

Service Management in a PCMM Environment



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Service Management in a PCMM Environment
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Documentation and Release Notes

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Supported Platforms

For the features described in this document, the following platforms are supported:

- C Series

Documentation Conventions

Table 1 on page x defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Documentation Conventions

[Table 1 on page x](#) defines the notice icons used in this guide. [Table 3 on page xi](#) defines text conventions used throughout this documentation.

Table 2: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 3: Text Conventions

Convention	Description	Examples
Bold text like this	<ul style="list-style-type: none"> Represents keywords, scripts, and tools in text. Represents a GUI element that the user selects, clicks, checks, or clears. 	<ul style="list-style-type: none"> Specify the keyword exp-msg. Run the install.sh script. Use the pkgadd tool. To cancel the configuration, click Cancel.
Bold text like this	Represents text that the user must type.	user@host# set cache-entry-age <i>cache-entry-age</i>
Fixed-width text like this	Represents information as displayed on your terminal's screen, such as CLI commands in output displays.	<pre> nic-locators { login { resolution { resolver-name /realms/ login/A1; key-type LoginName; value-type SaeId; } } </pre>
Regular sans serif typeface	<ul style="list-style-type: none"> Represents configuration statements. Indicates SRC CLI commands and options in text. Represents examples in procedures. Represents URLs. 	<ul style="list-style-type: none"> system ldap server{ stand-alone; Use the request sae modify device failover command with the force option user@host# ... http://www.juniper.net/techpubs/software/management/sdx/api-index.html

Table 3: Text Conventions (*continued*)

<i>Italic sans serif typeface</i>	Represents variables in SRC CLI commands.	<code>user@host# set local-address local-address</code>
Angle brackets	In text descriptions, indicate optional keywords or variables.	Another runtime variable is <gfwif>.
Key name	Indicates the name of a key on the keyboard.	Press Enter.
Key names linked with a plus sign (+)	Indicates that you must press two or more keys simultaneously.	Press Ctrl + b.
<i>Italic typeface</i>	<ul style="list-style-type: none"> Emphasizes words. Identifies book names. Identifies distinguished names. Identifies files, directories, and paths in text but not in command examples. 	<ul style="list-style-type: none"> There are two levels of access: <i>user</i> and <i>privileged</i>. <i>SRC-PE Getting Started Guide</i>. <i>o=Users, o=UMC</i> The <i>/etc/default.properties</i> file.
Backslash	At the end of a line, indicates that the text wraps to the next line.	<code>Plugin.radiusAcct-1.class=\ net.juniper.smgmt.sae.plugin\ RadiusTrackingPluginEvent</code>
Words separated by the symbol	Represent a choice to select one keyword or variable to the left or right of this symbol. (The keyword or variable may be either optional or required.)	<code>diagnostic line</code>

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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

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- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <http://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum: <http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

PART 1

Overview

- [Software Features Overview on page 3](#)
- [Premium Services in a PCMM Environment on page 7](#)

CHAPTER 1

Software Features Overview

- [SRC Component Overview on page 3](#)

SRC Component Overview

The SRC software is a dynamic system. It contains many components that you use to build a subscriber management environment. You can use these tools to customize and extend the SRC software for your use and to integrate the SRC software with other systems. The SRC software also provides the operating system and management tools for C Series Controllers.

[Table 4 on page 3](#) gives a brief description of the components that make up the SRC software.

Table 4: Descriptions of SRC Components

Component	Description
Server Components	
Service activation engine (SAE)	<ul style="list-style-type: none">• Authorizes, activates, and deactivates subscriber and service sessions by interacting with systems such as Juniper Networks routers, cable modem termination system (CMTS) devices, RADIUS servers, and directories.• Collects accounting information about subscribers and services from routers, and stores the information in RADIUS accounting servers, flat files, and other accounting databases.• Provides plug-ins and application programming interfaces (APIs) for starting and stopping subscriber and service sessions and for integrating with systems that authorize subscriber actions and track resource usage.
Subscriber Information Collector (SIC)	Used in conjunction with the MX Series router running the packet-triggered subscribers and policy control (PTSP) solution, the SIC listens for RADIUS accounting events from IP edge devices (accounting clients) and stores them in the Session State Registrar (SSR), or forwards them to a remote AAA server, allowing the SRC software to gain increased subscriber awareness. Additionally, the SIC can optionally edit accounting events before routing them.
Juniper Policy Server (JPS)	Acts as a policy decision point (PDP) and policy enforcement point (PEP) that manages the relationships between application managers and CMTS devices in a PCMM environment.
Network information collector (NIC)	Collects information about the state of the network and can provide a mapping from a given type of network data to another type of network data.

Table 4: Descriptions of SRC Components (*continued*)

Component	Description
Redirect Server	Redirects HTTP requests received from IP Filter to a captive portal page.
3GPP Gateway	The SRC Third-Generation Partnership Project (3GPP) gateway is a Diameter-based component in the SRC software, which provides integration with 3GPP Policy and Charging Control environments, to provide fixed-mobile convergence (FMC). The SRC 3GPP gateway provides Gx-based integration with the Policy and Charging Rules Function (PCRF). The SRC 3GPP gateway uses the northbound Gx interface to mediate between the PCRF and Juniper Networks routers like the E Series Broadband Services routers and MX Series routers. The northbound Gx interface on the SRC 3GPP gateway communicates with the PCRF using the Diameter protocol.
3GPP Gy	The SRC 3GPP Gy is a Diameter-based component in the SRC software, which provides Gy-based integration with the Online Charging System (OCS), to provide FMC. The SRC 3GPP Gy uses the northbound Gy interface to handle charging-related information between the OCS and Juniper Networks routers like the E Series Broadband Services routers and MX Series routers. The northbound Gy interface communicates with the OCS using the Diameter protocol.
Web Application Service	The SRC software includes a Web application server that hosts the Web Services Gateway and the Volume Tracking Application (SRC VTA). In production environments, this application server is designed to host only these applications. However, you can load your own applications into this server for testing or demonstration purposes.
Web Services Gateway	<p>Allows a gateway client—an application that is not part of the SRC network—to interact with SRC components through a Simple Object Access Protocol (SOAP) interface.</p> <p>The Web Services Gateway provides the Dynamic Service Activator which allows a gateway client to dynamically activate and deactivate SRC services for subscribers and to run scripts that manage the SAE.</p>
Repository	
Directory	<p>The SRC software includes the Juniper Networks database, which is a built-in Lightweight Directory Access Protocol (LDAP) directory for storing all SRC data including services, policies, and small subscriber databases.</p> <p>For large subscriber databases, you must supply your own directory.</p>
Session State Registrar (SSR)	The SSR is a stateless, highly reliable and highly available database cluster. When used in conjunction with an MX Series router running the packet-triggered subscribers and policy control (PTSP) solution, the SSR stores the IP edge attachment subscriber sessions data learned from IP edge devices in the centralized SSR database.
SRC Configuration and Management Tools	
SRC command line interface (CLI)	Provides a way to configure the SRC software on a C Series Controller from a Junos OS–like CLI. The SRC CLI includes the policies, services, and subscribers CLI, which has separate access privileges.
C-Web interface	Provides a way to configure, monitor, and manage the SRC software on a C Series Controller through a Web browser. The C-Web interface includes a policies, services, and subscribers component, which has separate access privileges.

Table 4: Descriptions of SRC Components (*continued*)

Component	Description
Simple Network Management Protocol (SNMP) agent	Monitors system performance and availability. It runs on all the SRC hosts and makes management information available through SNMP tables and sends notifications by means of SNMP traps.
Service Management Applications (Run on external system)	
IMS Services Gateway	Integrates into an IP multimedia system (IMS) environment. The SRC software provides a Diameter protocol-based interface that allows the SRC software to integrate with services found on the application layer of IMS.
SRC Programming Interfaces	
NETCONF API	Allows you to configure or request information from the NETCONF server on a C Series Controller that runs the SRC software. Applications developed with the NETCONF API run on a system other than a C Series Controller.
CORBA plug-in service provider interface (SPI)	Tracks sessions and enables linking the rest of the service provider's operations support system (OSS) with the SRC software so that the OSS can be notified of events in the life cycle of SAE sessions. Hosted plug-ins only.
CORBA remote API	Provides remote access to the SAE core API. Applications that use these extensions to the SRC software run on a system other than a C Series Controller.
NIC access API	Performs NIC resolutions. Applications that use these extensions to the SRC software run on a system other than a C Series Controller.
SAE core API	Controls the behavior of the SRC software. Applications that use these extensions to the SRC software run on a system other than a C Series Controller.
Script services	Provides an interface to call scripts that supply custom services such as provisioning policies on a number of systems across a network.
VTA API	The Volume Tracking Application (VTA) API is a Simple Object Access Protocol (SOAP) interface that allows developers to create gateway clients and that administrators use to manage VTA subscribers and sessions. The SRC Web Services Gateway allows a gateway client—an application that is not part of the SRC network—to interact with SRC components, such as the VTA, through a SOAP interface.
Authorization and Accounting Applications	
AAA RADIUS servers	Authenticates subscribers and authorizes their access to the requested system or service. Accepts accounting data—time active and volume of data sent—about subscriber and service sessions. RADIUS servers run on a system other than a C Series Controller.
SRC Admission Control Plug-In (SRC ACP)	Authorizes and tracks subscribers' use of network resources associated with services that the SRC application manages.
Flat file accounting	Stores tracking data to accounting flat files that can be made available to external systems that send the data to a rating and billing system.

Table 4: Descriptions of SRC Components (*continued*)

Component	Description
Volume Tracking Application	<p>The SRC Volume Tracking Application (SRC VTA) is an SRC component that allows service providers to track and control the network usage of subscribers and services. You can control volume and time usage on a per-subscriber or per-service basis. This level of control means that service providers can offer tiered services that use volume as a metric, while also controlling abusive subscribers and applications.</p> <p>When a subscriber or service exceeds bandwidth limits (or quotas), the SRC VTA can take actions including imposing rate limits on traffic, sending an e-mail notification, or charging extra for additional bandwidth consumed.</p>
Demonstration Applications (available on the Juniper Networks Website)	
Enterprise Audit Plug-In	Defines a callback interface, which receives events when IT managers complete specified operations.
Enterprise Manager Portal	<p>Allows service providers to provision services for enterprise subscribers on routers running JunosE or Junos OS and allows IT managers to manage services.</p> <p>Enterprise Manager Portal can be used with NAT Address Management Portal to allow service providers to manage public IP addresses for use with NAT services on routers running Junos OS and to all IT managers to make requests about public IP addresses through the Enterprise Manager Portal.</p>
Monitoring Agent application	Integrates IP address managers, such as a DHCP server or a RADIUS server, into an SRC-managed network so that the SAE is notified about subscriber events. The Monitoring Agent application runs on a Solaris platform.
Residential service selection portals	Provides a framework for building Web applications that allow residential and enterprise subscribers to manage their own network services. It comes with several full-featured sample Web applications that are easy to customize and suitable for deployment. The Residential service selection portals run on a Solaris platform.
Sample enterprise service portal	Lets service providers supply an interface to their business customers for managing and provisioning services.

Related Documentation • [SRC Product Description](#)

CHAPTER 2

Premium Services in a PCMM Environment

- [PCMM Environment Overview on page 7](#)
- [Using the SAE in a PCMM Environment on page 16](#)
- [Using the NIC Resolver in PCMM Environments on page 21](#)

PCMM Environment Overview

The PacketCable Multimedia (PCMM) specification defines a standards-based way to deliver premium quality of service (QoS)–enhanced services across the radio frequency (RF) portion of a cable network. The PCMM capabilities of the SRC software along with Juniper Networks routers provide an end-to-end solution that seamlessly links the cable operator's RF domain with IP edge and core QoS services.

Key services supported in this environment include:

- Bandwidth on demand and variable bandwidth
- QoS-enabled streaming media, including video on demand and video telephony
- Residential voice over IP (VoIP)
- Multicast audio and video applications
- Videoconferencing
- Interactive gaming
- Peer-to-peer controls and protection services

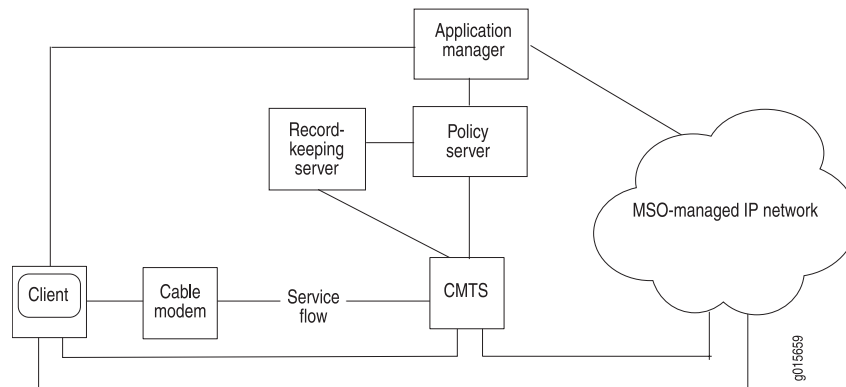
PCMM Architecture

[Figure 1 on page 8](#) depicts the PCMM architectural framework. The basic roles of the various PCMM components are:

- Application manager—Provides an interface to policy server(s) for the purpose of requesting QoS-based service on behalf of a subscriber or a network management system. It maps session requests to resource requests and creates policies.
- Policy server—Acts as a policy decision point and policy enforcement point and manages relationships between application managers and cable modem termination system (CMTS) devices.

- CMTS device—Cable modem termination system. Performs admission control and manages network resources through Data over Cable Service Interface Specifications (DOCSIS) service flows.
- Client—Represents endpoints, such as PC applications, that can send or receive data.
- Record-keeping server—Receives event messages from other network elements, such as the policy server or CMTS device, and acts as a short-term repository for the messages. It can also assemble event messages into coherent sets or call detail records, which are then made available to other back office systems, such as billing, fraud detection, and other systems.

Figure 1: PCMM Architectural Framework



In the PCMM architecture, a client requests a multimedia service from an application manager. The application manager relays the request to a policy server. The policy server is then responsible for provisioning the policies on a CMTS device. Based on the request, the policy server records an event that indicates the policy request. The request can include network resource records, and the policy server can provide the records to a record-keeping server, such as a RADIUS accounting server.

The policy server may also provide functions such as tracking resource usage and tracking the authorization of resources on a per-subscriber, per-service, or aggregate basis.

DOCSIS Protocol

The DOCSIS protocol is the standard for providing quality of service for traffic between the cable modem and CMTS devices. The CMTS device is the head-end in the DOCSIS architecture, and it controls the operations of many cable modems. Two channels carry signals between CMTS devices and cable modems:

- Downstream channels—Carry signals from the CMTS head-end to cable modems.
- Upstream channels—Carry signals from the cable modems to the CMTS head-end.

The DOCSIS protocol defines the physical layer and the Media Access Control (MAC) protocol layer that is used on these channels.

A cable modem usually uses one upstream channel and an associated downstream channel. Upstream channels are shared, and the CMTS device uses the MAC protocol to control the cable modem's access to the upstream channel.

Service Flows

The DOCSIS protocol uses the concept of service flows to support QoS on upstream and downstream channels. A service flow is a unidirectional flow of packets that provides a particular quality of service. Traffic is classified into a service flow, and each service flow has its own set of QoS parameters. The SRC software is compliant with the following upstream service flow scheduling types, as defined in the PacketCable Multimedia Specification PKT-SP-MM-I03-051221.

- Best effort—Used for standard Internet traffic such as Web browsing, e-mail, or instant messaging.
- Non-real-time polling service (NRTPS)—Used for standard Internet traffic that requires high throughput, and traffic that requires variable-sized data packets on a regular basis, such as high-bandwidth File Transfer Protocol (FTP).
- Real-time polling service (RTPS)—Used for applications such as Moving Pictures Experts Group (MPEG) video.
- Unsolicited grant service (UGS)—Used for real-time traffic that generates fixed-size data packets on a periodic basis. Applications include VoIP.
- Unsolicited grant service with activity detection (UGS-AD)—Used for applications such as voice activity detection, also known as silence suppression.

Downstream service flows are defined through a similar set of QoS parameters that are associated with the best-effort scheduling type on upstream service flows.

Client Types

The PCMM specification uses the concept of clients and defines a client as a logical entity that can send or receive data. The SRC software supports type 1 and type 2 clients.

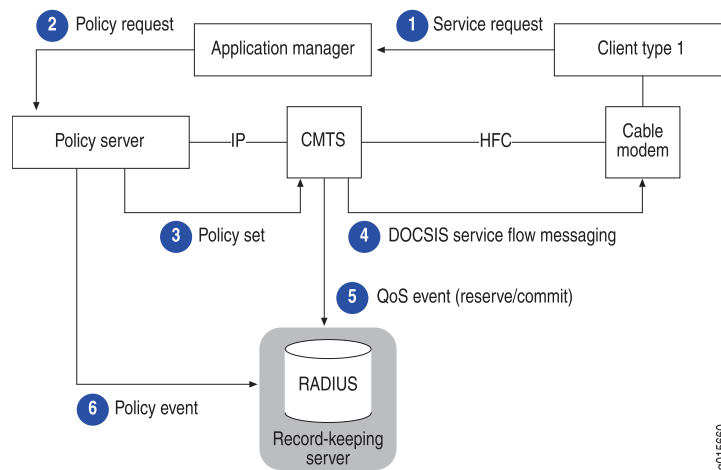
The PCMM specification defines two resource reservation models for each client type—a single phase and a dual phase. The SRC software supports the single-phase model.

Client Type 1 Single Phase Resource Reservation Model

Type 1 clients represent endpoints, such as PC applications or gaming consoles, that lack specific QoS awareness or signaling capabilities. Type 1 clients communicate with an application manager to request a service. They do not request QoS resources directly from the multiple service operator (MSO) network.

Client type 1 entities support the proxied-QoS with policy-push scenario of service delivery defined in PacketCable Multimedia Architecture Framework Technical Report (PKT-TR-MM-ARCH). In this scenario, the application manager requests QoS resources on behalf of the client, and the policy server pushes the request to the CMTS device. The CMTS device sets up and manages the DOCSIS service flow that the application requires, and might also set up and manage the cable modems.

Figure 2 on page 10 shows the message flow in an application scenario for the client type 1 single-phase resource reservation model.

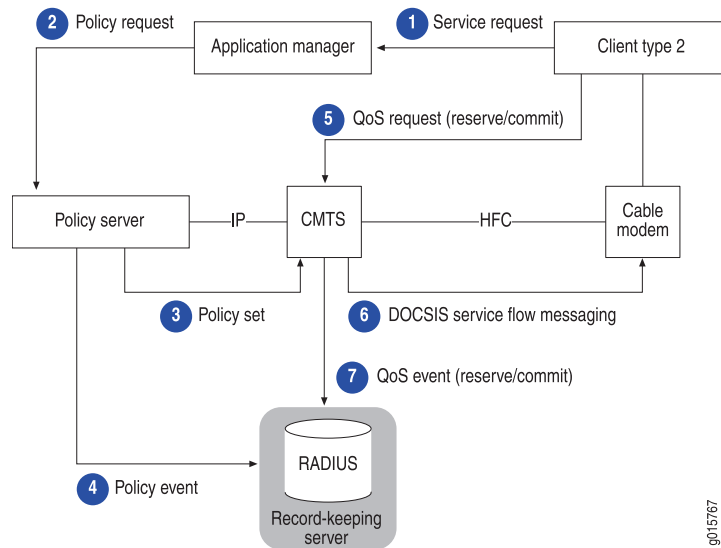
Figure 2: Client Type 1 Single-Phase Resource Reservation Model**Client Type 2 Single Phase Resource Reservation Model**

Type 2 clients represent endpoints that have QoS awareness or signaling capabilities. Type 2 clients communicate with an application manager to request a service and to obtain a token to present for requesting QoS resources directly from the MSO network.

Client type 2 entities support the client-requested QoS with policy-push scenario of service delivery defined in PacketCable Multimedia Architecture Framework Technical Report (PKT-TR-MM-ARCH). In this scenario, the application manager requests QoS resources on behalf of the client, and the policy server pushes the request to the CMTS device. The CMTS device sets up and manages the DOCSIS service flow that the application requires. After the CMTS device sets up the policy, the client can request QoS resources directly from the CMTS device as long as the request is authorized by the policy server.

Figure 3 on page 11 shows the message flow in an application scenario for the client type 2 single-phase resource reservation model.

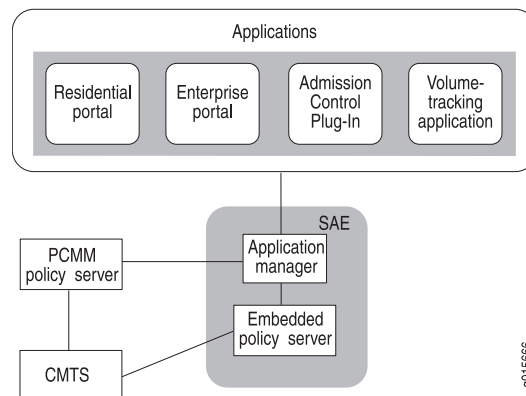
Figure 3: Client Type 2 Single-Phase Resource Reservation Model



SRC Software in the PCMM Environment

Figure 4 on page 11 shows the SRC software in the PCMM environment. The SAE is an application manager that can manage a PCMM-compliant policy server and/or a CMTS device on behalf of applications. The SAE has an embedded policy server that is not fully PCMM-compliant, but it can manage CMTS devices without requiring an external policy server. The Juniper Policy Server (JPS), a component of the SRC software that acts as a policy server, is a PCMM-compliant policy server. For more information about using the JPS, see *JPS Framework*.

Figure 4: SRC Software in the PCMM Environment



Traffic Profiles

The SRC software supports three types of policies that you can use to define traffic profiles between the CMTS device and the cable modem:

- DOCSIS parameters—Specifies the traffic profile through DOCSIS-specific parameters. You select the type of service flow that you want to offer, and then configure QoS parameters for the service flow.
- Service class name—Specifies the name of a service class that is configured on the CMTS device.
- FlowSpec—Defines the traffic profile through an Resource Reservation Protocol (RSVP)-like parameterization scheme. FlowSpecs support both controlled-load and guaranteed services.

You can also mark packets and then install policies that handle the marked packets in a certain way. The mark action sets the ToS byte in the IP header of IPv4 traffic or the traffic-class field in the IP header of IPv6 traffic.

For more information about traffic profiles, see *Delivering QoS Services in a Cable Environment*.

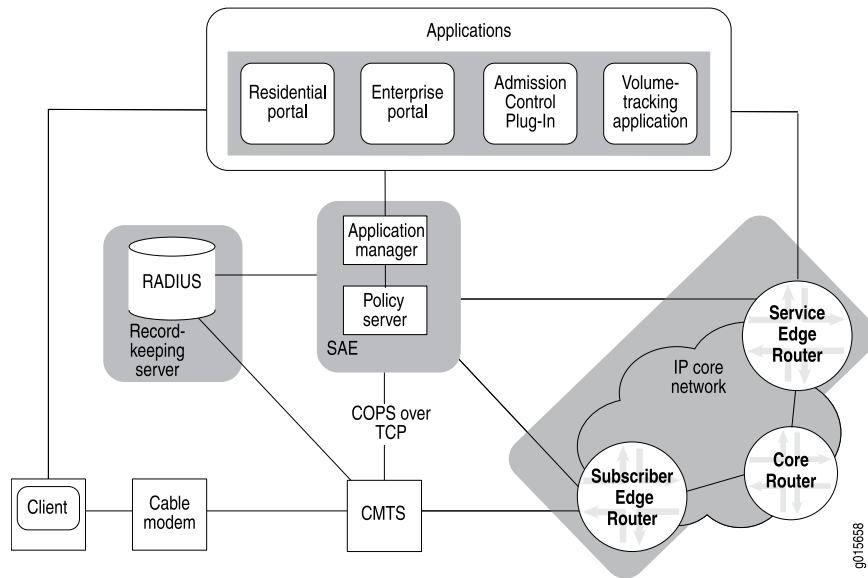
End-to-End QoS Architecture

The previous sections show how the SRC software supports QoS in the cable operator's RF domain, which encompasses the connection from the cable modem to the CMTS device. Using the SRC software along with Juniper Networks routers, you can link the RF domain to the subscriber and service edge domains.

- IP subscriber edge domain—Includes the IP network from the CMTS device to the edge router that typically connects to the cable operator's regional access network. (See [“Extending QoS to the Subscriber Edge Domain” on page 13.](#))
- IP service edge domain—Typically includes the IP network that connects the data center that houses service delivery applications to a backbone or directly to a cable head-on facility. (See [“Extending QoS to the Service Edge Domain” on page 13.](#))

By provisioning services across a network path, you can deliver a particular level of service for specified types of traffic. [Figure 5 on page 13](#) shows a typical high-level architecture of a cable operator and how the SRC software and Juniper Networks routers can be deployed to deliver end-to-end QoS services.

Figure 5: End-to-End QoS Architecture in a Cable Network



Extending QoS to the Subscriber Edge Domain

The subscriber edge domain includes subscriber edge routers that aggregate CMTS devices. To support QoS in subscriber edge domains, QoS must be enabled across the subscriber edge into the core or regional access network. When the SRC software receives a service request, it performs service authorization, which can include admission control. It then sends policies to the appropriate CMTS device and subscriber edge router interface.

In addition to the QoS services required in the RF domain, service policies in the subscriber edge domain that must be available for provisioning at this point include:

- Policy routing to best-of-breed appliances and premium paths
- Rate limiting, traffic shaping, and marking
- Admission control (edge resources and core resources)
- Captive portal and Web redirect capabilities
- Filtering and routers running Junos OS–based firewall services
- Routers running Junos OS virtual private network (VPN) services

Extending QoS to the Service Edge Domain

The service edge domain includes service edge routers that aggregate applications. To support QoS in service edge domains, the SRC software sends policies to a service edge router that provides for enhanced service delivery to the service origination edge for centralized or hosted services, such as multimedia or VoD.

In addition to the QoS services required in the RF domain, service policies in the service edge domain that must be capable of being provisioned at this point include:

- Policy routing to best-of-breed appliances and premium paths
- Rate limiting, traffic shaping (called hierarchical queuing in JunosE software), and marking
- Filtering and routers running Junos OS–based firewall services
- Routers running Junos OS VPN services

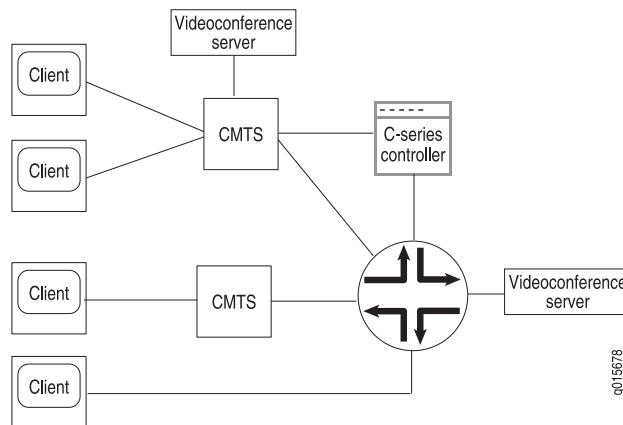
Provisioning End-to-End Services

The following sections provide examples of how you can use the SRC software to provision services for video applications. Although the examples show one SAE managing all the network devices, separate SAEs could manage each device and provide the same service.

Example for Videoconferencing Services

You can configure services to mark traffic forwarded from specified systems, and then apply an end-to-end service level for that traffic. [Figure 6 on page 14](#) shows a scenario in which videoconferencing is delivered in a PCMM environment.

Figure 6: Videoconferencing Example



To ensure a specified level of service from each client PC to the videoconference server and then to each client PC participating in the videoconference, you could configure the following types of services:

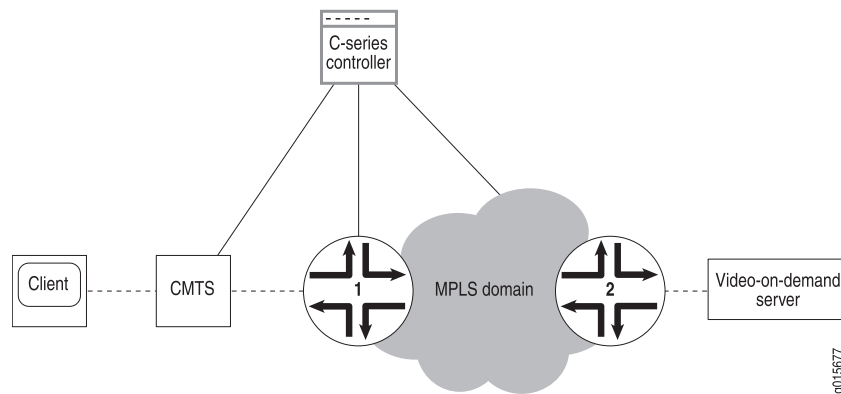
- Three services:
 - A service that provides policies to mark packets with a specified type of service for the videoconferencing software.
 - A service that provides policies for the type of service specified for CMTS device.
 - A service that provides policies for the type of service specified for the routers running Junos or JunosE Software.
- An infrastructure service for each service.
- An aggregate service that contains the three infrastructure services as fragment services.

This configuration marks packets that the CMTS device receives from both client and server, and applies forwarding policies on the CMTS device and on the routers running JunosE or Junos OS for packets sent to and received from the videoconferencing server.

Example for Video-on-Demand Services

You can configure services to provide server-to-client service for traffic sent from a video-on-demand server to client PCs. [Figure 7 on page 15](#) shows a scenario in which video on demand is delivered in a PCMM environment.

Figure 7: Video-on-Demand Example



To ensure a specified level of service from the video-on-demand server to the client PC, you could configure the following types of services:

- Services that provide bandwidth-on-demand (BoD) policies for traffic that is being forwarded from the video-on-demand server through:
 - Routers running Junos OS
 - CMTS devices
- A script service that sets up the Multiprotocol Label Switching (MPLS) path and delivers the specified service level for traffic that is being forwarded from the video-on-demand server through the MPLS domain.
- An infrastructure service for each value-added and script service.
- An aggregate service that contains all the infrastructure services as fragment services.

This configuration applies BoD policies to routers running JunosE or Junos OS, the MPLS domain, and the CMTS device, and sets up the MPLS path from router running Junos OS (2) to router running Junos OS (1).

Related Documentation

- For more information about each scheduling type, see *Delivering QoS Services in a Cable Environment*
- For more information about PCMM, consult the following specifications provided by CableLabs:
 - PacketCable Multimedia Architecture Framework Technical Report (PKT-TR-MM-ARCH)

- PacketCable Multimedia Specification PKT-SP-MM-I03-051221
- PacketCable Security Specifications (PKT-SP-SEC)
- [Using the SAE in a PCMM Environment on page 16](#)
- [Using the NIC Resolver in PCMM Environments on page 21](#)
- *Example: Providing Premium Services*

Using the SAE in a PCMM Environment

The SAE uses the Common Open Policy Service (COPS) protocol as specified in the PacketCable Multimedia Specification PKT-SP-MM-I03-051221 to manage PCMM-compliant CMTS devices in a cable network environment. The SAE connects to the CMTS device by using a COPS over Transmission Control Protocol (TCP) connection. In cable environments, the SAE manages the connection to the CMTS device.

The CMTS device does not provide address requests or notify the SAE of new subscribers, subscriber IP addresses, or any other attributes. IP address detection and all other subscriber attributes are collected outside of the COPS connection to the CMTS device. The SAE uses COPS only to push policies to the CMTS device and to learn about the CMTS status and usage data.

Because the CMTS device does not have the concept of interfaces, the SRC software uses pseudointerfaces to model CMTS subscriber connections similar to subscriber connections for routers running Junos OS.

This section describes how the SAE is used in cable networks. It includes the following topics:

- [Logging In Subscribers and Creating Sessions on page 16](#)
- [SAE Communities on page 19](#)
- [Storing Session Data on page 20](#)

Logging In Subscribers and Creating Sessions

You can use two mechanisms to obtain subscriber address requests and other information and to set up a pseudointerface on the CMTS device. (You must choose one mechanism; you cannot mix them.):

1. Assigned IP subscriber. The SAE learns about a subscriber through subscriber-initiated activities, such as activating a service through the portal or through the Advanced Services Gateway (ASG).

With this method, you use the assigned IP subscriber login type along with the network interface collector (NIC) to map IP addresses to the SAE.

2. Event notification from an IP address manager. The SAE learns about subscribers through notifications from an external IP address manager, such as a DHCP server or a RADIUS server.

With this method, you use the event notification application programming interface (API). The API provides an interface to the IP address manager, and lets the IP address manager notify the SAE of events such as IP address assignments.

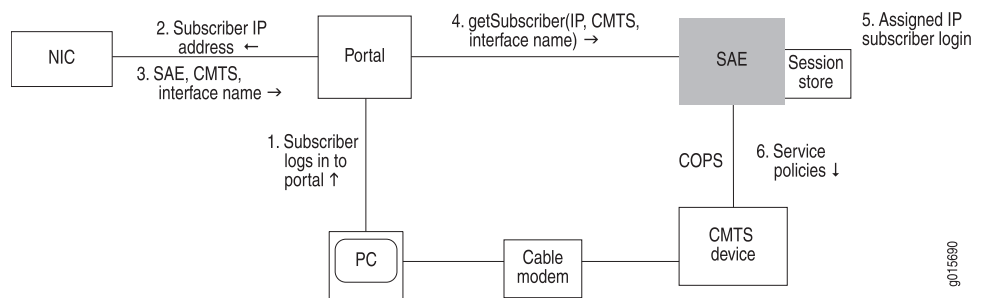
Assigned IP Subscribers

With the assigned IP subscriber method of logging in subscribers and creating sessions, the SRC software uses IP address pools along with NIC resolvers to provide mapping of IP addresses to SAEs. You configure the static address pools or dynamically discovered address pools in the virtual router configuration for a CMTS device. These pools are published in the NIC. The NIC maps subscriber IP addresses in requests received through the portal or Advanced Services Gateway to the SAE that currently manages that CMTS device.

Login Interactions with Assigned IP Subscribers

This section describes login interactions for assigned IP subscribers. In the example shown in [Figure 8 on page 17](#), the subscriber activates a service through a portal. You could also have the subscriber activate a service through the Advanced Services Gateway.

Figure 8: Login Interactions with Assigned IP Subscribers



The sequence of events for logging in and creating sessions for assigned IP subscribers is:

1. The subscriber logs in to the portal.
2. The portal sends the subscriber's IP address to the NIC.
3. Based on the IP address, the NIC looks up the subscriber's SAE, CMTS device, and interface name, and returns this information to the portal.
4. The portal sends a `getSubscriber` message to the SAE. The message includes the subscriber's IP address, CMTS device, and interface name.
5. The SAE creates an assigned IP subscriber and performs a subscriber login. Specifically, it:
 - a. Runs the interface classification script and creates a pseudointerface for the PCMM device driver.
 - If it finds a default policy, it pushes the policy to the CMTS device.

- If it does not find a default policy, it continues with the next steps.
 - b. Runs the subscriber classification script with the IP address of the subscriber. (Use the ASSIGNEDIP login type in subscriber classification scripts.)
 - c. Loads the subscriber profile.
 - d. Runs the subscriber authorization plug-ins.
 - e. Runs the subscriber tracking plug-ins.
 - f. Creates a subscriber session and stores the session data in the session store file.
6. The SAE pushes service policies for the subscriber session to the CMTS device.

Because the SAE is not notified when the subscriber logs out, the assigned IP idle timer begins when no service is active. The SAE removes the interface subscriber session when the timeout period ends.

Event Notification from an IP Address Manager

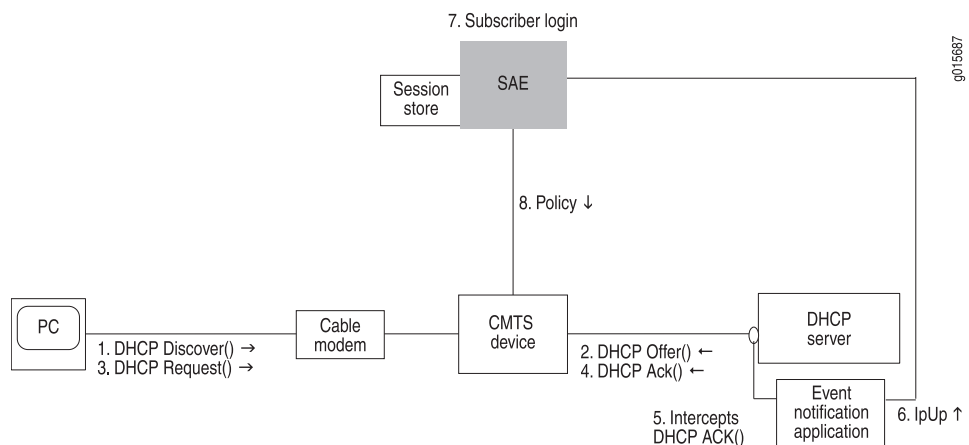
With the event notification method of logging in subscribers and creating subscriber sessions, the subscriber logs in to the CMTS device and obtains an IP address through an address server, usually a DHCP server. The SAE receives notifications about the subscriber, such as the subscriber's IP address, from an event notification application that is installed on the DHCP server.

To use this method of logging in subscribers, you can use the event notification API to create the application that notifies the SAE when events occur between the DHCP server and the CMTS device. You can also use Monitoring Agent, an application that was created with the event notification API, and that monitors DHCP or RADIUS messages for DHCP or RADIUS servers. See *SRC PE Sample Applications Guide*.

Login with Event Notification

This section describes login interactions using event notifications.

Figure 9: Login Interactions with Event Notification Application



The sequence of events for logging in subscribers and creating sessions is:

1. The DHCP client in the subscriber's computer sends a DHCP discover request to the DHCP server.
2. The DHCP server sends a DHCP offer to the subscriber's DHCP client.
3. The DHCP client sends a DHCP request to the DHCP server.
4. The DHCP server acknowledges the request by sending a DHCP Ack message to the DHCP client.
5. The event notification application that is running on the DHCP server intercepts the DHCP Ack message.
6. The event notification application sends an ipUp message to the SAE that notifies the SAE that an IP address is up.
7. The SAE performs a subscriber login. Specifically, it:
 - a. Runs the interface classification script and creates a pseudointerface for the PCMM device driver.
 - If it finds a default policy, it pushes the policy to the CMTS device.
 - If it does not find a default policy, it continues with the next steps.
 - b. Runs the subscriber classification script.
 - c. Loads the subscriber profile.
 - d. Runs the subscriber authorization plug-ins.
 - e. Runs the subscriber tracking plug-ins.
 - f. Creates a subscriber session and stores the session in the session store file.
8. The SAE provisions policies for the subscriber session on the CMTS device.

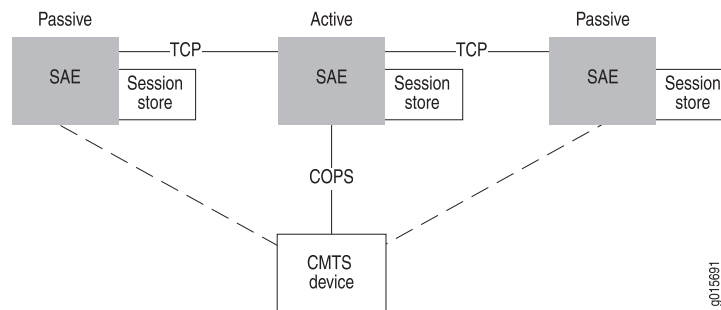
The ipUp event should be sent with a timeout set to the DHCP lease time. The DHCP server sends an ipUp event for each Ack sent to the client. The SAE restarts the timeout each time it receives an ipUp event.

If the client explicitly releases the DHCP address (that is, it sends a DHCP release event), the DHCP server sends an ipDown event. If the client does not renew the address, the lease expires on the DHCP server and the timeout expires on the SAE.

SAE Communities

For SAE redundancy in a cable network, you can have a community of two or more SAEs. SAEs in a community are given the role of either active SAE or passive SAE. The active SAE manages the connection to the CMTS device and keeps session data up to date within the community. [Figure 10 on page 20](#) shows a typical SAE community.

Figure 10: SAE Community



When an SAE opens a connection to the CMTS device, it negotiates with other SAEs to determine which SAE controls the CMTS device. The SAE community manager and members of the community select the active SAE.

A passive SAE needs to take over as active SAE in any of the following cases:

- The active SAE shuts down or the connection between the CMTS device and the active SAE goes down. In this case, the active SAE notifies the passive SAEs, and one of the passive SAEs takes over as active SAE.
- A passive SAE does not receive a keepalive message from the active SAE within the keepalive interval. In this case, the passive SAE attempts to become the active SAE.

Storing Session Data

To aid in recovering from an SAE failover, the SAE stores subscriber and service session data. When the SAE manages a CMTS device, session data is stored locally in the SAE host's file system. The SRC component that controls the storage of session data on the SAE is called the session store. The session store queues data and then writes the data to session store files on the SAE host's disk. Once the data is written to disk, it can survive a server reboot.

For more information, see *Fault Recovery*.

PCMM Record-Keeping Server Plug-In

To allow the SAE's embedded policy server to communicate with a record-keeping server (RKS) in a PCMM environment, you need to use the PCMM record-keeping server plug-in. This plug-in is similar to the RADIUS accounting plug-ins, but it works with any RKS that is compliant with the PCMM specification. The RKS plug-in supports additional attributes: Application-Manager-ID, Request-Type, and Update-Reason. The plug-in sends all requests to the RKS as Acct-Status-Type=Interim-Update.

Related Documentation

- [PCMM Environment Overview on page 7](#)
- [Using the NIC Resolver in PCMM Environments on page 21](#)
- [Configuring the SAE to Manage PCMM Devices \(SRC CLI\) on page 27](#)
- [Initially Configuring the SAE](#)

- *Storing Subscriber and Service Session Data*

Using the NIC Resolver in PCMM Environments

If you are using the NIC to map the subscriber IP address to the SAE, you need to configure a NIC host. The NIC system uses IP address pools to map IP addresses to SAEs. You configure the local address pools in the application manager configuration for a policy server group. These pools are published in the NIC. The NIC maps subscriber IP addresses in requests received through the portal or Advanced Services Gateway to the policy server group that currently manages that CMTS device.

The OnePopPcmm sample configuration data supports this scenario for a PCMM environment in which you use the assigned IP subscriber method to log in subscribers and in which you use the NIC to determine the subscriber's SAE. The OnePopPcmm configuration supports one point of presence (POP). NIC replication can be used to provide high availability. The realm for this configuration accommodates the situation in which IP pools are configured locally on each application manager group object.

The resolution process takes a subscriber's IP address as the key and returns a reference to the SAE managing this subscriber as the value.

The following agents collect information for resolvers in this realm:

- Directory agent PoolVr collects and publishes information about the mappings of IP pools to the policy server group.
- Directory agent VrSaeld collects and publishes information about the mappings of policy server groups to SAEs.

Related Documentation

- [PCMM Environment Overview on page 7](#)
- [Using the SAE in a PCMM Environment on page 16](#)
- *Specifying Application Manager Identifiers for Policy Servers (C-Web Interface)*
- *Configuring the NIC (SRC CLI)*
- *OnePopPcmm Scenario*

PART 2

Configuration

- [Tasks for Configuring the SAE for a PCMM Environment on page 25](#)
- [Configuration Tasks for Adding Objects for CMTS Devices on page 41](#)

CHAPTER 3

Tasks for Configuring the SAE for a PCMM Environment

- [Configuring the SAE for a Cable Network Environment \(SRC CLI\) on page 25](#)
- [Configuring the SAE for a Cable Network Environment \(C-Web Interface\) on page 26](#)
- [Configuring the SAE to Manage PCMM Devices \(SRC CLI\) on page 27](#)
- [Configuring the SAE to Manage PCMM Devices \(C-Web Interface\) on page 30](#)
- [Setting Up SAE Communities \(SRC CLI\) on page 30](#)
- [Setting Up SAE Communities \(C-Web Interface\) on page 31](#)
- [Configuring the SAE Community Manager on page 31](#)
- [Configuring the SAE Community Manager \(C-Web Interface\) on page 33](#)
- [Configuring SAE Properties for the Event Notification API \(SRC CLI\) on page 33](#)
- [Configuring SAE Properties for the Event Notification API \(C-Web Interface\) on page 34](#)
- [Configuring Record-Keeping Server Peers for Plug-Ins \(SRC CLI\) on page 34](#)
- [Configuring Record-Keeping Server Peers for Plug-Ins \(C-Web Interface\) on page 35](#)
- [Configuring PCMM Record-Keeping Server Plug-Ins \(SRC CLI\) on page 36](#)
- [Configuring PCMM Record-Keeping Server Plug-Ins \(C-Web Interface\) on page 38](#)
- [Configuring CMTS-Specific RKS Plug-Ins \(SRC CLI\) on page 38](#)
- [Configuring CMTS-Specific RKS Plug-Ins \(C-Web Interface\) on page 39](#)

Configuring the SAE for a Cable Network Environment (SRC CLI)

The tasks to configure the SAE for a cable network environment are:

1. Configure the SAE to manage PCMM devices.
[“Configuring the SAE to Manage PCMM Devices \(SRC CLI\)” on page 27.](#)
2. Configure the session store.
[See *Configuring the Session Store Feature \(SRC CLI\)*.](#)
3. Set up SAE communities.
[See “Setting Up SAE Communities \(SRC CLI\)” on page 30.](#)

4. (Optional) Configure SAE properties for the event notification API.
See [“Configuring SAE Properties for the Event Notification API \(SRC CLI\)” on page 33](#) (if you are using an external address manager).
5. (Optional) Configure record-keeping server peers for plug-ins.
See [“Configuring Record-Keeping Server Peers for Plug-Ins \(SRC CLI\)” on page 34](#) (if you are using the RKS plug-in).
6. (Optional) Configure PCMM record-keeping server plug-ins.
See [“Configuring PCMM Record-Keeping Server Plug-Ins \(SRC CLI\)” on page 36](#) (if you are using the SAE’s embedded policy server).
7. (Optional) Configure CMTS-specific RKS plug-ins.
See [“Configuring CMTS-Specific RKS Plug-Ins \(SRC CLI\)” on page 38](#).

In addition to configuring the SAE, you need to:

1. Configure the CMTS device in the directory (if you are using the SAE’s embedded policy server).
See [“Adding Objects for CMTS Devices \(SRC CLI\)” on page 41](#).
2. Configure the NIC (if you are using assigned IP subscribers).
See Using the NIC Resolver.
3. Enable the Common Open Policy Service (COPS) interface on the CMTS device. See the documentation for your CMTS device for information about how to do this.

**Related
Documentation**

- [PCMM Environment Overview on page 7](#)
- [Configuring the SAE for a Cable Network Environment \(C-Web Interface\) on page 26](#)
- [Configuring the SAE to Manage PCMM Devices \(C-Web Interface\) on page 30](#)
- [Configuring an SAE Group](#)

Configuring the SAE for a Cable Network Environment (C-Web Interface)

The tasks to configure the SAE for a cable network environment are:

1. Configure the SAE to manage PCMM devices.
See [“Configuring the SAE to Manage PCMM Devices \(C-Web Interface\)” on page 30](#).
2. Configure the session store.
3. Set up SAE communities.
See Setting Up SAE Communities (C-Web Interface).
4. (Optional) Configure SAE properties for the Event Notification API.
See [“Configuring SAE Properties for the Event Notification API \(C-Web Interface\)” on page 34](#) (if you are using an external address manager).

5. (Optional) Configure record-keeping server peers for plug-ins.
See [“Configuring Record-Keeping Server Peers for Plug-Ins \(C-Web Interface\)” on page 35](#) (if you are using the RKS plug-in).
6. (Optional) Configure PCMM record-keeping server plug-ins.
See [“Configuring PCMM Record-Keeping Server Plug-Ins \(C-Web Interface\)” on page 38](#) (if you are using the SAE's embedded policy server).

In addition to configuring the SAE, you need to:

1. Configure the CMTS device in the directory (if you are using the SAE's embedded policy server).
See [“Adding Objects for CMTS Devices \(C-Web Interface\)” on page 42](#).
2. Configure the NIC (if you are using assigned IP subscribers).
See [“Using the NIC Resolver in PCMM Environments” on page 21](#).
3. Enable the Common Open Policy Service (COPS) interface on the CMTS device. See the documentation for your CMTS device for information about how to do this.

Related Documentation

- [Configuring the SAE for a Cable Network Environment \(SRC CLI\) on page 25](#)
- [Using the SAE in a PCMM Environment on page 16](#)
- [PCMM Environment Overview on page 7](#)

Configuring the SAE to Manage PCMM Devices (SRC CLI)

The SAE connects to the PCMM device by using a COPS over TCP connection. The PCMM device driver controls this connection.

Use the following configuration statements to configure the SAE to manage CMTS devices:

```
shared sae configuration driver pcmm {
  keepalive-interval keepalive-interval ;
  tcp-connection-timeout tcp-connection-timeout ;
  application-manager-id application-manager-id ;
  message-timeout message-timeout ;
  cops-message-maximum-length cops-message-maximum-length ;
  cops-message-read-buffer-size cops-message-read-buffer-size ;
  cops-message-write-buffer-size cops-message-write-buffer-size ;
  sae-community-manager sae-community-manager ;
  disable-full-sync disable-full-sync ;
  disable-pcmm-i03-policy disable-pcmm-i03-policy ;
  session-recovery-retry-interval session-recovery-retry-interval ;
  element-id element-id ;
  default-rks-plug-in default-rks-plug-in ;
}
```

To configure the SAE to manage CMTS devices:

1. From configuration mode, access the configuration statement that configures the PCMM driver. In this sample procedure, the PCMM device driver is configured in the west-region group.

```
user@host# edit shared sae group west-region configuration driver pcmm
```

2. Configure the interval between keepalive messages sent from the COPS client (the PCMM device) to the COPS server (the SAE).

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set keepalive-interval keepalive-interval
```

3. Configure the timeout for opening a TCP connection to the PCMM device.

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set tcp-connection-timeout tcp-connection-timeout
```

4. When this SAE is configured as the application manager, configure the identifier of the application manager.

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set application-manager-id application-manager-id
```

5. Configure the time that the COPS server (the SAE) waits for a response to COPS requests from the COPS client (the PCMM device). Change this value only if a high number of COPS timeout events appear in the error log.

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set message-timeout message-timeout
```

6. Configure the maximum length of a COPS message.

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set cops-message-maximum-length cops-message-maximum-length
```

7. Configure the buffer size for receiving COPS messages from the COPS client.

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set cops-message-read-buffer-size cops-message-read-buffer-size
```

8. Configure the buffer size for sending COPS messages to the COPS client.

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set cops-message-write-buffer-size cops-message-write-buffer-size
```

9. Configure the name of the community manager that manages PCMM driver communities. Active SAEs are selected from this community.

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set sae-community-manager sae-community-manager
```

10. Enable or disable state synchronization with PCMM policy servers.

```
[edit shared sae group west-region configuration driver pcmm]  
user@host# set disable-full-sync disable-full-sync
```

11. Enable or disable the SAE to send classifiers to the router that comply with PCMM IO3. Disable this option if your network deployment has CMTS devices that do not support PCMM IO3.

```
[edit shared sae group west-region configuration driver pcmm]
user@host# set disable-pcmm-io3-policy disable-pcmm-io3-policy
```

12. Configure the time between attempts by the SAE to restore service sessions that are being recovered in the background when state synchronization completes with a state-data-incomplete error.

```
[edit shared sae group west-region configuration driver pcmm]
user@host# set session-recovery-retry-interval session-recovery-retry-interval
```

13. (Optional) Configure the unique identifier that the SAE uses to identify itself when it originates in record-keeping server (RKS) events.

```
[edit shared sae group west-region configuration driver pcmm]
user@host# set element-id element-id
```

14. (Optional) Specify the name of the default RKS plug-in to which the SAE sends events for CMTS devices.

```
[edit shared sae group west-region configuration driver pcmm]
user@host# set default-rks-plugin default-rks-plugin
```

15. (Optional) Verify your PCMM driver configuration.

```
[edit shared sae group west-region configuration driver pcmm]
user@host# show
keepalive-interval 45;
tcp-connection-timeout 5;
application-manager-id 1;
message-timeout 120000;
cops-message-maximum-length 204800;
cops-message-read-buffer-size 3000;
cops-message-write-buffer-size 3000;
sae-community-manager PcmCommunityManager;
disable-full-sync true;
disable-pcmm-io3-policy true;
session-recovery-retry-interval 3600000;
element-id 1;
default-rks-plugin rksTracking;
```

Related Documentation

- [Using the SAE in a PCMM Environment on page 16](#)
- [Connections to Managed Devices](#)
- [Configuring the SAE to Manage PCMM Devices \(C-Web Interface\) on page 30](#)
- [Configuring CMTS-Specific RKS Plug-Ins \(SRC CLI\) on page 38](#)
- [Initially Configuring the SAE](#)

Configuring the SAE to Manage PCMM Devices (C-Web Interface)

The SAE connects to the PCMM device by using a COPS over TCP connection. The PCMM device driver controls this connection.

To configure the SAE to manage PCMM devices:

1. Click **Configure**, expand **Shared>SAE>Configuration>Driver**, and then click **PCCM**.

The PCCM pane appears.

2. Click **Create**, enter information as described in the Help text in the main pane, and then click **Apply**.

Related Documentation

- For information about setting up SAE groups, see *Configuring an SAE Group*
- [Configuring the SAE to Manage PCMM Devices \(SRC CLI\) on page 27](#)
- [Configuring PCMM Record-Keeping Server Plug-Ins \(SRC CLI\) on page 36](#)
- [Using the SAE in a PCMM Environment on page 16](#)

Setting Up SAE Communities (SRC CLI)

You can configure the following for SAE communities:

- Define the members of an SAE community by adding the IP addresses of SAEs in the community to the virtual router object of the network device in the directory.

See [“Creating Virtual Routers for the CMTS Device \(SRC CLI\)” on page 43](#).

- Configure parameters for the SAE community manager.

See [“Configuring the SAE Community Manager” on page 31](#).

- Specify the name of the community manager with the **set sae-community-manager** option in the PCMM driver configuration.

See [“Configuring the SAE to Manage PCMM Devices \(SRC CLI\)” on page 27](#).

- If there is a firewall in the network, configure the firewall to allow SAE messages through.

Related Documentation

- [Using the SAE in a PCMM Environment on page 16](#)
- [Setting Up SAE Communities \(C-Web Interface\)](#)
- [Initially Configuring the SAE](#)
- [Configuring SAE Properties for the Event Notification API \(SRC CLI\) on page 33](#)

Setting Up SAE Communities (C-Web Interface)

Tasks to configure SAE communities are:

- [Configuring the SAE Community Manager on page 31](#)
- [Specifying the Community Manager in the SAE Device Driver on page 31](#)

Configuring the SAE Community Manager

To configure the SAE community manager that manages third-party device communities:

1. Click **Configure**, expand **Shared>SAE**, and then click the SAE group for which you want to manage third-party devices.

The Group pane appears.

2. In the side pane, expand **Configuration>External Interface Features: PCMMCommunityManager**, and then click **Community Manager**.

The Community Manager pane appears.

3. Enter information as described in the Help text in the main pane, and click **Apply**.

Specifying the Community Manager in the SAE Device Driver

To specify the community manager in the SAE device driver:

1. Click **Configure**, expand **Shared>SAE>Configuration>Driver**, and then click **Third Party**.

The Third Party pane appears.

2. Click **Create**, enter information as described in the Help text in the main pane, and then click **Apply**.

Related Documentation

- [Setting Up SAE Communities \(SRC CLI\)](#)
- [Setting Up Script Services](#)
- [Adding Objects for Network Devices \(C-Web Interface\)](#)

Configuring the SAE Community Manager

Use the following configuration statements to configure the SAE community manager that manages PCMM device communities:

```
shared sae configuration external-interface-features name CommunityManager {
    keepalive-interval keepalive-interval ;
    threads threads ;
    acquire-timeout acquire-timeout ;
    blackout-time blackout-time ;
}
```

To configure the community manager:

1. From configuration mode, access the configuration statements for the community manager. In this sample procedure, `west_region` is the name of the SAE group, and `sae_mgr` is the name of the community manager.

```
user@host# edit shared sae group west-region configuration
external-interface-features sae_mgr CommunityManager
```

2. Specify the interval between keepalive messages sent from the active SAE to the passive members of the community.

```
[edit shared sae group west-region configuration external-interface-features sae_mgr
CommunityManager]
user@host# set keepalive-interval keepalive-interval
```

3. Specify the number of threads that are allocated to manage the community. You generally do not need to change this value.

```
[edit shared sae group west-region configuration external-interface-features sae_mgr
CommunityManager]
user@host# set threads threads
```

4. Specify the amount of time an SAE waits for a remote member of the community when it is acquiring a distributed lock. You generally do not need to change this value.

```
[edit shared sae group west-region configuration external-interface-features sae_mgr
CommunityManager]
user@host# set acquire-timeout acquire-timeout
```

5. Specify the amount of time that an active SAE must wait after it shuts down before it can try to become the active SAE of the community again.

```
[edit shared sae group west-region configuration external-interface-features sae_mgr
CommunityManager]
user@host# set blackout-time blackout-time
```

6. (Optional) Verify the configuration of the SAE community manager.

```
[edit shared sae group west-region configuration external-interface-features
sae_mgr CommunityManager]
user@host# show
CommunityManager {
  keepalive-interval 30;
  threads 5;
  acquire-timeout 15;
  blackout-time 30;
}
```

Related Documentation

- [Using the SAE in a PCMM Environment on page 16](#)
- [Configuring the SAE Community Manager \(C-Web Interface\) on page 33](#)
- [Setting Up SAE Communities \(SRC CLI\) on page 30](#)
- [Initially Configuring the SAE](#)

Configuring the SAE Community Manager (C-Web Interface)

To configure the SAE community manager that manages PCMM device communities:

1. Click **Configure**, expand **Shared>SAE**, and then expand the SAE group for which you want to manage PCMM devices.
2. In the side pane, expand **Configuration>External Interface Features: PCMMCommunityManager**, and then click **Community Manager**.

The Community pane appears.

3. Enter information as described in the Help text in the main pane, and click **Apply**.

Related Documentation

- For information about setting up SAE groups, see *Configuring an SAE Group*
- *Setting Up SAE Communities (C-Web Interface)*
- [Configuring the SAE Community Manager on page 31](#)
- [Using the SAE in a PCMM Environment on page 16](#)

Configuring SAE Properties for the Event Notification API (SRC CLI)

Use the following configuration statements to configure properties for the Event Notification API:

```
shared sae configuration external-interface-features name EventAPI {
  retry-time retry-time ;
  retry-limit retry-limit ;
  threads threads ;
}
```

To configure properties for the Event Notification API:

1. From configuration mode, access the configuration statements for the Event Notification API. In this sample procedure, *west-region* is the name of the SAE group, and *event_api* is the name of the Event API configuration.

```
user@host# edit shared sae group west-region configuration
external-interface-features event_api EventAPI
```

2. Specify the amount of time between attempts to send events that could not be delivered.

```
[edit shared sae group west-region configuration external-interface-features event_api
EventAPI]
user@host# set retry-time retry-time
```

3. Specify the number of times an event fails to be delivered before the event is discarded.

```
[edit shared sae group west-region configuration external-interface-features event_api
EventAPI]
user@host# set retry-limit retry-limit
```

4. Specify the number of threads allocated to process events.

```
[edit shared sae group west-region configuration external-interface-features event_api
EventAPI]
user@host# set threads threads
```

5. (Optional) Verify the configuration of the Event Notification API properties.

```
[edit shared sae group west-region configuration external-interface-features
event_api EventAPI]
user@host# show
EventAPI {
  retry-time 300;
  retry-limit 5;
  threads 5;
}
```

**Related
Documentation**

- [Using the SAE in a PCMM Environment on page 16](#)
- [Configuring SAE Properties for the Event Notification API \(C-Web Interface\) on page 34](#)
- [Initially Configuring the SAE](#)
- [Configuring the SAE to Manage PCMM Devices \(SRC CLI\) on page 27](#)

Configuring SAE Properties for the Event Notification API (C-Web Interface)

To configure properties for the event notification API:

1. Click **Configure**, expand **Shared>SAE**, and then expand the SAE group for which you want to manage devices.
2. In the side pane, expand **Configuration>External Interface Features: event**, and then click **Event API**.

The Event API pane appears.
3. Enter information as described in the Help text in the main pane, and click **Apply**.

**Related
Documentation**

- [Configuring an SAE Group](#)
- [Configuring SAE Properties for the Event Notification API \(SRC CLI\) on page 33](#)

Configuring Record-Keeping Server Peers for Plug-Ins (SRC CLI)

An RKS peer is an instance of an RKS. A PCMM environment has a primary RKS and optionally a secondary RKS. The primary RKS is mandatory, and you assign the RKS as primary by configuring it as the default peer in the RKS plug-in. The secondary RKS is optional, and it is an RKS peer that is not configured as the default peer. If you define multiple nondefault peers, one of them is randomly chosen to be the secondary RKS.

RKS peers are configured in the peer group for each PCMM RKS plug-in instance. To create an RKS peer group:

Use the following configuration statements to configure an RKS peer group.

```
shared sae configuration plug-ins name name pcmm-rks peer-group name {
  server-address server-address ;
  server-port server-port ;
}
```

To configure an RKS peer group:

1. From configuration mode, access the configuration statements for RKS plug-ins. In this sample procedure, west-region is the name of the SAE group, and rksPlugin is the name of the plug-in and rksPeer is the name of the peer group.

```
user@host# edit shared sae group west-region configuration plug-ins name rksPlugin
pcmm-rks peer-group rksPeer
```

2. Specify the IP address of the RKS server to which the SAE sends accounting data.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks
peer-group rksPeer]
user@host# set server-address server-address
```

3. Specify the port used for sending accounting packets.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks
peer-group rksPeer]
user@host# set server-port server-port
```

4. (Optional) Verify your configuration.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin
pcmm-rks peer-group rksPeer]
user@host# show
server-address 10.10.3.60;
server-port 1812;
```

Related Documentation

- [Using the SAE in a PCMM Environment on page 16](#)
- [Configuring Record-Keeping Server Peers for Plug-Ins \(C-Web Interface\) on page 35](#)
- [Configuring PCMM Record-Keeping Server Plug-Ins \(SRC CLI\) on page 36](#)
- [Configuring CMTS-Specific RKS Plug-Ins \(SRC CLI\) on page 38](#)
- [Initially Configuring the SAE](#)

Configuring Record-Keeping Server Peers for Plug-Ins (C-Web Interface)

An RKS peer is an instance of a record-keeping server. A PCMM environment has a primary RKS and optionally a secondary RKS. The primary RKS is mandatory, and you assign the RKS as primary by configuring it as the default peer in the RKS plug-in. The secondary RKS is optional, and it is an RKS peer that is not configured as the default peer. If you define multiple nondefault peers, one of them is randomly chosen to be the secondary RKS.

RKS peers are configured in the peer group for each PCMM RKS plug-in instance. To create an RKS peer group:

1. Click **Configure**, expand **Shared>SAE**, and then expand the SAE group for which you want to create RKS plug-ins.
2. In the side pane, expand **Configuration>Plug Ins**.
3. Expand the plug-in that you created for RKS, and then click **PCMM RKS**.
4. Enter information as described in the Help text in the main pane, and click **Apply**.

**Related
Documentation**

- [Configuring Record-Keeping Server Peers for Plug-Ins \(SRC CLI\) on page 34](#)
- [Configuring PCMM Record-Keeping Server Plug-Ins \(C-Web Interface\) on page 38](#)
- [Configuring PCMM Record-Keeping Server Plug-Ins \(SRC CLI\) on page 36](#)

Configuring PCMM Record-Keeping Server Plug-Ins (SRC CLI)

Use the following configuration statements to configure an RKS plug-in.

```
shared sae configuration plug-ins name name pcmm-rks {  
  load-balancing-mode (failover | roundRobin);  
  failback-timer failback-timer;  
  retry-interval retry-interval ;  
  maximum-queue-length maximum-queue-length ;  
  bind-address bind-address ;  
  udp-port udp-port ;  
  feid-mso-data feid-mso-data ;  
  feid-mso-domain-name feid-mso-domain-name ;  
  trusted-element;  
  default-peer default-peer ;  
}
```

To configure an RKS plug-in:

1. From configuration mode, access the configuration statements for RKS plug-ins. In this sample procedure, west-region is the name of the SAE group, and rksPlugin is the name of the plug-in.

```
user@host# edit shared sae group west-region configuration plug-ins name rksPlugin  
pcmm-rks
```

2. Specify the mode for load-balancing RKSs.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]  
user@host# set load-balancing-mode (failover | roundRobin)
```

3. Specify if and when the SAE attempts to fail back to the default peer.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]  
user@host# set failback-timer failback-timer
```

4. Specify the time the SAE waits for a response from an RKS before it resends the packet.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]
user@host# set retry-interval retry-interval
```

5. Specify the maximum number of unacknowledged messages that the plug-in receives from the RKS before it discards new messages.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]
user@host# set maximum-queue-length maximum-queue-length
```

6. (Optional) Specify the source IP address that the plug-in uses to communicate with the RKS.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]
user@host# set bind-address bind-address
```

7. (Optional) Specify the source UDP port or a pool of ports that the plug-in uses to communicate with the RKS.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]
user@host# set udp-port udp-port
```

8. (Optional) Specify the multiple service operator (MSO)—defined data in the financial entity ID (FEID) attribute, which is included in event messages.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]
user@host# set feid-mso-data feid-mso-data
```

9. (Optional) Specify the MSO domain name in the FEID attribute that uniquely identifies the MSO for billing and settlement purposes.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]
user@host# set feid-mso-domain-name feid-mso-domain-name
```

10. (Optional) When the SAE is running as a policy server—which means that the SAE sends event messages directly to the RKS—enable the SAE as a trusted network element.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]
user@host# set trusted-element
```

11. Specify the name of the primary RKS peer to which the SAE sends accounting packets.

See [“Configuring Record-Keeping Server Peers for Plug-Ins \(SRC CLI\)”](#) on page 34.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin pcmm-rks]
user@host# set default-peer default-peer
```

12. (Optional) Verify your RKS plug-in configuration.

```
[edit shared sae group west-region configuration plug-ins name rksPlugin
pcmm-rks]
user@host> show
```

```
load-balancing-mode failover;  
failback-timer -1;  
retry-interval 3000;  
maximum-queue-length 10000;  
feid-mso-domain-name abcd.com;  
trusted-element;  
default-peer radius01;
```

13. (Optional) Specify an RKS plug-in for specific CMTS devices.

See “Configuring CMTS-Specific RKS Plug-Ins (SRC CLI)” on page 38.

**Related
Documentation**

- [Using the SAE in a PCMM Environment on page 16](#)
- [PCMM Environment Overview on page 7](#)
- [Configuring PCMM Record-Keeping Server Plug-Ins \(C-Web Interface\) on page 38](#)
- *Initially Configuring the SAE*

Configuring PCMM Record-Keeping Server Plug-Ins (C-Web Interface)

To configure an RKS plug-in:

1. Click **Configure**, expand **Shared>SAE**, and then expand the SAE group for which you want to create RKS plug-ins,
2. In the side pane, expand **Configuration>Plug Ins**.
3. Expand the plug-in that you created for RKS, and then click **PCMM RKS**.
4. Click **Create**, enter information as described in the Help text in the main pane, and then click **Apply**.

**Related
Documentation**

- *Configuring an SAE Group*
- [Configuring PCMM Record-Keeping Server Plug-Ins \(SRC CLI\) on page 36](#)
- [Configuring Record-Keeping Server Peers for Plug-Ins \(C-Web Interface\) on page 35](#)
- [Using the SAE in a PCMM Environment on page 16](#)

Configuring CMTS-Specific RKS Plug-Ins (SRC CLI)

You can configure an RKS plug-in for specific CMTS devices. When there are events for the CMTS device, the SAE sends the events to the specified plug-in.

Use the following configuration statement to assign a CMTS-specific RKS plug-in.

```
shared sae configuration driver pcmm cmts-specific-rks-plug-ins name {  
    rks-plug-in rks-plug-in ;  
}
```

To configure a CMTS-specific RKS plug-in:

1. From configuration mode, access the configuration statements for RKS plug-ins. In this sample procedure, west-region is the name of the SAE group, and cmtsPlugin is the name of the plug-in assignment.

```
user@host# edit shared sae group west-region configuration driver pcmm
cmts-specific-rks-plug-ins cmtsPlugin
```

2. Specify the name of the CMTS-specific RKS plug-in.

```
[edit shared sae group west-region configuration driver pcmm cmts-specific-rks-plug-ins
cmtsPlugin]
user@host# set rks-plug-in rks-plug-in
```

3. (Optional) Verify your configuration.

```
[edit shared sae group west-region configuration driver pcmm
cmts-specific-rks-plug-ins cmtsPlugin]
user@host# show
rks-plug-in rksPlugin;
```

Related Documentation

- [Configuring CMTS-Specific RKS Plug-Ins \(C-Web Interface\) on page 39](#)
- [Configuring Record-Keeping Server Peers for Plug-Ins \(SRC CLI\) on page 34](#)
- [Configuring PCMM Record-Keeping Server Plug-Ins \(SRC CLI\) on page 36](#)
- [Adding Objects for CMTS Devices \(SRC CLI\) on page 41](#)
- [Initially Configuring the SAE](#)

Configuring CMTS-Specific RKS Plug-Ins (C-Web Interface)

You can configure an RKS plug-in for specific CMTS devices. When there are events for the CMTS device, the SAE sends the events to the specified plug-in.

To configure a CMTS-specific RKS plug-in:

1. Click **Configure**, expand **Shared>SAE,>Configuration>Driver**, and then click **PCCM**.
2. Click **Configure**, expand **Shared>SAE**, and then expand the SAE group for which you want to create CMTS-specific RKS plug-ins.
3. In the side pane, expand **Configuration>Drivers**, and then click **PCCM**.
The PCMM pane appears.
4. From the Create new list, select **CMTS Specific RKS Plug-Ins**.
5. Type a name for the new plug-in in the dialog box, and click **OK**.
6. In the side pane, click the new plug-in.
7. Click **Create**, enter information as described in the Help text in the main pane, and then click **Apply**.

**Related
Documentation**

- [Configuring CMTS-Specific RKS Plug-Ins \(SRC CLI\) on page 38](#)
- [Adding Objects for CMTS Devices \(SRC CLI\) on page 41](#)
- [Creating Virtual Routers for the CMTS Device \(SRC CLI\) on page 43](#)

CHAPTER 4

Configuration Tasks for Adding Objects for CMTS Devices

- [Adding Objects for CMTS Devices \(SRC CLI\) on page 41](#)
- [Adding Objects for CMTS Devices \(C-Web Interface\) on page 42](#)
- [Creating Virtual Routers for the CMTS Device \(SRC CLI\) on page 43](#)
- [Creating Virtual Routers for the CMTS Device \(C-Web Interface\) on page 44](#)

Adding Objects for CMTS Devices (SRC CLI)

To manage CMTS devices, the SAE creates and manages pseudointerfaces that it associates with a virtual router object. Each CMTS device in the SRC network must appear in the configuration as a router object, and it must be associated with a virtual router object called default. The router and virtual router are not actually configured on the CMTS device; the router and virtual router provide a way for the SAE to manage the CMTS device by using the SAE's embedded policy server.

Use the following configuration statements to add a router object:

```
shared network device name {  
  description description ;  
  management-address management-address ;  
  device-type (junose | junos | pcmm | proxy);  
  qos-profile [ qos-profile ...];  
}
```

To add a router:

1. From configuration mode, access the configuration statements that configure network devices. In this sample procedure, `pcmm_dtr` is the name of the object.

```
user@host# edit shared network device pcmm_dtr
```

2. (Optional) Add a description for the CMTS device.

```
[edit shared network device pcmm_dtr]  
user@host# set description description
```

3. Add the IP address of the CMTS device.

```
[edit shared network device pcmm_dtr]
user@host# set management-address management-address
```

4. (Optional) Specify the type of device that you are adding.

```
[edit shared network device pcmm_dtr]
user@host# set device-type pcmm
```

5. (Optional) Verify your configuration.

```
[edit shared network device pcmm_dtr]
user@host# show
description "CMTS device";
management-address 192.168.3.5;
device-type pcmm;
interface-classifier {
  rule rule-0 {
    script #;
  }
}
```

**Related
Documentation**

- [Connections to Managed Devices](#)
- [Configuring CMTS-Specific RKS Plug-Ins \(SRC CLI\) on page 38](#)
- [Creating Virtual Routers for the CMTS Device \(SRC CLI\) on page 43](#)

Adding Objects for CMTS Devices (C-Web Interface)

To manage CMTS devices, the SAE creates and manages pseudointerfaces that it associates with a virtual router object. Each CMTS device in the SRC network must appear in the configuration as a router object, and it must be associated with a virtual router object called default. The router and virtual router are not actually configured on the CMTS device; the router and virtual router provide a way for the SAE to manage the CMTS device by using the SAE's embedded policy server.

To add a router:

1. Click **Configure**, expand **Shared**, and then click **Network**.
The Shared Network pane appears.
2. From the Create new list, select **Device**.
3. Type a name for the new device in the dialog box, and click **OK**.
The Device pane appears.
4. From the Device Type list, select **pccm**.
5. Enter information as described in the Help text in the main pane, and click **Apply**.

**Related
Documentation**

- [Creating Virtual Routers for the CMTS Device \(C-Web Interface\) on page 44](#)

Creating Virtual Routers for the CMTS Device (SRC CLI)

You need to add a virtual router object called default to the CMTS device.

Use the following configuration statements to add a virtual router:

```
shared network device name virtual-router name {
  sae-connection [ sae-connection ...];
  snmp-read-community snmp-read-community ;
  snmp-write-community snmp-write-community ;
  scope [ scope ...];
  local-address-pools local-address-pools ;
  static-address-pools static-address-pools ;
  tracking-plug-in [ tracking-plug-in ...];
}
```

To add a virtual router:

1. From configuration mode, access the configuration statements for virtual routers. In this sample procedure, `pcmm_dtr` is the name of the router and `default` is the name of the virtual router.

```
user@host# edit shared network device pcmm_dtr virtual-router default
```

2. Specify the addresses of SAEs that can manage this router. This step is required for the SAE to work with the router.

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# set sae-connection [ sae-connection ...]
```

To specify the active SAE and the redundant SAE, enter an exclamation point (!) after the hostname or IP address of the connected SAE. For example:

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# set sae-connection [sae1! sae2!]
```

3. (Optional) Specify an SNMP community name for SNMP read-only operations for this VR.

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# set snmp-read-community snmp-read-community
```

4. (Optional) Specify an SNMP community name for SNMP write operations for this virtual router.

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# set snmp-write-community snmp-write-community
```

5. (Optional) Specify service scopes assigned to this virtual router.

See *Configuring Service Scopes (SRC CLI)*.

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# set scope [ scope ...]
```

6. (Optional) Specify the list of IP address pools that a CMTS virtual router currently manages and stores.

If you are using assigned IP subscribers along with the network information collector (NIC), you need to configure either a local or static address pool so that the NIC can resolve the IP-to-SAE mapping.

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# set local-address-pools local-address-pools
```

7. (Optional) Specify the list of IP address pools that a CMTS VR manages but does not store.

If you are using assigned IP subscribers along with the NIC, you need to configure either a local or static address pool so that the NIC can resolve the IP-to-SAE mapping.

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# set static-address-pools static-address-pools
```

8. (Optional) Specify the plug-ins that track interfaces that the SAE manages on this virtual router.

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# tracking-plugin [ tracking-plugin ...]
```

9. (Optional) Verify your configuration.

```
[edit shared network device pcmm_dtr virtual-router default]
user@host# show
sae-connection [ 10.14.39.2 10.10.5.30 ];
snmp-read-community *****;
snmp-write-community *****;
scope POP-Westford;
local-address-pools "10.25.8.0 10.25.20.255";
tracking-plugin rksPlugin;
```

Related Documentation

- [Adding Objects for CMTS Devices \(SRC CLI\) on page 41](#)
- [Configuring CMTS-Specific RKS Plug-Ins \(SRC CLI\) on page 38](#)
- [Associating Security Names with a Community \(SRC CLI\)](#)

Creating Virtual Routers for the CMTS Device (C-Web Interface)

You need to add a virtual router object called default to the CMTS device.

To add a virtual router to an existing router:

1. Click **Configure**, expand **Shared>Network**, and then click a CMTS device.
The Device pane appears.
2. From the Create new list, select **Virtual Router**.
3. Type a name for the new device in the dialog box, and click **OK**.

The Virtual Router pane appears.

4. Click **Create**, enter information as described in the Help text in the main pane, and then click **Apply**.

**Related
Documentation**

- [Adding Objects for CMTS Devices \(C-Web Interface\) on page 42](#)

PART 3

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