **Next**. The Select VPN dialog box appears (see Figure 7-8).

Selecting the VPN

- Step 1** From the Select VPN dialog box shown in Figure 7-8, select the VPN that the cable maintenance interface is associated with.

Figure 7-8 Selecting the VPN



The most common types of VPNs are *hub-and-spoke* and *full mesh*. These two basic types of VPNs—full mesh and hub and spoke—can be represented with a single CERC.

For additional information on CE routing communities, see the “CE Routing Communities” section on page 1-18 and the “Defining CE Routing Communities” section on page 3-15.

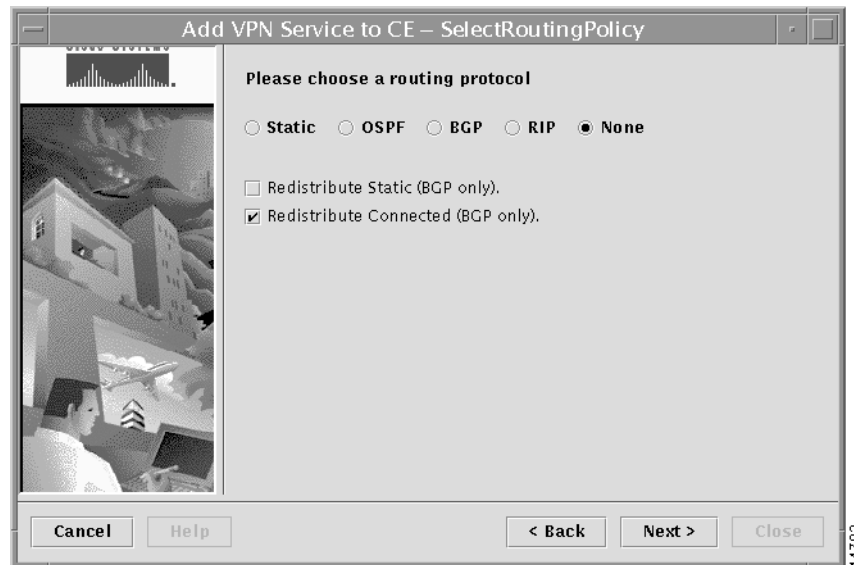
- Step 2** If you are building a VPN with a hub-and-spoke topology, check the **Join as Spoke** check box.
- A hub-and-spoke CERC is one in which one or a few CEs act as hubs, and all spoke CEs talk only to or through the hubs, never directly to each other.
 - A full mesh CERC is one in which every CE connects to every other CE.
- Step 3** If you are building a VPN with CEs that are members of multiple VPNs (extranets), check the **Advanced setup required** check box.
- Extranet provisioning provides a way to create multiple VPN connectivity to a single VRF.
- Step 4** When provisioning a cable service maintenance interface, joining the management VPN is required. Therefore, check the **Join the management VPN** check box. For more information on the management VPN and VPN Solutions Center software, see the “Implementing the Management VPN Technique” section on page 3-23.
- When you use the VPN Solutions Center software to define a management VPN, the software automatically generates an *export route map* for the management VPN.
- Step 5** When finished entering the necessary information, click **Next**. The Select Routing Policy dialog box appears (see Figure 7-9).

Specifying No Routing Protocol for the Cable CE

When operating a cable link, the link does not run a routing protocol. The **None** option in the Routing Policy dialog box is provided to allow for configuring a service over a cable link without having to specify a routing protocol.

- Step 1** From the list of routing protocol options (see Figure 7-9), choose **None**.

Figure 7-9 Specifying No Routing Protocol

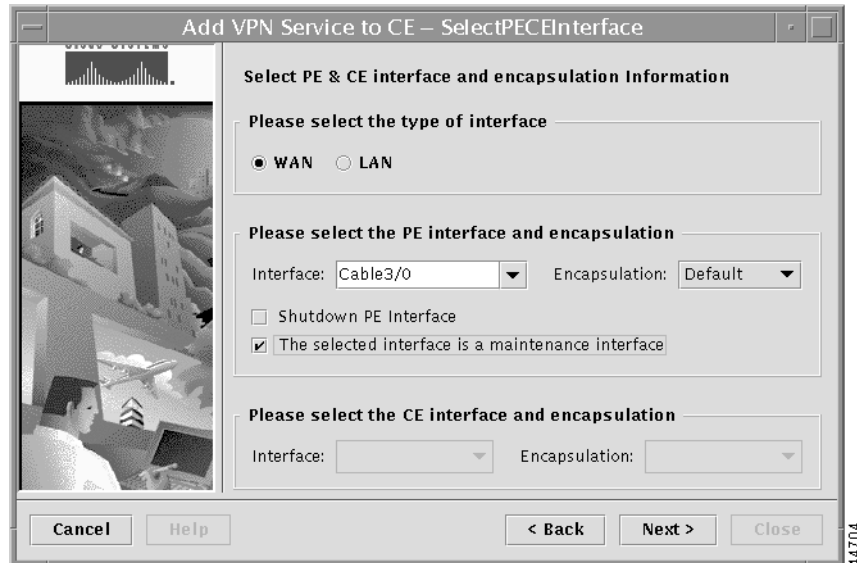


- Step 2** If you want to distribute static routes into the provider core network (which runs BGP), check the **Redistribute Static (BGP only)** check box.
- Step 3** Because there is no routing protocol on the cable link, we recommend that you redistribute the connected routes to all the other CEs in the VPN. To do so, check the **Redistribute Connected (BGP only)** check box.
- Step 4** When finished entering the necessary information, click **Next**. The Select PE-CE Interface dialog box appears (see Figure 7-10).

Specifying the Cable Maintenance Interface on the PE

You can now specify the interface on the PE that will host the cable maintenance subinterface.

Figure 7-10 *Selecting the Cable Maintenance Interface*



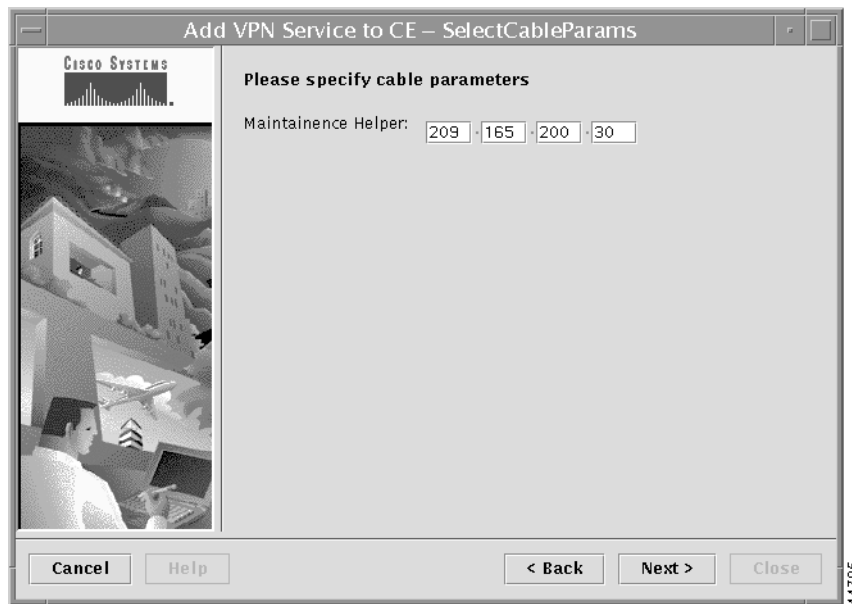
-
- Step 1** Specify whether the interfaces for the PE-CE link are for a Wide Area Network (WAN) or Local Area Network (LAN).
 - Step 2** Select the interface on the PE that hosts the cable maintenance subinterface.
The encapsulation method is set to *Default* for the cable interface.
 - Step 3** Enable the **Shutdown PE Interface** option if desired:
When you check the **Shutdown PE Interface** checkbox, the specified PE interface will be configured in a shut down state.
 - Step 4** Be sure to check the **Selected interface is a maintenance interface** check box.
Checking this option provisions the cable maintenance interface; this interface is always configured as subinterface 1 (for example, if the selected cable interface is 3/0, the maintenance subinterface is 3/0.1).
 - Step 5** When finished with these settings, click **Next**. The Select Cable Parameters dialog box appears (see Figure 7-11).
-

Specifying the Cable Maintenance Helper Address

The *maintenance helper address* is the IP address of the DHCP server in the Multiple Service Operator (MSO) network.

In the fields provided for the *Maintenance Helper* address, enter the appropriate IP address, then click **Next**.

Figure 7-11 Setting the Maintenance Helper Address

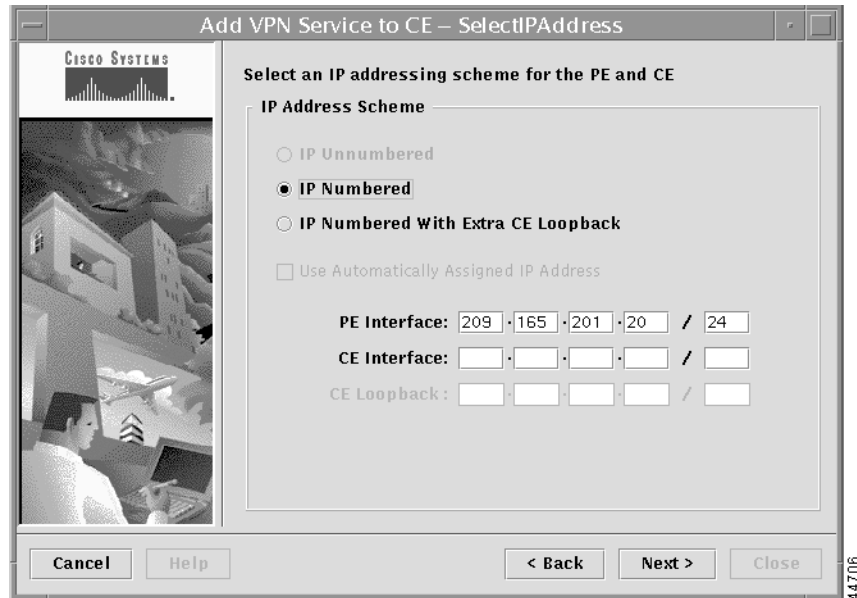


The Select IP Addresses dialog box appears (see Figure 7-12).

Specifying the IP Address for the Maintenance Subinterface

In the Select IP Addresses dialog box, you must specify the IP address for the cable maintenance subinterface on the PE.

Figure 7-12 Specifying the IP Address for the Maintenance Subinterface



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- Step 1** For the IP addressing scheme, choose **IP Numbered**.
The *IP Numbered with Extra CE Loopback* option is not a viable option in a cable services configuration.
- Step 2** In the **PE Interface** fields, enter the IP addresses on the PE for the cable maintenance subinterface.



Note The IP address entered here must be different from the IP address entered for the cable subinterface. To be reachable, each subinterface must have its own IP address.

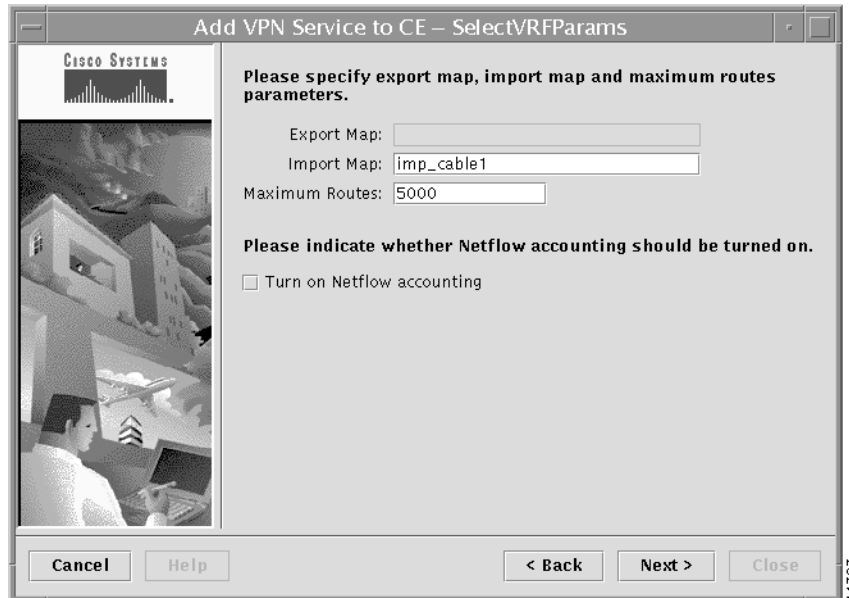
You do not need to enter an IP address for the CE interface.

- Step 3** When finished entering the necessary information, click **Next**. The Select VRF Parameters dialog box appears (see Figure 7-13).
-

Specifying the VRF Parameters

The Select VRF Parameters dialog box lets you set values for an import route map and the maximum number of routes in the VRF table. You can also enable NetFlow accounting.

Figure 7-13 Specifying the VRF Parameters



- Step 1** In the *Import Map* field, enter the name of an existing import route map on the PE.



Note The Cisco IOS supports only one import route map per VRF (and therefore, per VPN).

An import route map does apply a filter. Therefore, if you want to exclude a particular route from the VRF on this PE, you can either set an export route map on the sending router to make sure it does not have any route targets that can be imported into the current VRF, or create an import route map on this PE to exclude the route.

For command reference details on the **import map** command, see the “import map” section on page C-6.

- Step 2** In the *Maximum Routes* field, specify the maximum number of routes that can be imported into the VRF on this PE.
- Step 3** To enable NetFlow accounting, check the **Turn on NetFlow accounting** checkbox.
- For more information, see the “NetFlow Collector and VPN Solutions Center Software” section on page 1-29 and the “MPLS VPN NetFlow Accounting” section on page 5-2.
- Step 4** When you have completed the fields as necessary in the Specify VRF Parameters dialog box, click **Next**. The Class of Service (CoS) dialog box appears.

Selecting a Class of Service Profile for the PE-CE Link

- Step 1** If desired, select a Class of Service (CoS) profile to assign to the PE-CE link.
- You can create a Class of Service (CoS) profile when you define the Provider Administrative Domain. For information on creating a CoS Profile, see the “Defining a Class of Service Profile” section on page 2-67. For a discussion on the Class of Service feature, see the “Quality of Service and Class of Service” section on page 1-25.
- Class of Service profiles are applied to the Provider Edge Router (PE), but the CoS definition is enforced across the PE-CE link on both the PE and CE.
- Step 2** Click **Next**. The Confirm dialog box appears (see Figure 7-14).

Confirming the Cable VPN Service Settings

VPN Solutions Center displays a summary of settings defined for this cable services VPN.

Figure 7-14 Viewing the Service Settings



- Step 1** Verify that the service request information is correct, then click **Next**. The wizard displays the following message:
- Your request to “Add VPN Service to CE” has been submitted with ID number *n*. This service request can be deployed by using the “Deploy Service Requests” wizard or by using the “Deploy VPN Service” item under the “Provisioning” option of a VPN service request report.
- Step 2** Press **Close**. You have now queued a service request. It is entered into the product database and is in the initial state of “Requested.”

Provisioning the Cable Link

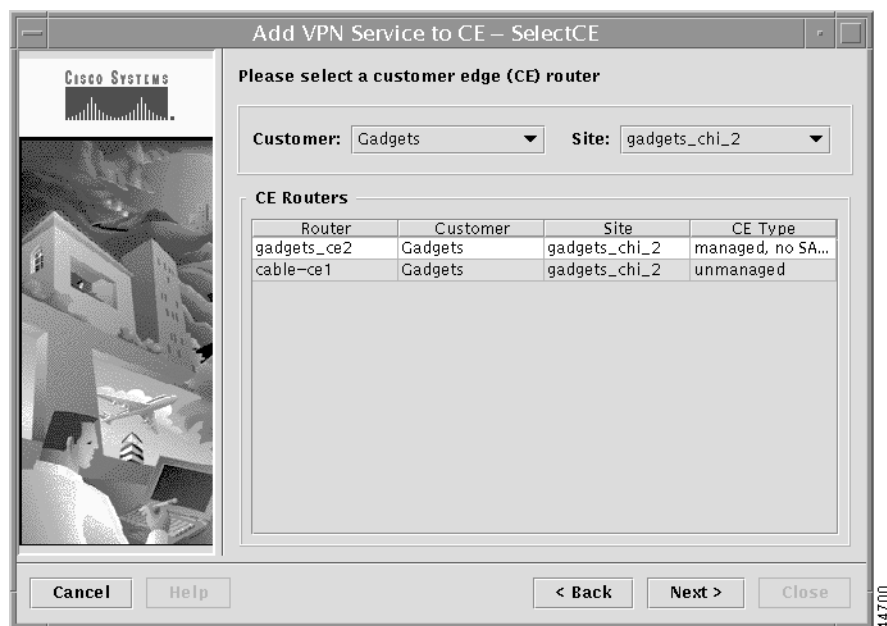
When you have completed the tasks to create the cable-CE, set up the PE that has cable interfaces, and provisioned the cable maintenance subinterface on the PE as described in the previous sections, you can proceed to provision the cable link.

To provision the cable link, follow these steps:

Selecting the Cable-CE

- Step 1 From the VPN Console, choose **Provisioning > Add VPN Service to CE**.
- Step 2 Click **Next**. The Select CE dialog box appears (see Figure 7-15).

Figure 7-15 Selecting the Cable-CE



- Step 3 From the Select CE dialog box, do the following:
 - a. From the Customer drop-down list, select the appropriate customer.
 - b. From the Site drop-down list, select the appropriate site.
 - c. From the CE Routers list, select the name of the cable-CE.



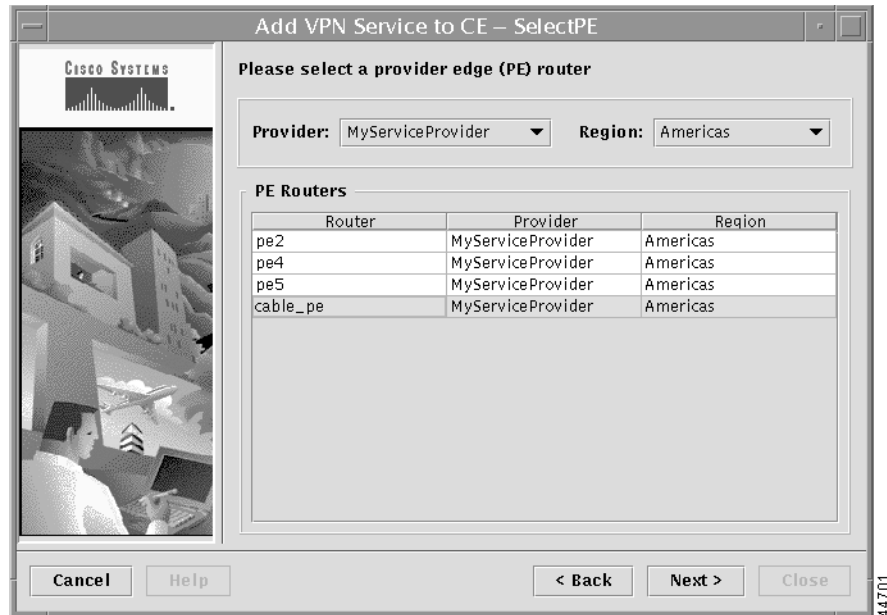
Note When configuring a service for a cable link, the specified CE should be an unmanaged CE.

- d. Click **Next**. The Select PE dialog box appears (see Figure 7-16).

Selecting the PE for Cable Service

- Step 1** From the Select PE dialog box, select the provider edge router for this cable link.

Figure 7-16 Selecting the Cable-PE

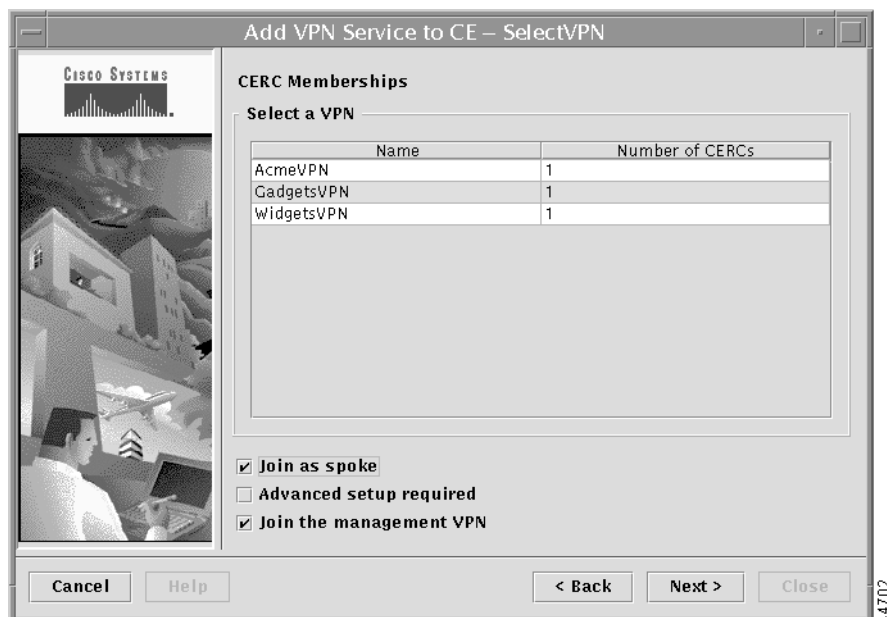


- Step 2** From the Provider drop-down list, select the appropriate provider name.
- Step 3** From the Region drop-down list, select the appropriate region.
- Step 4** From the PE Routers list, select the PE.
- Step 5** When finished entering the necessary information, click **Next**. The Select VPN dialog box appears (see Figure 7-17).

Selecting the VPN

- Step 1** From the Select VPN dialog box, select the VPN that the cable maintenance interface is associated with.

Figure 7-17 *Selecting the VPN*



The most common types of VPNs are *hub-and-spoke* and *full mesh*. These two basic types of VPNs—full mesh and hub and spoke—can be represented with a single CERC.

For additional information on CE routing communities, see the “CE Routing Communities” section on page 1-18 and the “Defining CE Routing Communities” section on page 3-15.

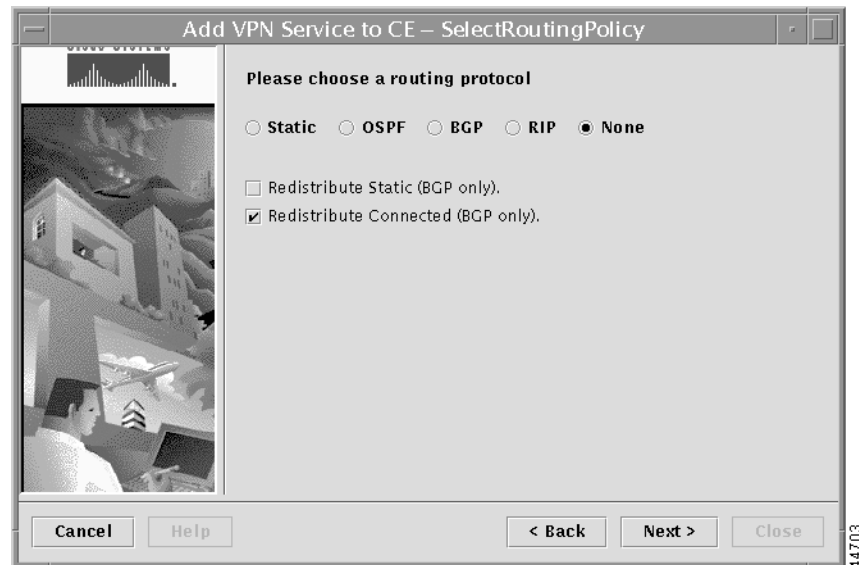
- Step 2** If you are building a VPN with a hub-and-spoke topology, check the **Join as Spoke** check box.
- A hub-and-spoke CERC is one in which one or a few CEs act as hubs, and all spoke CEs talk only to or through the hubs, never directly to each other.
 - A full mesh CERC is one in which every CE connects to every other CE.
- Step 3** If you are building a VPN with CEs that are members of multiple VPNs (extranets), check the **Advanced setup required** check box.
- Extranet provisioning provides a way to create multiple VPN connectivity to a single VRF.
- Step 4** When provisioning a cable service, we recommend that you check the **Join the management VPN** check box. For more information, see the “Implementing the Management VPN Technique” section on page 3-23.
- When you use the VPN Solutions Center software to define a management VPN, the software automatically generates an *export route map* for the management VPN.
- Step 5** When finished entering the necessary information, click **Next**. The Select Routing Policy dialog box appears (see Figure 7-18).

Specifying No Routing Protocol for the Cable Link

When operating a cable link, the link does not run a routing protocol. The **None** option in the Routing Policy dialog box is provided to allow for configuring a service over a cable link without having to specify a routing protocol.

- Step 1** From the list of routing protocol options, choose **None**.

Figure 7-18 Specifying No Routing Protocol

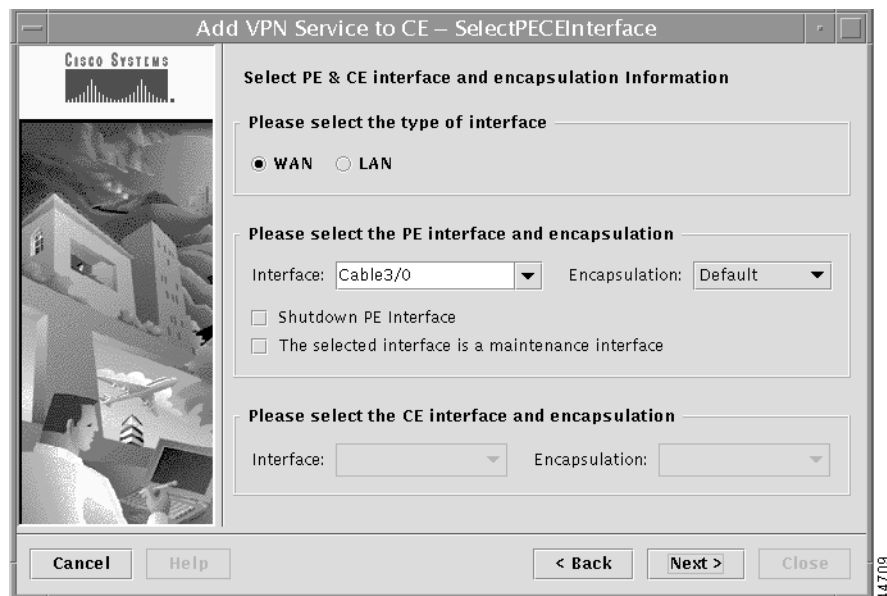


- Step 2** If you want to distribute static routes into the provider core network (which runs BGP), check the **Redistribute Static (BGP only)** check box.
- Step 3** Because there is no routing protocol on the cable link, we recommend that you redistribute the connected routes to all the other cable CEs in the VPN. To do so, check the **Redistribute Connected (BGP only)** check box.
- Step 4** When finished entering the necessary information, click **Next**. The Select PE-CE Interface dialog box appears (see Figure 7-19).

Specifying the Cable Interface

You can now specify the interface on the PE that will host the cable subinterface.

Figure 7-19 *Selecting the Cable Interface*



- Step 1** Specify whether the interfaces for the PE-CE link are for a Wide Area Network (WAN) or Local Area Network (LAN).
- Step 2** Select the interface on the PE that hosts the cable subinterface.
- VPN Solutions Center software automatically selects the subinterface number based on the VRF. If a subinterface that is associated with the current VRF does not yet exist, VPNSC software creates a subinterface and assigns it to the correct VRF. The subinterface number is incremented to 1 greater than the largest subinterface currently assigned for the selected cable interface.



Tips

Be sure to select the same interface that you chose for the maintenance subinterface. For example, if you chose *Cable 3/0* for the maintenance subinterface, choose *Cable 3/0* here as well.

The encapsulation method is set to *Default* for the cable interface.

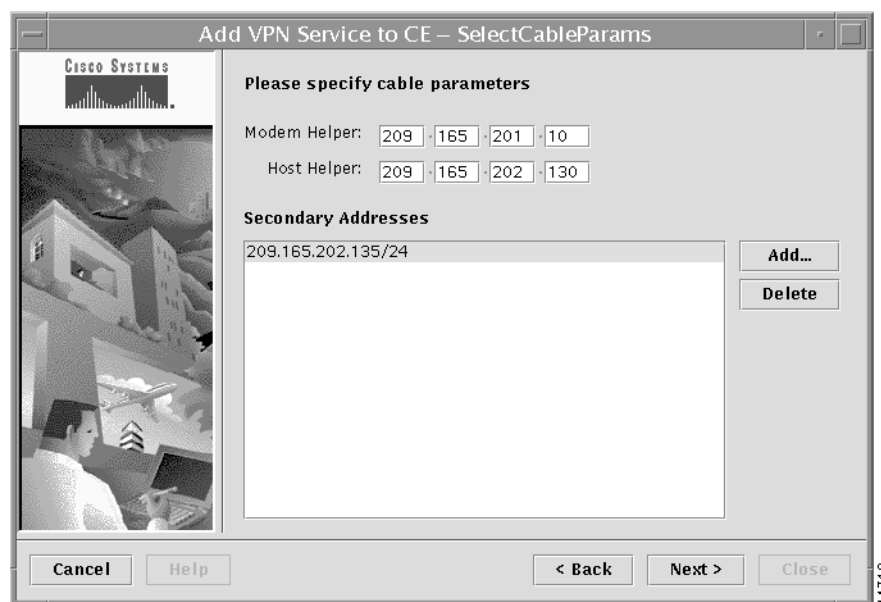
- Step 3** Enable the **Shutdown PE Interface** option if desired:
- When you check the **Shutdown PE Interface** checkbox, the specified PE interface will be configured in a shut down state.
- Step 4** Be sure to *not* check the **Selected interface is a maintenance interface** check box.
- You should enable this option only when you want to provision the cable maintenance interface.
- Step 5** When finished with these settings, click **Next**. The Select Cable Parameters dialog box appears (see Figure 7-20).

Specifying the Cable Helper Addresses

In this Select Cable Parameters dialog box, you must specify the *Modem Helper address* and the *Host Helper address*. You can also specify *secondary addresses*.

- The *modem helper address* is the IP address of the DHCP server in the MSO network. The modem helper address assigns the IP address of the cable modem interface.
- The *host helper address* is the IP address of the DHCP server of the Internet Service Provider (ISP) to which the customer belongs.
- *Secondary addresses* are IP addresses that are used for routing packets to the host devices connected to the cable modem. All the host devices on that cable subnet can use a single secondary address.

Figure 7-20 Setting the Cable Helper Addresses



-
- Step 1** In the *Modem Helper* fields, enter the modem helper IP address.
- Step 2** In the *Host Helper* fields, enter the host helper IP address.
- Step 3** If necessary, enter a secondary address.
- a. Click **Add**.
- The Secondary Addresses dialog box appears (see Figure 7-21).

Figure 7-21 *Entering a Secondary Address*

Secondary Address

Please enter or modify the IP address

IP Address: 209 · 165 · 202 · 135 / 24

209.165.202.135/24

Add

Modify

Delete

Ok Cancel

44711

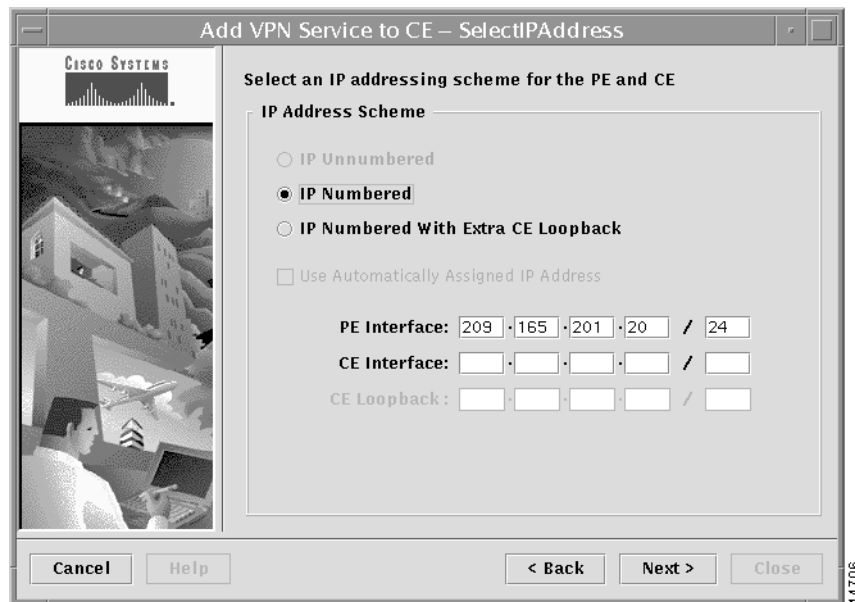
- b. In the *IP Address* fields, enter the secondary IP address, then click **Add**.
The address you entered appears in the display field.
 - c. If the address is correct, click **OK**.
If you need to edit the secondary address, click **Modify**, then edit the address as necessary.
You return to the Select Cable Parameters dialog box.
 - d. Click **Next**. The Select IP Addresses dialog box appears (see Figure 7-22).
-

Specifying the IP Address for the Cable Subinterface

In the Select IP Addresses dialog box, you must specify the IP address for the cable subinterface on the PE.

If two or more cable modems belong to a particular ISP, the cable modems are connected to the same subnet on the PE, and that subnet is in the ISP's VPN.

Figure 7-22 Specifying the Address for the Cable Subinterface



- Step 1** For the IP addressing scheme, choose **IP Numbered**.

The *IP Numbered with Extra CE Loopback* option is not a viable option in a cable services configuration.

- Step 2** In the **PE Interface** fields, enter the IP address on the PE for the subinterface that the cable is connected to.



Note The IP address entered here must be different from the IP address entered for the maintenance subinterface. To be reachable, each subinterface must have its own IP address.

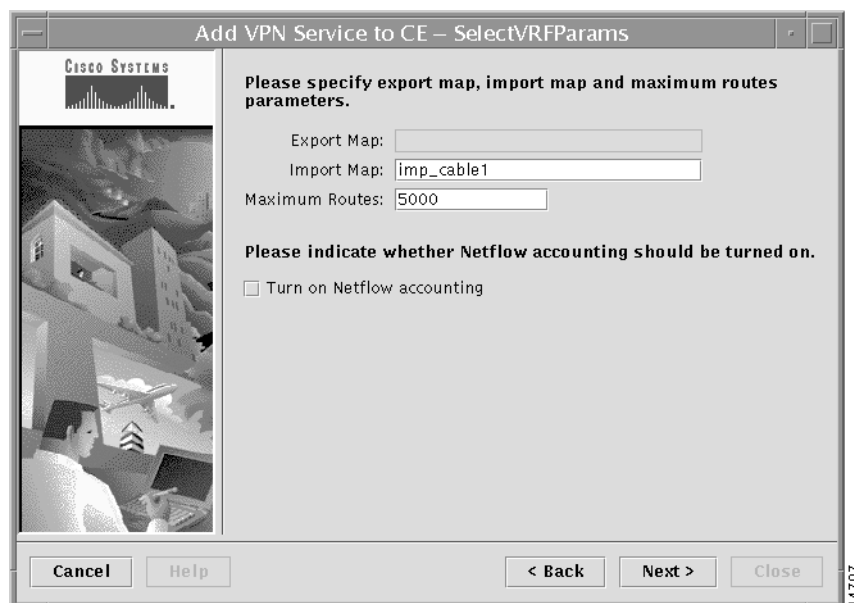
You do not need to enter an IP address for the CE interface.

- Step 3** When finished entering the necessary information, click **Next**. The Select VRF Parameters dialog box appears (see Figure 7-23).

Specifying the VRF Parameters

The Select VRF Parameters dialog box lets you set values for an import route map and the maximum number of routes in the VRF table. You can also enable NetFlow accounting.

Figure 7-23 Specifying the VRF Parameters



-
- Step 1** In the *Import Map* field, enter the name of an existing import route map on the PE.



Note The Cisco IOS supports only one import route map per VRF (and therefore, per VPN).

An import route map applies a filter. Therefore, if you want to exclude a particular route from the VRF on this PE, you can either set an export route map on the sending router to make sure it does not have any route targets that can be imported into the current VRF, or create an import route map on this PE to exclude the route.

For command reference details on the **import map** command, see the “import map” section on page C-6.

- Step 2** In the *Maximum Routes* field, specify the maximum number of routes that can be imported into the VRF on this PE.
- Step 3** To enable NetFlow accounting, check the **Turn on NetFlow accounting** checkbox.
- For more information, see the “NetFlow Collector and VPN Solutions Center Software” section on page 1-29 and the “MPLS VPN NetFlow Accounting” section on page 5-2.
- Step 4** When you have completed the fields as necessary in the Specify VRF Parameters dialog box, click **Next**. The Class of Service (CoS) dialog box appears.
-

Selecting a Class of Service Profile

-
- Step 1** If desired, select a Class of Service (CoS) profile to assign to the PE-CE link.
- You can create a Class of Service (CoS) profile when you define the Provider Administrative Domain. For information on creating a CoS Profile, see the “Defining a Class of Service Profile” section on page 2-67. For a discussion on the Class of Service feature, see the “Quality of Service and Class of Service” section on page 1-25.
- Class of Service profiles are applied to the Provider Edge Router (PE), but the CoS definition is enforced across the PE-CE link on both the PE and CE.
- Step 2** Click **Next**. The Confirm dialog box appears.
-

Confirming the Cable VPN Service Settings

The Confirm dialog box displays a summary of settings defined for this cable services VPN.

-
- Step 1** Verify that the service request information is correct, then click **Next**. The wizard displays the following message:
- Your request to “Add VPN Service to CE” has been submitted with ID number *n*. This service request can be deployed by using the “Deploy Service Requests” wizard or by using the “Deploy VPN Service” item under the “Provisioning” option of a VPN service request report.
- Step 2** Press **Close**. You have now queued a service request. It is entered into the product database and is in the initial state of “Requested.”
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