CISCO

CISCO SERVICE CONTROL SOLUTION GUIDE

Cisco Service Control Traffic Optimization: Capacity Control Solution

Guide, Release 3.5.5

1 Introduction and Toolset Overview

Introduction

Delivering a quality broadband experience is increasingly difficult with rising contention on the available network capacity, new delay sensitive applications, and a subscriber-base that is increasingly sensitive to privacy, neutrality, and fairness. Service providers face exponential growth in the demand for network resources, driven by new applications built to consume as much bandwidth as possible. Adding more capacity to the network, which increases the service provider expense, is quickly consumed by these applications and provides only temporary relief. Additionally, new delay sensitive applications like voice-over-IP (VoIP) are severely affected by the congestion events caused by the high load of the network. This badly affects the user experience and reduces subscribers charm.

The Cisco Service Control Engine (SCE) provides a toolset to deal with such challenges. The SCE network management controls the network capacity, while increasing the provider revenue. The SCE allows you to create policies that are customized to the targets of your business. You can actively prioritize specific subscribers or specific applications, and create incentives for subscribers to upgrade their plans to higher subscription-plans.

SCE Capacity Control Solution

The SCE Capacity Control Solution deals with the demand for network resources. This demand is driven by the presence of applications that consume as much bandwidth as possible and the coexistence of delay-sensitive applications that are badly affected by the congestion caused by these high bandwidth consumption applications. The goal of this solution is to divide the available network resources fairly between all active subscribers, while maximizing the overall experience of all the subscribers using the network.

Using this solution, you can configure the SCE to work in one of two ways:

- Anonymous subscriber mode—The SCE is aware of the individual subscribers using the network.
- Subscriberless mode—The SCE controls each session individually without looking at the context of the subscriber.

When working in anonymous subscriber mode, there is no need to integrate the SCE with the Operations Support Systems (OSS). In anonymous subscriber mode, the SCE automatically defines each IP address as a subscriber and when the network is congested the SCE fairly divides the resources between the subscribers. When the SCE is working in subscriberless mode, the bandwidth is fairly shared between the individual sessions but not between the subscribers.

In the Capacity Control solution, the SCE enforces the policy only when one of the network resources is congested, such as the physical interface of the SCE. However, you can set additional rules which create congestion. For example, you can limit the total bandwidth that is allocated for a specific application. When the total bandwidth from the specific application exceeds the predefined rule, the system enforces the policy to fairly share the resources of this application between all subscribers using the application.

To maximize the overall experience of all subscribers using the network, you can prioritize specific applications when congestion occurs instead of statically limiting the total bandwidth of specific applications. The SCE provides 10 levels of hierarchy and you can set each application to one of these levels. When there is congestion, traffic from level 1 is affected first. If the congestion continues, level 2 is affected, and so on. Traffic from level 10 is never affected, allowing you to mark specific applications as untouched by the SCE under any condition.

SCE Tiered Services Solution

The SCE Tiered Services Solution provides a toolset with which to increase revenue by applying policies that prioritize specific subscribers or services. Where the Capacity Control Solution fairly allocates the bandwidth between all subscribers, the Tiered Services Solution provides an infrastructure for differentiating between subscribers to achieve your business goals.

The use case for tiered services is the creation of several profiles called packages. Each package contains multiple features that can be customized per package. Features include:

- Limiting the maximum bandwidth
- Minimizing the bandwidth allocated first in priority
- Assigning the relative hierarchy level that defines the portion of bandwidth a package receives during congestion

In addition, each package includes a set of rules for specific applications which are either allowed or blocked in the package, the sharing of the bandwidth of a subscriber between multiple applications, the priority between the services, etc.

The Tiered Services Solution always includes integration of the SCE with your OSS so that you can identify and apply the correct policies for the subscribers.

SCE Toolset Overview

The physical link bandwidth is an absolute limit on the bandwidth that travels through the system as shown in Figure 1. To optimize traffic, you can limit the available bandwidth on two levels:

- Subscriber bandwidth control—Limit the available bandwidth per subscriber
- Global control—Limit the available bandwidth per service

The following configurable building blocks comprise the solution:

- Bandwidth Controller (BWC)—Controls the available bandwidth per service, per subscriber
- Primary Bandwidth Controllers (PBWC)—Controls the total traffic per subscriber
- Global Controllers—Controls the total bandwidth per service, per group of subscribers
- Port Controller—Controls the total bandwidth of the physical port on the SCE

Figure 1   *Bandwidth Management Building Blocks*
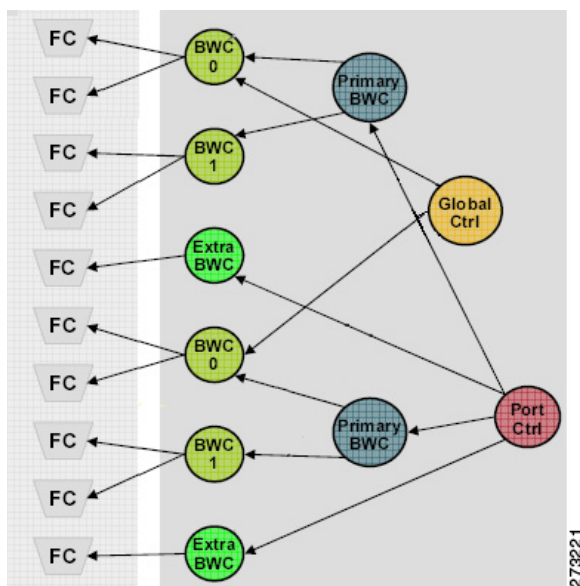
Bandwidth Control

Subscriber BWCs control the bandwidth from a specific service used by individual subscribers. Each BWC controls available bandwidth for selected services.

A BWC is specified by the following parameters:

- Committed Information Rate (CIR)—The minimum bandwidth that is granted to the services controlled by the BWC
- Peak Information Rate (PIR)—The maximum bandwidth that can be consumed by the services controlled by the BWC
- Assurance Level (AL)—The rate of change of available bandwidth under conditions of traffic congestion.

  The AL controls how quickly the bandwidth of the service decreases from the PIR to the CIR as congestion builds, or how quickly the AIR increases from the CIR to the PIR as congestion decreases.

The BWC ensures that even when the network is congested (PIR-congestion) at least the CIR is granted. Similarly, the BWC ensures that even when there is little traffic associated with a BWC, the PIR is not exceeded.

Bandwidth may be thought of in terms of a virtual pipe of adjustable width. The PIR is the maximum allowed width of the virtual pipe. The CIR is the minimum width to which the pipe can contract. The actual pipe width is between the CIR and the AIR. During network congestion, the system contracts each pipe differently to differentiate between subscribers and between their services.

Primary and Service Bandwidth Control

In the Cisco Service Control Application for Broadband (SCA BB), each subscriber has an independent set of BWCs, consisting of a single Primary BWC that controls the total bandwidth available to the subscriber and several Service BWCs that control the available bandwidth of some services of that subscriber. For example, one BWC may control the streaming service; another may control the download and e-mail services together.

The PIR defines the maximum bandwidth for the associated services; the CIR defines the minimum bandwidth for the services.

External Bandwidth Control

An external bandwidth controller (EBC) controls the available bandwidth for a specific service negating the defined subscriber parameters. For example, the EBC may control VoIP to ensure that it always has sufficient bandwidth regardless of the other subscriber parameters.

Global Bandwidth Control

Global controllers provide constraints for large, global volumes of traffic, such as "Total Gold Subscriber Traffic", or "Total P2P Traffic". Each global controller defines the maximum bandwidth allowed for a particular type. Using a global controller, you can limit total traffic of services such as Peer-to-Peer (P2P) in the system to any desired bandwidth.

Port Control

The physical link bandwidth is an absolute limit on the bandwidth that can pass through the system. You can limit the total bandwidth capacity of the SCE platform to a value lower than the physical link bandwidth. For example, if another device sitting next to the SCE platform on the IP stream has limited bandwidth capacity, you can limit the bandwidth passing through the SCE platform to match the capacity of the other device.

2 Configuring the Solution

This chapter describes the following solutions for local links as well as the steps to configure the solutions.

- Capacity Control
- Tiered Subscriber Services
- Capacity Control and Tiered Subscriber Services

Capacity Control

The capacity control solution provides a means to equally distribute the total amount of bandwidth over the local links.

SCA BB supports the following two modes in which the capacity control solution can be configured:

- Subscriberless mode—Available bandwidth is divided equally between the flows. This means that the same amount of bandwidth is allocated per service regardless of the number of services each subscriber is currently running.
- Anonymous subscriber mode—Available bandwidth is divided equally between subscribers. Each subscriber's total bandwidth is then divided equally between their services. This means that all subscribers have an equal amount of bandwidth regardless of the number of services they are running.

Configuring the Solution

Step 1 From the Console main menu, choose **Help > Welcome**.

The Welcome window appears as shown Figure 2.

Figure 2 **Welcome Window**
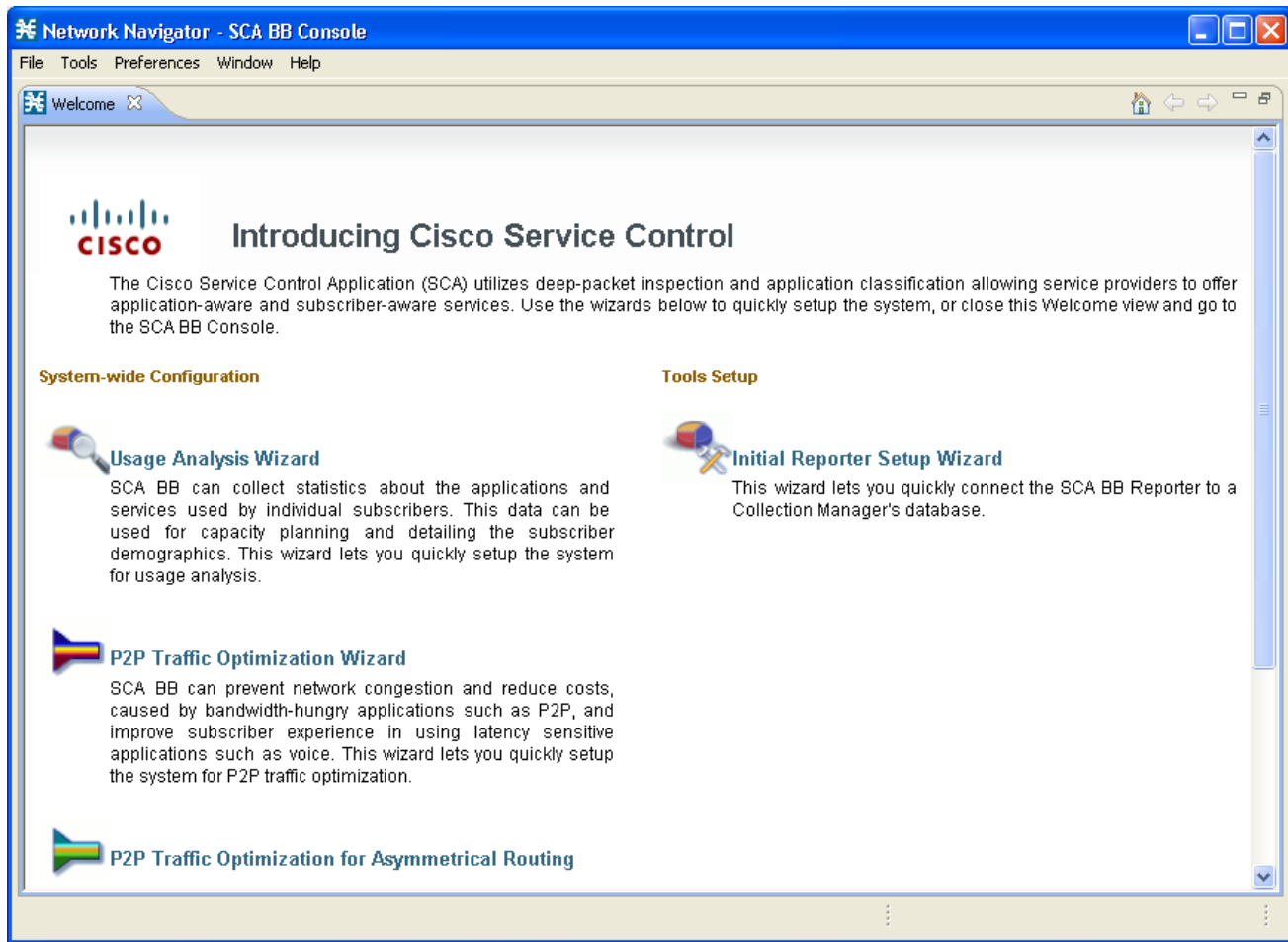
Step 2 Click **P2P Traffic Optimization Wizard**.

The Welcome window of the P2P Traffic Optimization wizard appears as shown in Figure 3.

Figure 3   P2P Traffic Optimization
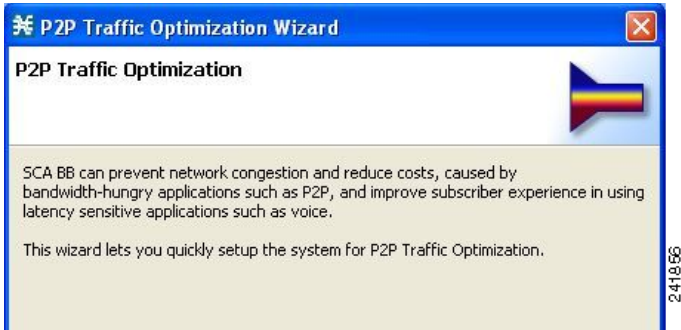
Note   You can also open the P2P Traffic Optimization wizard from the Network Navigator tool:
1 Select one or more devices in the Site Manager tree.
2 Right-click one of the selected devices.
3 From the popup menu that appears, choose **Configuration Wizards > P2P Traffic Optimization Wizard**.
4 You can set only one collection manager and one Service Control Application Reporter (SCA Reporter) database in the wizard. If you select more than one collection manager or SCA Reporter database, only one collection manager and one SCA Reporter database is selected and a warning message is displayed. Click **OK** to continue.

Step 3   Click **Next**.

The SCE IP Addresses window of the P2P Traffic Optimization wizard appears as shown in Figure 4.

Figure 4   SCE IP Addresses Window
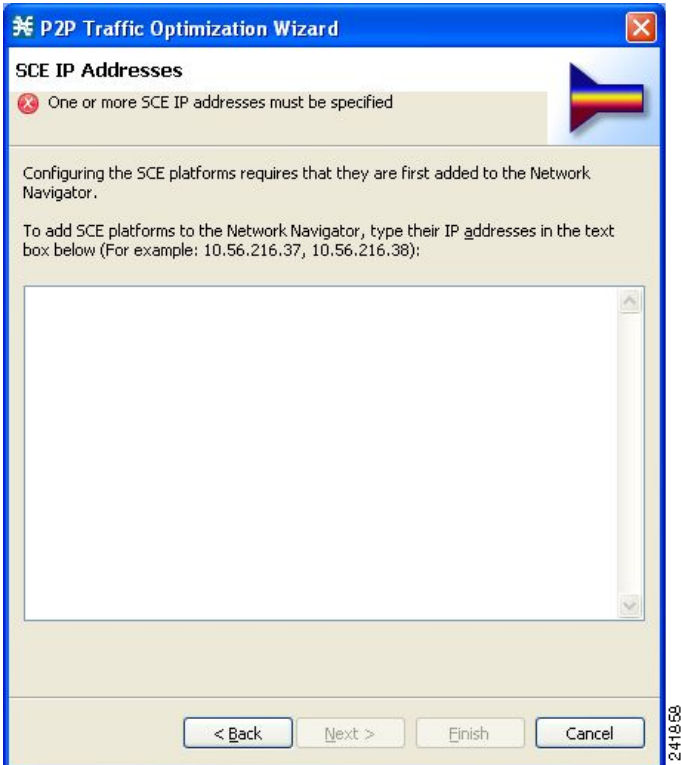
Step 4 In the edit box, enter the IP addresses of the SCE devices that should be added to the model.

If you started from the Network Navigator, the IP addresses of the SCE devices that you selected are displayed in the edit box. You can add additional addresses.

✎
Note You can work with up to 20 SCE devices at one time using the wizard.

Step 5 Click **Next**.

The SCE Usernames and Passwords window of the P2P Traffic Optimization wizard appears as shown in Figure 5.

Figure 5 *SCE Usernames and Passwords Window*
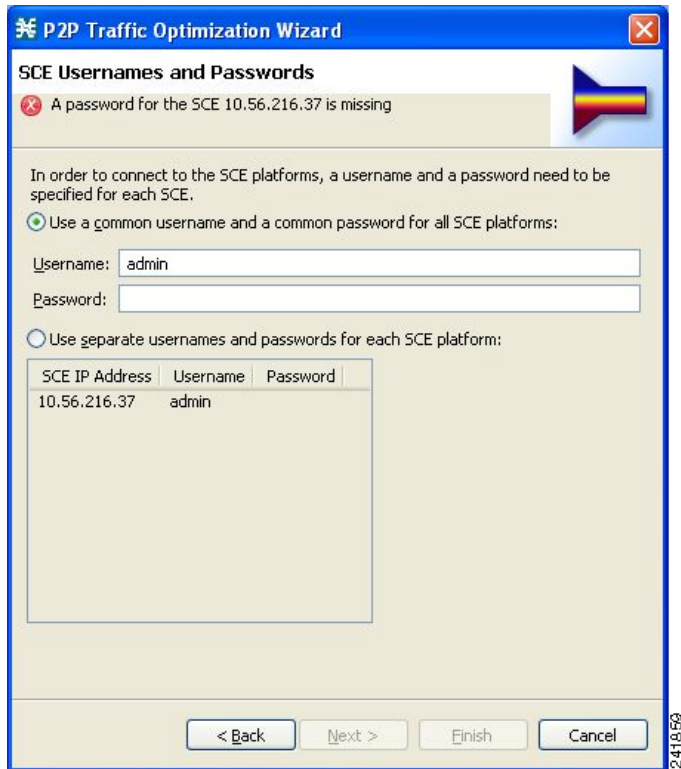
Step 6 Enter the user names and passwords for the SCE devices.

Do one of the following:

- To use the same user name and password for all the SCE devices that you are adding, enter the user name in the Username field and the password in the Password field.
- To provide a different user name and password pair for each SCE device, click the **Use separate usernames and passwords for each SCE platform** radio button, and, for each SCE device, enter the user name and password in the appropriate cell of the SCE device table.

Step 7 Click **Next**.

The CM Setup window of the P2P Traffic Optimization wizard appears as shown in Figure 6.

Figure 6   *CM Setup Window*
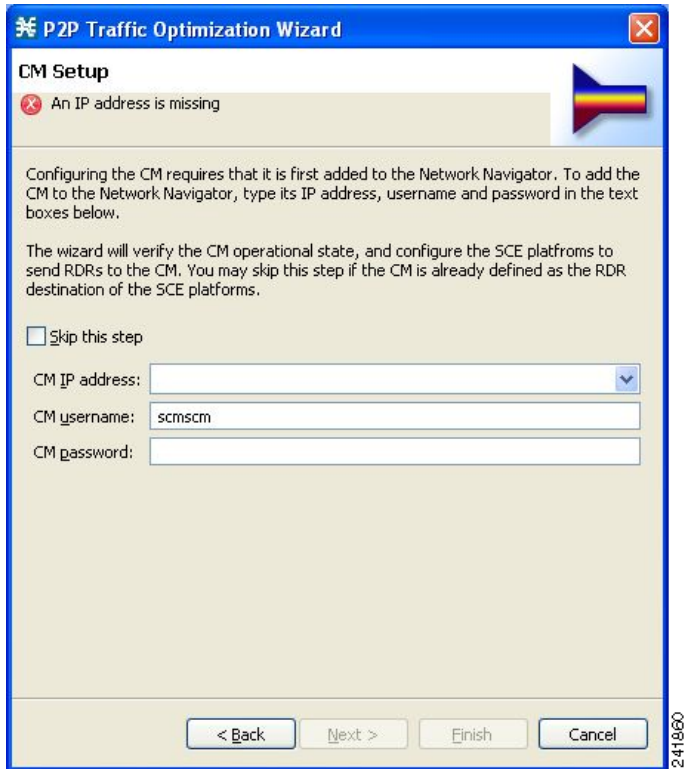
Step 8   Define the Collection Manager (CM) to use with this configuration.

Do one of the following:

- Enter the IP address, user name, and password of the collection manager device in the appropriate fields.

    If you started from the Network Navigator, this information is retrieved and displayed. You can modify these parameters.

- Check the **Skip this step** check box.

Step 9   Click **Next**.

The Reporter Setup window of the P2P Traffic Optimization wizard appears as shown in Figure 7.

Figure 7   Reporter Setup Window
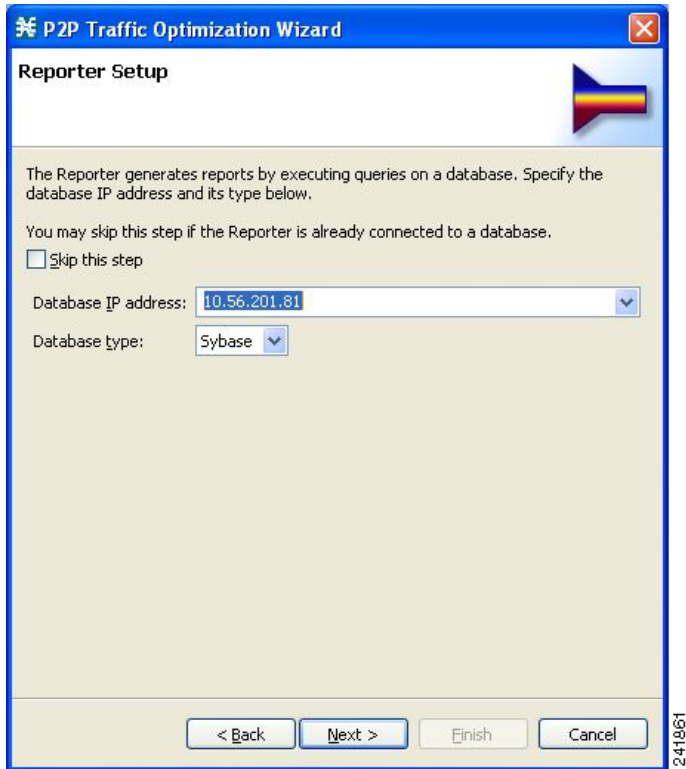
Step 10 Define the database to which the SCA Reporter tool should connect.

Do one of the following:

- Enter the IP address of the database and select the database type.

  If you started from the Network Navigator, this information is retrieved and displayed. You can modify these parameters.

- Check the **Skip this step** check box.

Step 11 Click **Next**.

The Connectivity Test window of the P2P Traffic Optimization wizard appears as shown in Figure 8. The wizard tests the connectivity between the defined devices.

Figure 8   Connectivity Test Window
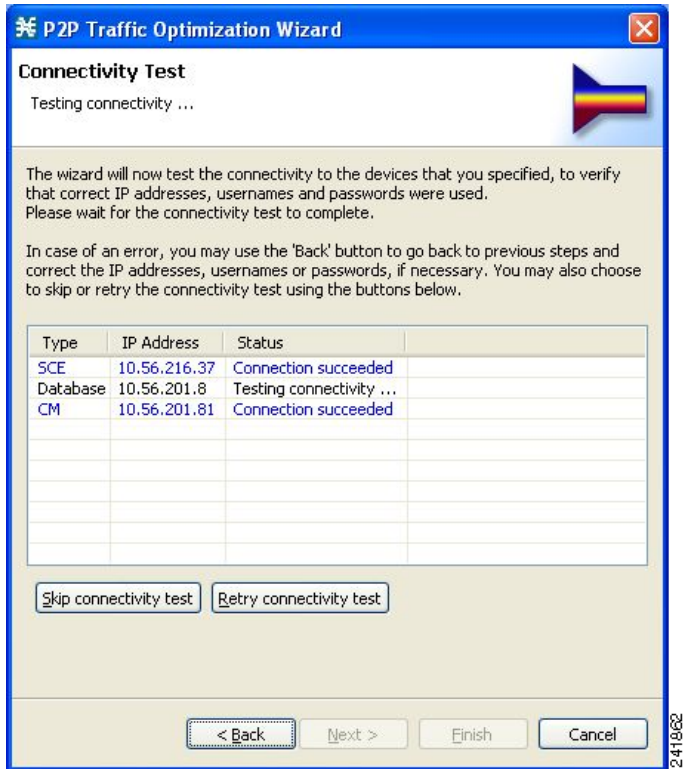
Note   If a connection to one or more of the devices cannot be made or if there is some problem with the connection (such as invalid version of the device) an error is displayed next to the device. You can skip these tests by clicking **Skip connectivity test**. The connections are validated when you click Finish at the end of the wizard.

Step 12   Click **Next**.

The Anonymous Subscribers window of the P2P Traffic Optimization wizard appears as shown in Figure 9.

Figure 9   Anonymous Subscribers Window
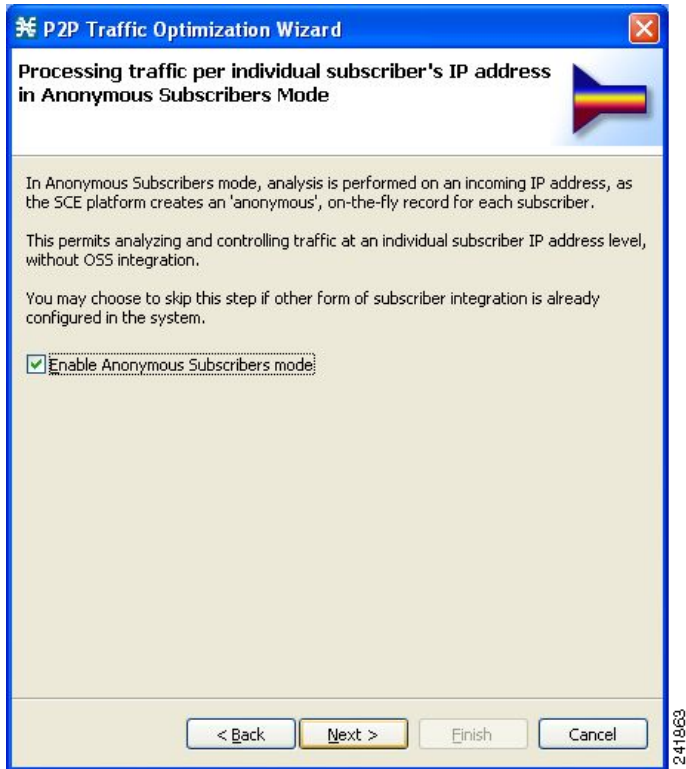
Step 13   To configure the SCE to work in anonymous subscriber mode, check the **Enable Anonymous Subscribers mode** check box. To configure the SCE to work in subscriberless mode, uncheck the **Enable Anonymous Subscribers mode** check box.

Step 14   Click **Next**.

The Effect of P2P Traffic Optimization window of the P2P Traffic Optimization wizard appears as shown in Figure 10, which explains why you should optimize (limit) P2P traffic.

Figure 10   Effect of P2P Traffic Optimization Window
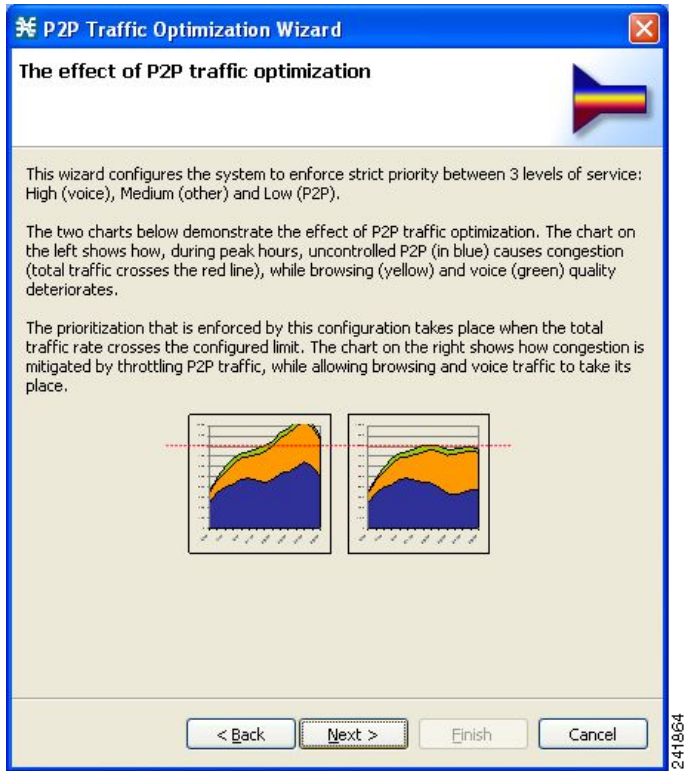
Step 15 Click **Next**.

The Link Rate Limits for P2P Traffic Optimization window of the P2P Traffic Optimization wizard appears as shown in Figure 11.

Figure 11   *Link Rate Limits for P2P Traffic Optimization Window*
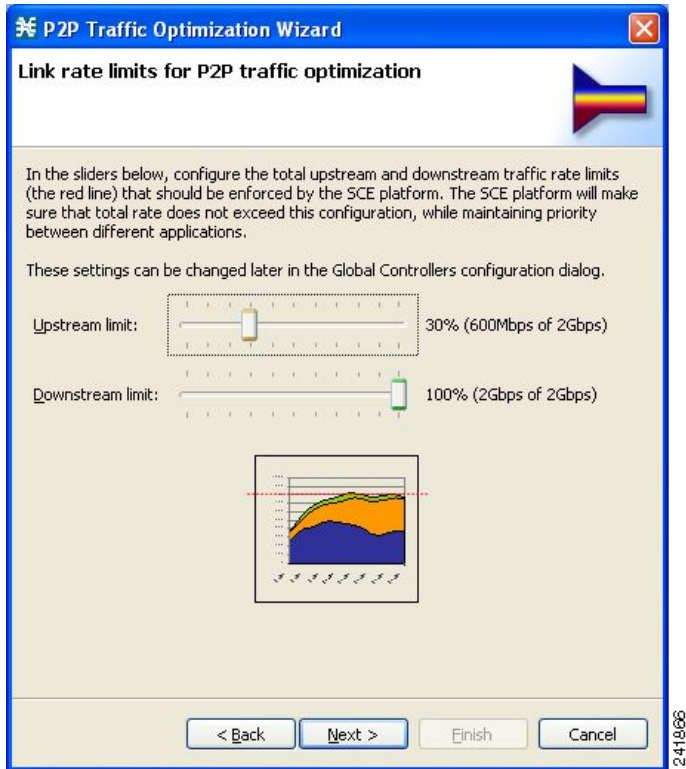
Step 16   Use the sliders to configure the upstream and downstream link rate limits.

The scale of each slider is the percentage of the aggregated bandwidth of both links.

Step 17   Click **Next**.

The Confirmation window of the P2P Traffic Optimization wizard appears as shown in Figure 12.

Figure 12   Confirmation Window
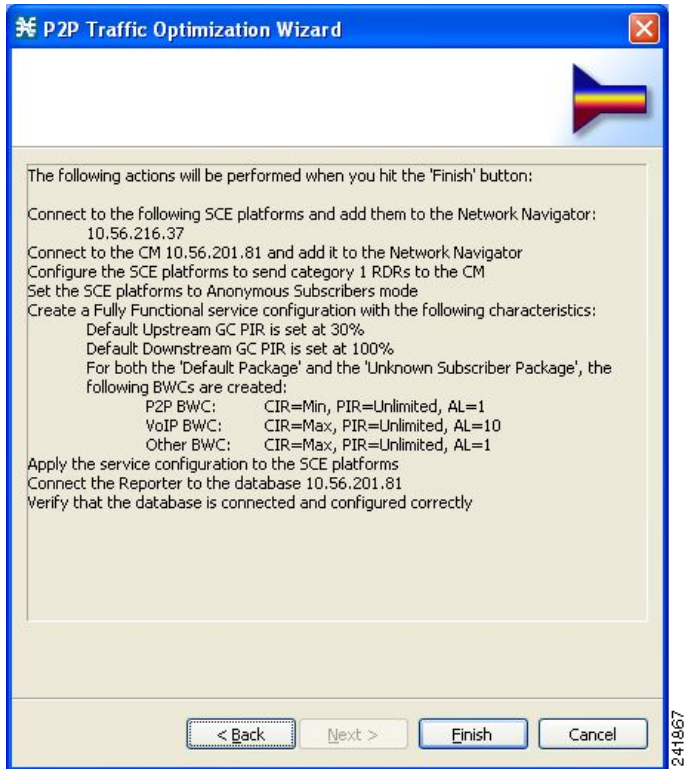
The actions that the wizard is about to take are listed in the page.

Step 18   Click **Finish**.

The Configuration Output window of the P2P Traffic Optimization wizard appears as shown in Figure 13.

Figure 13   Configuration Output Window
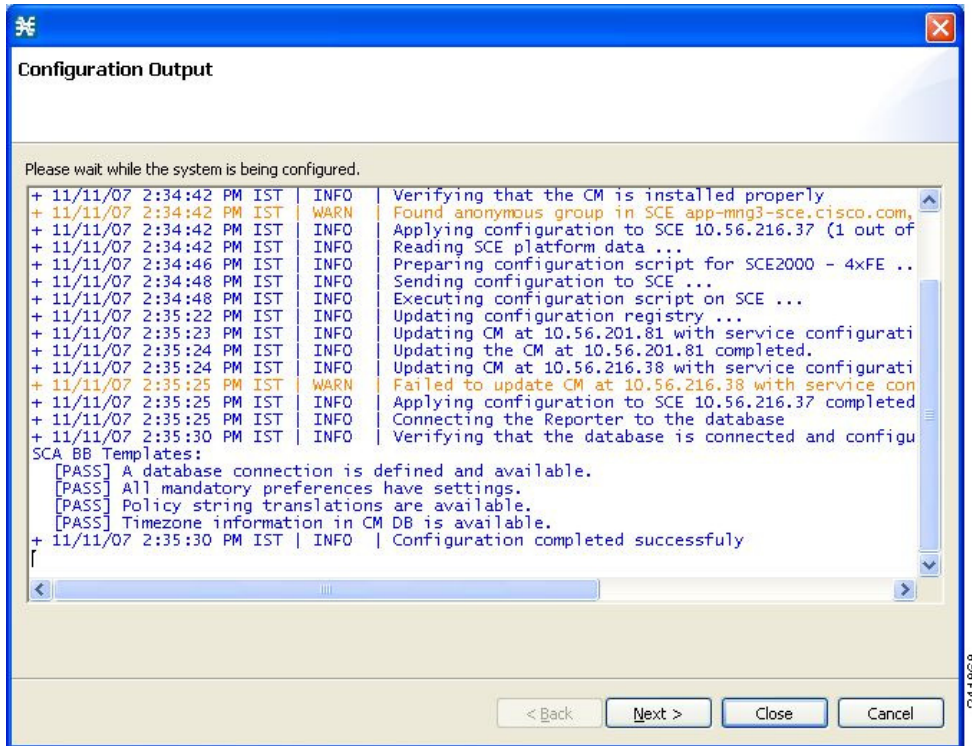
New devices are added to the default site of the Site Manager tree in the Network Navigator (Figure 14).

Figure 14   Network Navigator—Site Manager Tree
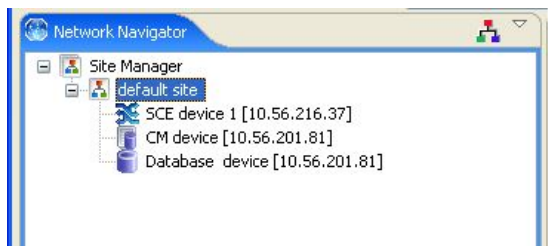
The wizard attempts to connect to all devices that you defined. The operation fails if:

- The wizard cannot connect to any of the SCE devices that you listed in Step 4.
- You defined a collection manager in Step 8, but the wizard cannot connect to it.
- You defined a database in Step 10, but the wizard cannot connect to it.

If you defined a collection manager in Step 8, the SCE devices are configured so that the only category 1 Raw Data Record (RDR) destination is the collection manager.

Note RDR categories are the mechanism by which different types of RDRs can be sent to different collectors. For details about RDR categories, see the *Cisco Service Control Application for Broadband Reference Guide*, the "Raw Data Records: Formats and Field Contents" chapter.

A new service configuration named P2P Traffic Optimization is created, and opens in the Service Configuration Editor.

The service configuration has the following characteristics:

- Full functionality mode.
- The upstream and downstream default AGCs are set with the link limit values defined in Step 15.
- For both the default package and the Unknown Subscriber Traffic package, the following upstream and downstream BWCs are created:
    - P2P

  CIR = 0

  PIR = <value set in global controller>

  AL = 1

    - VoIP

  CIR = <value set in global controller>

  PIR = <value set in global controller>

  AL = 10

    - P2P

  CIR = <value set in global controller>

  PIR = <value set in global controller>

  AL = 1

The service configuration is applied to the SCE devices.

If you defined a database in Step 10:

  1 The SCA Reporter tool is connected to the selected database.

  2 The first SCE platform entered in Step 4 is selected as the source of service configuration data.

  3 The Next button is enabled.

Step 19 If you did not define a database in Step 10, click **Finish**.

The P2P Traffic Optimization wizard closes.

Step 20 Click **Next**.

The Create Common Reports window of the P2P Traffic Optimization wizard appears as shown in Figure 15.

Figure 15   Create Common Reports Window
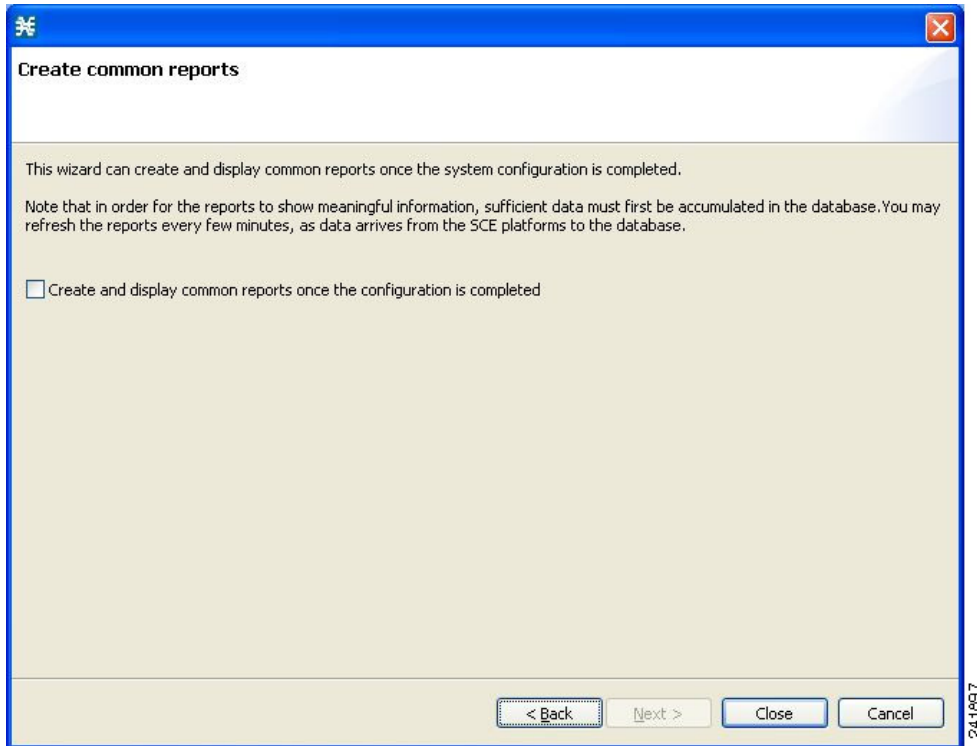
Step 21 To create reports, check the **Create and display common reports once the configuration is completed** check box.

> ✎
> **Note**   Report instances are created for four predefined report types:
> — Global Bandwidth per Service
> — Global Active Subscribers per Service
> — Top P2P Protocols
> — Global Hourly Call Minutes per Service (VoIP)

Step 22 Click **Close**.

The wizard closes. The SCA Reporter tool opens in the Console. Report instances of each of the four report types open in the Report View of the Reporter tool.

Tiered Subscriber Services

The tiered subscriber services solution provides the ability to create different subscriber packages with class of service parameters defined for each package.

Within each package, you define the available bandwidth and allotted services, as well as the priorities for the selected services. Additionally, you can define priorities between the packages so that when the link is congested, each package receives a different, predefined share of the bandwidth.

For example, you can define the following three packages:

* Gold - 5 MB, 3 services (VoIP, P2P, Browsing)
* Silver - 3 MB, 3 services (VoIP, browsing, P2P)
* Bronze - 1.5 MB, 2 services (browsing, P2P)

In this example, in the silver package you may give VoIP priority so that if all services are running simultaneously, VoIP still has sufficient bandwidth for optimal performance.

Gold has top priority, followed by silver, and then bronze. When the link is congested, gold has the most available bandwidth followed by silver and then bronze.

Configuring the Solution

Step 1   Create a new service configuration file.

     a. In the Service Configuration Editor tool, from the Console main menu, choose **File > New Service Configuration**.

     The New Service Configuration Settings window appears as shown Figure 16.

Figure 16   *New Service Configuration Settings Window*
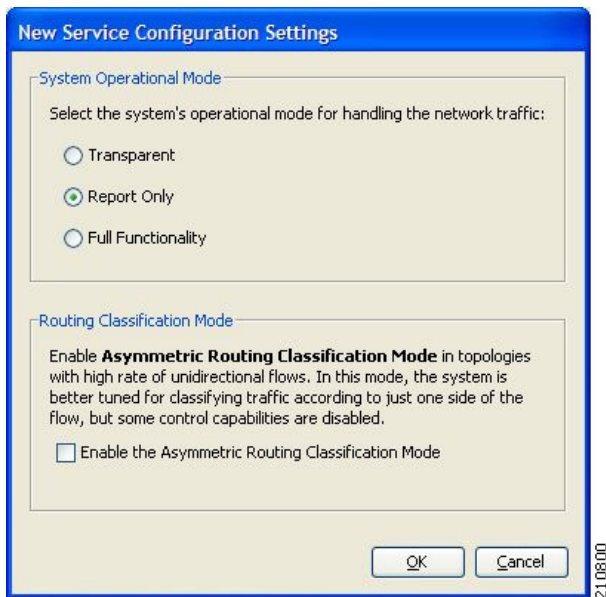
     b. In the System Operational Mode area, click the **Full Functionality** radio button.

     c. Click **OK**.

     The new service configuration is added to the Console window, open on the Policies tab, and becomes the active service configuration (Figure 17).

Figure 17   Service Configuration Editor—New Service Configuration
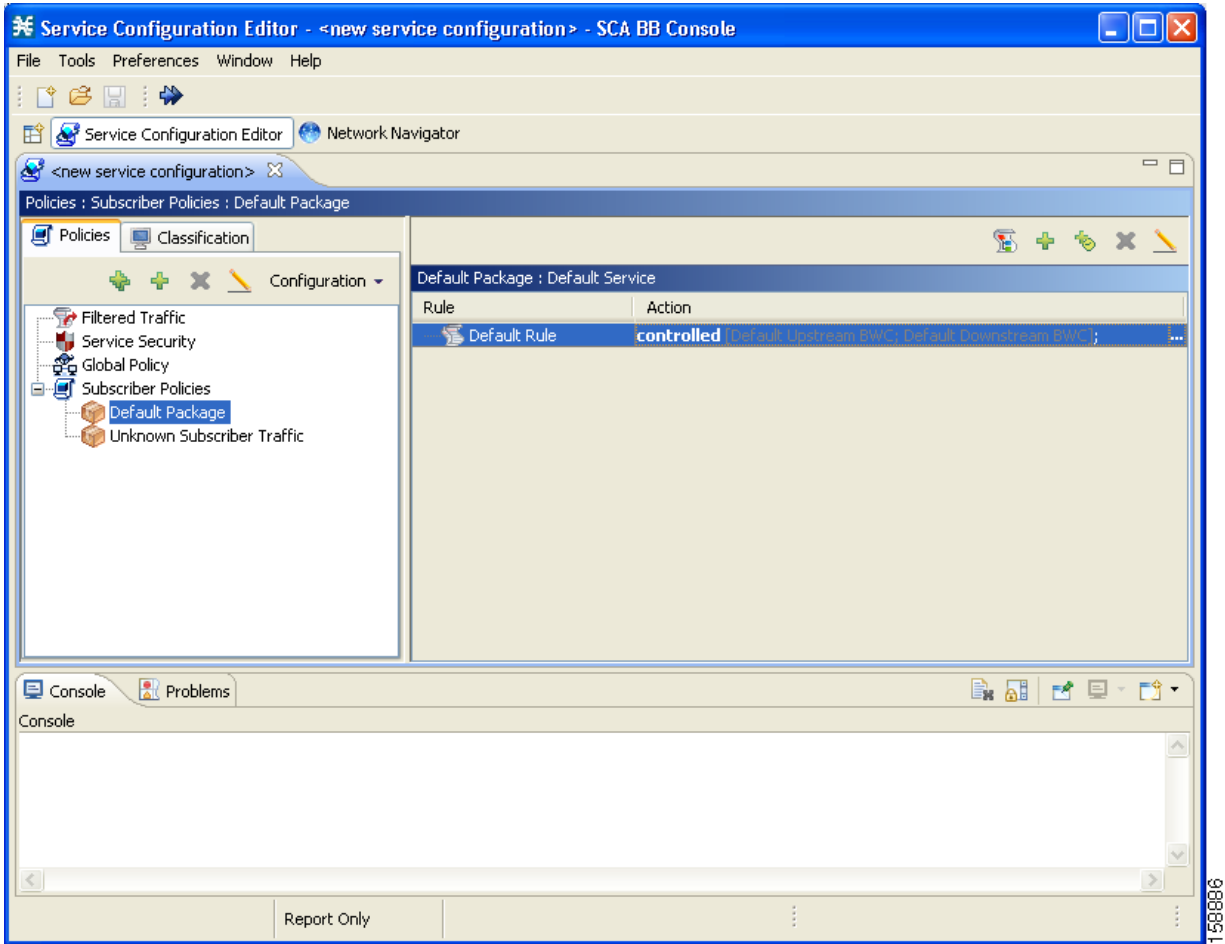
Step 2   Add a new package.

a.   In the Policies tab, click **Subscriber policies** and click ✚ (**Add Package**).

The Package Settings window appears as shown in Figure 18.

Figure 18   Package Settings Window
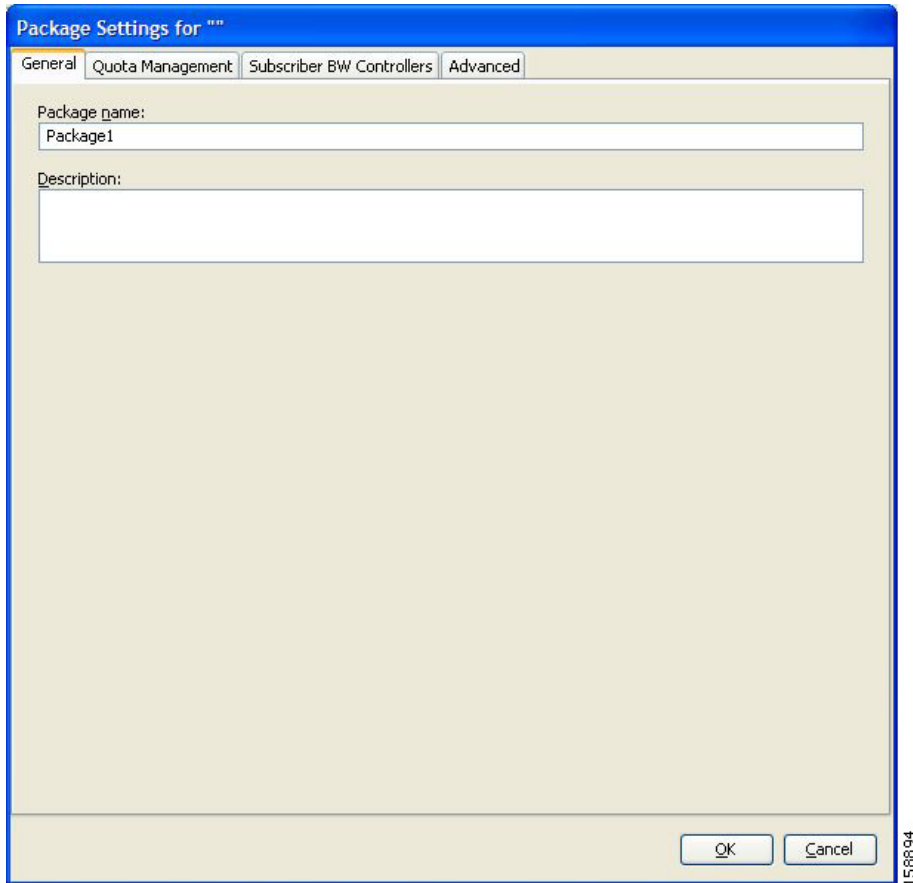
b. In the **Package name** field, enter Gold.

c. In the **Description** field, enter a meaningful description for the Gold package.

d. Click **OK**.

Step 3 Add the following services to the Gold package:

- Voice and Video Calls
- P2P
- Browsing

a. Click the Gold package.

b. In the right (Rule) pane, click ✚ (**Add Rule**).

The Add New Rule to Package window appears as shown in Figure 19.

Figure 19   *Add New Rule to Package Window*
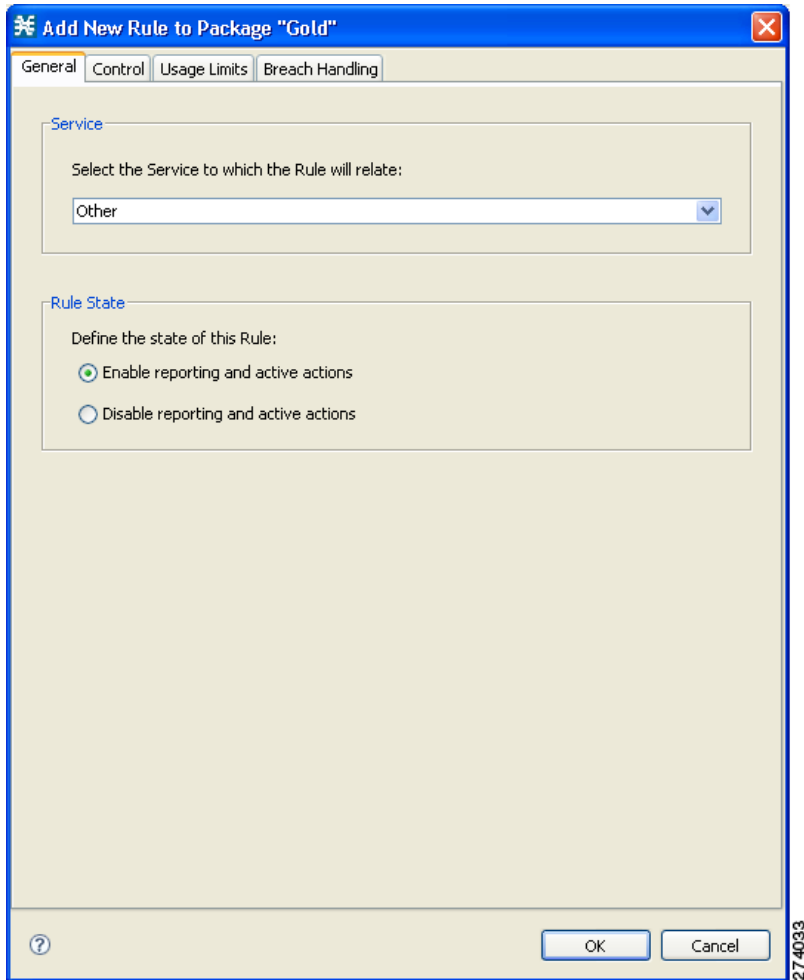
c. In the Service area, from the Select the Service to which the Rule will relate drop-down list, choose **Voice and Video Calls**.

d. Click **OK**.

e. Repeat steps a. to d., adding P2P and Browsing services.

Step 4   For each service, create an upstream and downstream Bandwidth Controller (BWC) and configure the BWC parameters.

a. Click the Gold package, and click ✐ (**Edit**).

The Package Settings dialog box appears.

b. In the Package Settings dialog box, click the **Subscriber BW Controllers** tab.

The Subscriber BW Controllers tab appears as shown in Figure 20.

Figure 20   Subscriber BW Controllers Tab
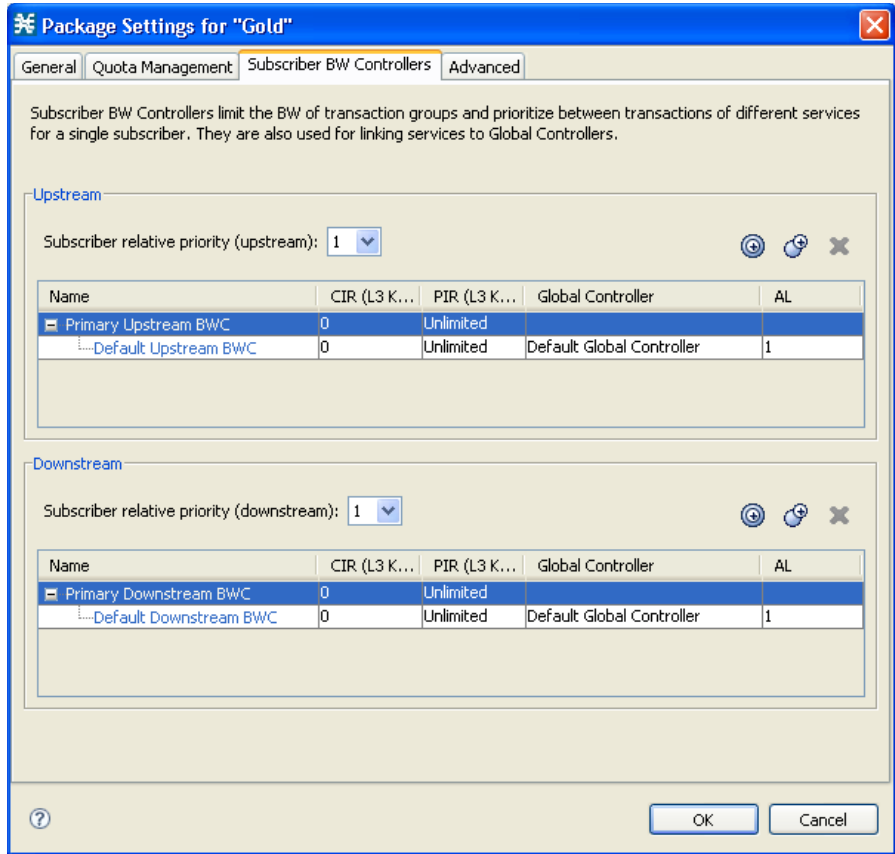
c. Add an upstream BWC to the package. In the Upstream area, click ⊕ (**Add a sub BW Controller**).

A new BWC is added.

d. In the **Name** field, enter Upstream Voice and Video Calls.

e. Configure the parameters for the BWC, as required for the Voice and Video Calls service, as follows:

   – In the CIR (Kbps) field, enter 256.

   – In the PIR (Kbps) field, enter Unlimited.

   – In the AL field drop-down list, choose 9.

f. Add a downstream BWC, and configure the parameters, as required for the Voice and Video Calls service, as follows:

   – In the Name field, enter Downstream Voice and Video Calls.

   – In the CIR (Kbps) field, enter 256.

   – In the PIR (Kbps) field, enter Unlimited.

   – In the AL field drop-down list, choose 9.

g. Configure the remaining BWCs with the values displayed in the following window (Figure 21).

Figure 21   Package Settings Example
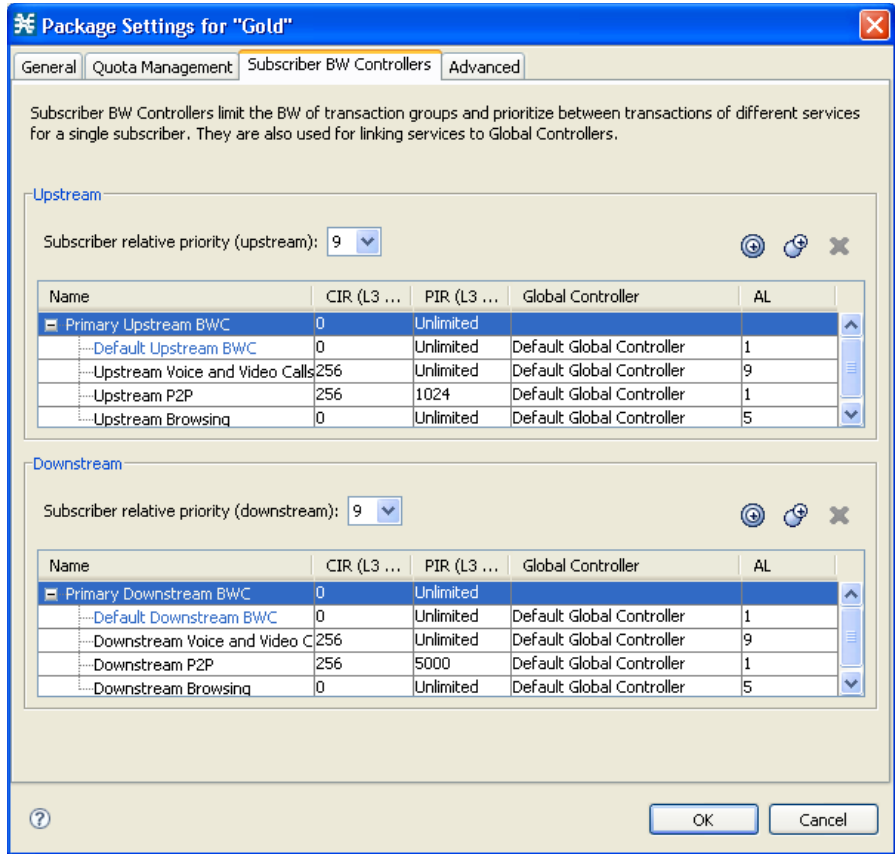
> **h.** From the Subscriber relative priority drop-down list (for both upstream and downstream), choose 9.

Step 5   Associate the services with the BWCs.

> **a.** Click the Voice and Video Calls rule and click ✏️ (**Edit**).
>
> The Add New Rule for Service dialog box appears.
>
> **b.** Click the **Control** tab.
>
> The Control tab opens (Figure 22).

Figure 22   Control Tab
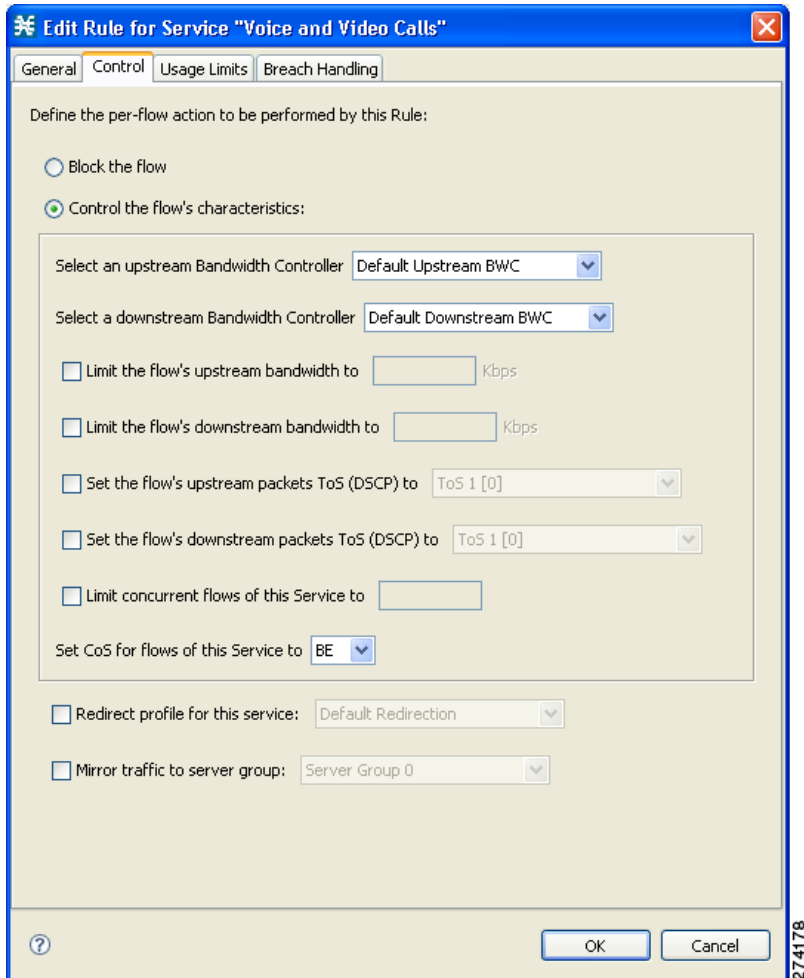
c. From the **Select an Upstream Bandwidth Controller** drop-down list, choose Upstream Voice and Video Calls.

d. From the **Select a Downstream Bandwidth Controller** drop-down list, choose Downstream Voice and Video Calls.

e. Click **OK**.

f. Repeat steps a. to e. for the other services.

Step 6   Duplicate the Gold Package and apply required changes to create a Silver package.

a. Click the Gold package, and click ![icon] (**Duplicate Package**).

A duplicate package is created with all the same attributes as the original package. The name of the new package is "Gold (1)".

b. Click the Gold (1) package and click ![icon] (**Edit**).

c. In the **Name** field, enter Silver and enter an appropriate description in the Description field.

d. Change the BWCs to reflect the Silver configurations.

Step 7   Repeat Step 6 to create a Bronze package.

Capacity Control and Tiered Subscriber Services

The capacity control and tiered subscriber services solution is a combination of the first two solutions; where subscriber packages are defined. However, on top of the packages, the bandwidth is limited per service (subscriberless mode) or per subscriber (anonymous subscriber mode).

Configuring the Solution

In this solution, you add a global controller, limit the global controller bandwidth to 500 kbps, and assign the global controller to the P2P service for the Silver and Gold packages.

Step 1   Configure the solution as described in Configuring the Solution, page 18.

Step 2   Add a new global controller and set a single value for the maximum bandwidth limit for this global controller.

    a.   In the Policies tab, click **Global Policy**.

        The Global Bandwidth Settings appear in the right (Rule) pane.

    b.   Above the Upstream interface area, click ➕ (**Add**).

        The Select Addition Mode window appears (Figure 23).

Figure 23   Select Addition Mode Window
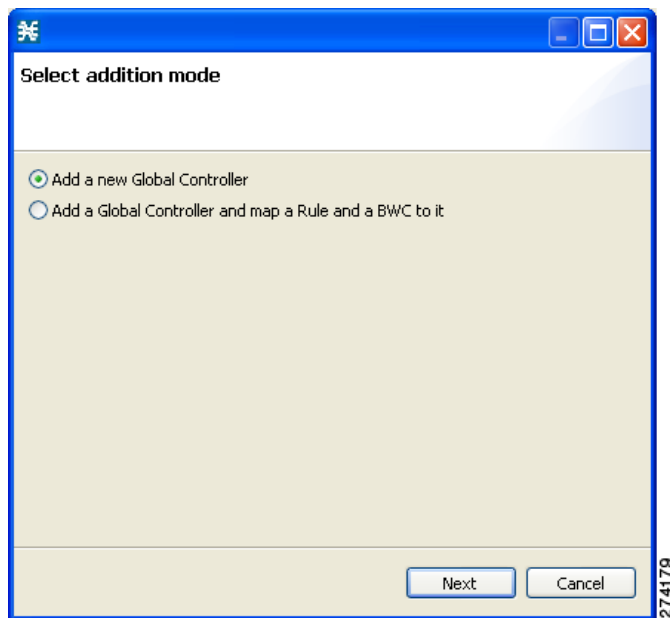
    c.   Click the **Add a new Global Controller** radio button.

    d.   Click **Finish**.

        The Global Controller Settings window appears (Figure 24).

Figure 24   Global Controller Settings Window
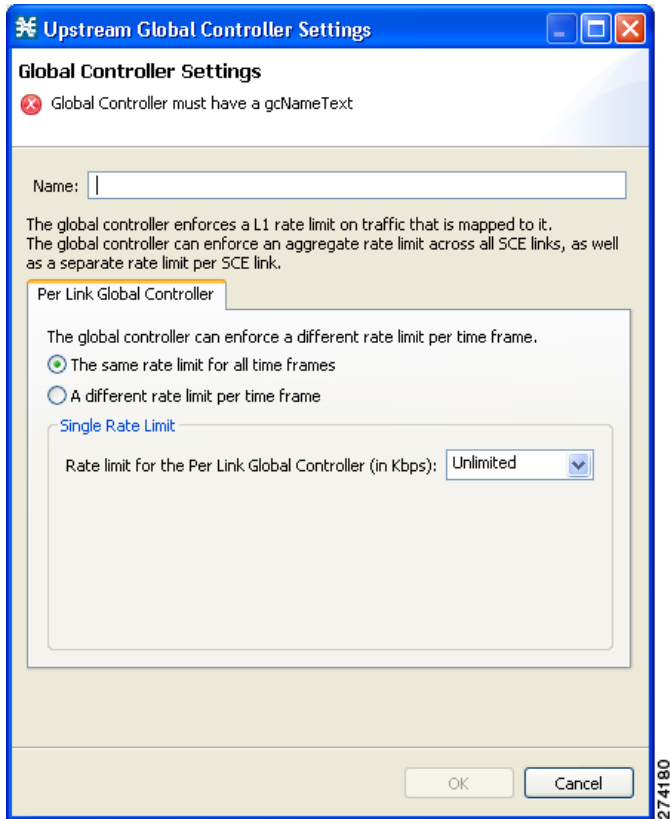
e. In the Name field, enter P2P GC.

f. Click the **The same rate limit for all time frames** radio button, and from the Rate limit for the Per Link Global Controller (in Kbps) drop-down list, choose 500 for the maximum bandwidth.

g. Click **Finish**.

Step 3   Repeat Step 2 to add an identical global controller for downstream.

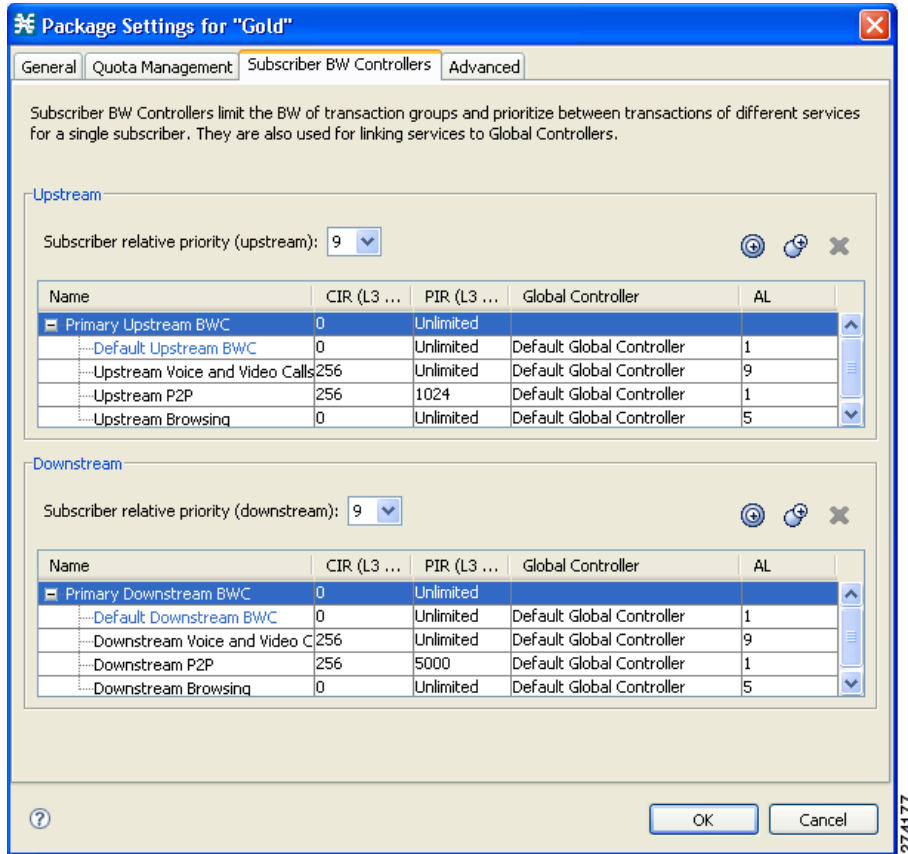**Step 4**   Apply the P2P global controller to the Silver package.

a. Click the Silver package, and click ✎ (**Edit**).

The Package Settings dialog box appears.

b. In the Package Settings dialog box, click the **Subscriber BW Controllers** tab.

The Subscriber BW Controllers tab appears (Figure 25).

Figure 25   Subscriber BW Controllers Tab

c. In the Upstream P2P row, in the Global Controller column, choose P2P GC.

d. Repeat step c. for downstream.

e. Click **OK**.

Step 5   Repeat Step 4 for the Bronze package.

Traffic Optimization Reports

There are several reports that can be generated to assist in traffic optimization for the local links. For details, see the *Cisco Service Control Application Reporter User Guide*.

3   Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

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