Cisco Service Control Quota Manager User Guide

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Preface

Published: September 23, 2015

Introduction

This preface describes the *Cisco Service Control Quota Manager User Guide*, how it is organized, its document conventions, and how to obtain documentation and technical assistance. This guide assumes a basic familiarity with the concept of the Cisco Service Control solution, the Cisco Service Control Engine (Cisco SCE) platforms, and related components.

The *Cisco Service Control Quota Manager User Guide* enables integration engineers and ISPs to police subscriber bandwidth usage over time by using quota management.

This document is for ISPs and system integrators who integrate the Cisco Service Control Application for Broadband (Cisco SCA BB) solution with external components belonging to a customer’s ecosystem to provide a quota management solution.

The document assumes that the reader is familiar with the Cisco SCA BB solution.

Document Revision History

The following Document Revision History table records the changes made to this document.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Document Revision History</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revision</strong></td>
<td><strong>Cisco Service Control Release and Date</strong></td>
</tr>
<tr>
<td>OL-31827-01</td>
<td>Release 5.0.x</td>
</tr>
<tr>
<td></td>
<td>July 30, 2014</td>
</tr>
</tbody>
</table>

Cisco Service Control Quota Manager User Guide
Organization

This guide contains the following sections.

Table 2  Document Organization

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
<td>Quota Management Overview</td>
<td>Provides an overview of the Cisco Service Control solution and the advantages in applying quota management to the subscriber traffic consumption.</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>Quota Management Scenarios</td>
<td>Provides an overview of the Cisco Quota Manager major functionality, components, interfaces, and integration models.</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Configuring the Quota Manager</td>
<td>Provides an introduction to ways to configure the Cisco Quota Manager.</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Using the Quota Manager Command-Line Utility</td>
<td>Provides a description and sample configurations illustrating the use of the Cisco Quota Manager solution in different integration models.</td>
</tr>
</tbody>
</table>

Related Documentation

Use this *Cisco Service Control Management Suite Quota Manager User Guide* in conjunction with the following Cisco documentation:

- *Cisco Service Control Management Suite Subscriber Manager User Guide*
- *Cisco Service Control Management Suite Service Control Engine Subscriber API Programmer Guide*
- *Cisco Service Control Application for Broadband User Guide*
- *Cisco Service Control Application for Broadband Service Configuration API Programmer Guide*

Conventions

This document uses the following conventions.

Table 3  Document Conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>bold</strong> font</td>
<td>Commands and keywords and user-entered text appear in <strong>bold</strong> font.</td>
</tr>
<tr>
<td><strong>italic</strong> font</td>
<td>Document titles, new or emphasized terms, and arguments for which you supply values are in <strong>italic</strong> font.</td>
</tr>
<tr>
<td>[   ]</td>
<td>Elements in square brackets are optional.</td>
</tr>
<tr>
<td>{x | y | z }</td>
<td>Required alternative keywords are grouped in braces and separated by vertical bars.</td>
</tr>
</tbody>
</table>
### Table 3 Document Conventions (continued)

| [x | y | z ] | Optional alternative keywords are grouped in brackets and separated by vertical bars. |
|---|---|
| string | A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks. |
| courier font | Terminal sessions and information the system displays appear in courier font. |
| < > | Nonprinting characters such as passwords are in angle brackets. |
| [ ] | Default responses to system prompts are in square brackets. |
| !, # | An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line. |

---

**Note**

Means reader take note.

---

**Tip**

Means the following information will help you solve a problem.

---

**Caution**

Means reader be careful. In this situation, you might perform an action that could result in equipment damage or loss of data.

---

**Timesaver**

Means the described action saves time. You can save time by performing the action described in the paragraph.

---

**Warning**

Means reader be warned. In this situation, you might perform an action that could result in bodily injury.

---

**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:


Subscribe to What’s New in Cisco Product Documentation as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.
Quota Management Overview

Published: September 23, 2015

Introduction

This chapter provides an overview of the Quota Manager. The chapter contains the following sections:

- Information About the Quota Management Solution, page 1-1
- Quota Manager Description, page 1-2

Information About the Quota Management Solution

Quota Management is a type of policing of broadband user traffic that enforces policy actions based on integral and accumulative characteristics. Specifically, the Quota Manager controls the amount of consumed traffic per application and direction. The subscribers who consume various amounts of the data traffic during specified periods of time can help the provider in preventing abusive use of ISP resources shared by ISP subscribers. This is important in ensuring improved user experience for the maximum number of subscribers.

The Cisco Service Control Application for Broadband (Cisco SCA BB) solution provides powerful quota management capabilities that enable simple implementation of quota management for application traffic:

- Managed network resources—Upstream traffic volume, downstream traffic volume, number of sessions.
- External or internal quota replenishment schemes.
- Real-time notifications—Subscriber quota depletion, subscriber quota below threshold.
- Java API for Quota Management integration—Included within the Cisco SCE Subscriber Management API.
- Simultaneous different quota management schemes per subscriber group (policy package).
- Various actions upon quota depletion/breach—Bandwidth control, block, subscriber notification, real-time notification.
- Raw Data Record (RDR) based reporting.
- Support for multiple Cisco SCEs—Manages the quota consumed by a subscriber when the subscriber is simultaneously logged in from one or more Cisco SCEs within a domain.
- Support for multiple bucket quota provisioning with the penalty profile.

Cisco SCA BB supports three Quota Management operational and integration models that allow gradual investment and trade-off between integration/deployment complexity and functional offering:

- Cisco SCE Internal model—Time-based, auto-replenished quota.
Quota Manager Description

In versions of the Service Control Subscriber Manager (SM) earlier than Release 3.0, subscriber quota levels could be maintained across subscriber sessions. This functionality, removed in Release 3.0, has been enhanced and reinstated.

The Quota Manager is now available as a component of the Subscriber Manager, which enables the Service Control solution providers to manage the subscriber quota, with a high degree of flexibility.

This section contains these subsections:
- Quota Manager Functionality, page 1-2
- Quota Manager Module, page 1-3
- Quota Manager Network Topology, page 1-3
- Quota Indications and Quota Responses, page 1-4
- Cisco SCA BB Quota Buckets, page 1-4
- Quota Provisioning, page 1-5
- Sliding Window Model, page 1-6
- Multiple Thresholds of Subscriber Quota, page 1-7
- Support for Multiple Bucket Quota Provisioning with Penalty Profile, page 1-10
- Support for Multiple Cisco SCEs, page 1-10

Quota Manager Functionality

The Quota Manager controls SCA-BB quota functionality and acts as an entry-level quota policy repository. The Quota Manager is an event-driven solution, which leverages the functionality of the Cisco Service Control Engine (Cisco SCE) Subscriber API.

Quota management and bandwidth control is the same for IPv4 and IPv6 traffic. Quota allocation is based on the Subscriber ID and package mappings. The quota manager considers both IPv4 and IPv6 traffic for dual stack subscribers.

The quota manager provides the following functionality:
- Subscriber quota is preserved across subscriber sessions.
- Aggregation periods and amounts can be set on a per package basis.
- Quota allocation at the beginning of an aggregation period can be spread over time for different subscribers to avoid the buildup of traffic bursts at the start of the aggregation period.
- Subscriber quota is preserved across Quota Manager upgrade.

The Quota Manager supports the following:
- All Cisco SCE topologies (1+1 and MGSCP).
- High availability of the Quota Manager server (utilizing a Veritas Cluster Server [VCS]).
Chapter 1 Quota Management Overview

Quota Manager Module

Multiple quota thresholds that allows service providers to move subscribers to penalty packages when a certain quota threshold is breached.

Using the Quota Manager, subscribers can do the following:

- Assign time-based quota for a period called an aggregation period while the consumption during this period is calculated in a sliding window model. For more information, see the “Sliding Window Model” section on page 1-6.
- Assign a one-time quota that can be replenished only manually.
- Move between packages at any time, whether they are logged in or not.
- Purchase additional quota within an aggregation period.

**Note**

We recommend that you enable the tunable GT_SLS_IGNORE_EXCESS_QUOTA_UPDATE in the Cisco SCE if there are frequent login and logout events by subscribers.

Quota Manager Module

The Quota Manager module runs as a component on the Subscriber Manager. The logic to manage and maintain quotas runs on the Subscriber Manager server; therefore, you should configure the QM on the Subscriber Manager or load the configuration onto the Subscriber Manager. In a cluster setup, you must load the configuration onto each Subscriber Manager in the cluster. Subscriber quotas are stored in the SM database.

The Quota Manager uses the Cisco SCE Subscriber API to provision quota to subscribers upon request by using the existing external quota functionality of the Cisco SCE.

**Note**

Per package quota is configured on the Subscriber Manager and this adds complexity to the integration or operation. Quota management also requires more management messages on the network.

Quota Manager Network Topology

The Quota Manager can serve more than one Cisco SCE. At any point in time, one subscriber is managed by one Cisco SCE. **Figure 1-1** shows the network topology of a system, which uses quota management.

**Figure 1-1 Quota Manager Network Topology**

![Quota Manager Network Topology Diagram]
Quota Indications and Quota Responses

The Quota Manager is an event-driven component. All quota logic is performed as a response to quota indications that the Cisco SCE initiates. Therefore, the quota state is up-to-date in accordance with the last quota indication received.

Table 1-1 lists the quota indications and the quota responses to the indications.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Reason Generated</th>
<th>Quota Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quota breach</td>
<td>Generated when a subscriber uses the entire available quota in the Cisco SCE.</td>
<td>Responds to this indication by providing more quota for the subscriber if the subscriber quota allocation is not depleted for the current aggregation period.</td>
</tr>
<tr>
<td>Remaining quota</td>
<td>Periodically generated to keep the Quota Manager updated with the information about the quota remaining in the Cisco SCE. Generated in response to a subscriber logout event.</td>
<td>In most cases, does not respond to this indication, but writes the quota value to the database to be stored until the subscriber logs in next. If the reported quota is below zero, responds by providing more quota for the subscriber if the subscriber quota allocation has not been depleted for the current aggregation period.</td>
</tr>
<tr>
<td>Quota below threshold</td>
<td>Generated when the subscriber quota in the Cisco SCE drops below a predefined level.</td>
<td>Responds to this indication by providing more quota for the subscriber if the subscriber quota allocation is not depleted for the current aggregation period.</td>
</tr>
<tr>
<td>Quota state restore</td>
<td>Generated in response to a subscriber login event.</td>
<td>Responds to this indication by updating the subscriber quota in the Cisco SCE.</td>
</tr>
</tbody>
</table>

Note: Quota calculation uses the system date and time of the Quota Manager machine to calculate aggregation periods. During Quota Manager operation, if the date and time of the system are changed, we recommend that you delete all quota information from the SM database to recalculate all aggregation periods according to the new date and time. This operation also causes a quota replenish for all subscribers. To remove quota information from the SM database, use the `p3subsdb --clear-all-states` command. Use the `p3subsdb --clear-all-states` command in a maintenance window after moving all the subscribers to a non-quota profile with the Cisco Quota Manager disabled.

Cisco SCA BB Quota Buckets

The basic building block that the Cisco SCA BB uses to implement a specific quota is called a quota bucket. Each subscriber can be assigned a maximum of 16 quota buckets to maintain the utilization of subscriber traffic over a specific service.

The following network resources can be managed with a quota bucket:
Traffic volume in units of Layer 3 kilobytes—Subscriber traffic consumption can be monitored separately per traffic direction such as from the subscriber (up) or to the subscriber (down).

Number of sessions—The total number of network sessions classified to the services associated with the quota bucket.

The Cisco SCE provides real-time notifications and reporting of the quota breach, remaining quota periodic, quota state restore, and quota threshold events.

Depletion or breach of a quota bucket occurs when a monitored resource is consumed when the bucket is empty. After the quota is depleted, the quota bucket causes all the service rules associated with that quota bucket to execute breach-state actions. Quota bucket replenishment (automatic or external) can bring the quota to a non-depleted state, and has the service rules associated with the quota bucket execute the normal (nonbreached) actions.

Upon quota depletion, the Cisco SCE platform can perform one or more actions, as defined in the service configuration settings. The following actions are:

- Send quota breach RDR.
- Signal a quota breach notification through Java API.
- Activate subscriber notification (HTTP redirect-based notification).

Quota Provisioning

The Quota Manager uses quota provisioning to provide additional quota to the subscriber as a response to the following quota indications: Quota State Restore, Quota Below Threshold, and Quota Breach. Quota provisioning occurs only if quota is still available for the subscriber.

Quota provisioning is split into dosages to ensure that quota consumption is accounted for accordingly in the quota manager database. This ensures that in cases of failures, the amount of quota used, but not accounted for by a subscriber, is limited by the quota dosage size.

The Quota Manager performs the provisioning by adding quota to the Cisco SCE so that after the provisioning operation, the available quota in the Cisco SCE equals the minimum of either the dosage size or the remaining quota in Quota Manager.

For example, when the bucket size is 100 MB, the dosage size is 10 MB, and the threshold size is 1 MB, the following quota provisioning takes place:

- When the subscriber logs in for the first time, the Cisco SCE initiates a Quota State Restore indication for this subscriber. This indication triggers the following actions:
  - Quota of 100 MB is added to the Quota Manager database for the first aggregation period.
  - The Quota Manager provisions only 10 MB to the Cisco SCE, as configured by the quota dosage value.

- After the subscriber consumes 9 MB of quota, the quota threshold (1 MB) is reached and the Cisco SCE initiates a Quota Below Threshold indication for this subscriber. This indication triggers the following actions:
  - The Cisco Service Control Quota Manager provisions a further 10 MB to the Cisco SCE if multiple Cisco SCE support is enabled in the Cisco Quota Manager.
  - If multiple Cisco SCE support is not enabled, the Cisco Service Control Quota Manager provisions only 9 MB. After the provisioning operation, the remaining quota in the Cisco SCE equals the dosage size (10 MB).
Along with provisioning, the Cisco Service Control Quota Manager updates its database to indicate that 9 MB of quota was consumed by the subscriber. After the provisioning operation, the remaining quota in the Cisco Service Control Quota Manager is 91 MB (for example, 100 - 9).

### Aggregation Period, Slices, and Bucket

To measure the consumption of each subscriber, Cisco Service Control Quota Manager uses these three concepts in the sliding window model:

- **Aggregation period**—Time-based quota for a period.
- **Slice**—Aggregation period is further divided into time-based units called slices. Slices are valid only when the aggregation period is set to minutes, hourly, daily or weekly. Minimum value is 10. When the aggregation period is set to monthly or none, the slice period is not used or should be set to -1. Here -1 is the default value and it means that the period equal to the aggregation period.
- **Bucket**—Quota limits within an aggregation period.

Table 1-2 provides details of aggregation periods, allowed slice periods, and maximum slice period.

<table>
<thead>
<tr>
<th>Aggregation Period</th>
<th>Allowed Slice Period</th>
<th>Maximum Slice Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 minutes</td>
<td>10, 20, 30, 60</td>
<td>60</td>
</tr>
<tr>
<td>180 minutes</td>
<td>10, 20, 30, 60, 90, 180</td>
<td>180</td>
</tr>
<tr>
<td>1440 minutes</td>
<td>10, 20, 30, 60, 90, 180...1440</td>
<td>1440</td>
</tr>
<tr>
<td>hourly</td>
<td>10, 20, 30, 60</td>
<td>60</td>
</tr>
<tr>
<td>daily</td>
<td>10, 20, 30, 60, 90, 180...1440</td>
<td>1440</td>
</tr>
<tr>
<td>weekly</td>
<td>420...10080</td>
<td>10080</td>
</tr>
<tr>
<td>monthly</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>none</td>
<td>-1</td>
<td>-1</td>
</tr>
</tbody>
</table>

Slice quota must always be a whole number. If it is a fractional value, the fractional part is ignored during quota calculation. This validation is done on loading the configuration file. A warning is displayed. Modify the values so that the slice quota will be a whole number. You can use '--ignore-warnings' option to complete the task.

For example, if bucket is 1000, aggregation period is 30 minutes, and slice period is 10 minutes, the number of slices will be 3 and the slice quota will be 333.3333. The fractional part is ignored. So the total remaining quota in Quota Manager is 999 (333+333+333). In this scenario, adjust the bucket size to 1200 or number of slices to 2 to get a whole number as the slice quota.

### Sliding Window Model

The aggregation period is divided into multiple slices. Using the sliding window model, the Cisco SCE calculates the bandwidth consumption for each time slice or time period separately and saves the calculated bandwidth consumption in the Cisco Service Control Quota Manager. The Cisco SCE calculates the bandwidth consumption during the aggregation period over a configured number of time
slices ($N$ slices) or time periods. Calculating bandwidth consumption over the configured number of time periods ensures that the bandwidth consumption calculation is based on the average bandwidth consumption.

**Note**
If you use the `p3qm --set-quota` command on quota breach, the subscriber will have more remaining quota.

Figure 1-2 illustrates the aggregation time over multiple slices.

**Figure 1-2 Aggregation Time Over Multiple Time Slices**

The sliding history data may be inaccurate if the subscriber consumption is not spread across the aggregation period. If you expect that a switching of packages may occur, we recommend that you enable the `reset_quota_on_profile_switch` tunable and the `reset_quota_on_penalty_profile_switch` tunable in the Quota Manager section of the Cisco Service Control Subscriber Manager configuration file.

If sliding history data is maintained across the penalty profile switch in a single or multiple bucket penalty profile configuration, that is, if the `reset_quota_on_penalty_profile_switch` parameter is set to false, any remaining quota from a previous slice period in the base profile is the usable quota in the corresponding slice period in the penalty profile. If there is excess quota consumption in the previous slice period in the base profile, there is no quota to consume in the corresponding slice period in the penalty profile.

In Cisco SCE releases prior to 4.1.0, the carryforward quota from the base profile is added or deducted in the current slice period after a penalty profile switch. Effective with Cisco SCE 4.1.0, any excess quota consumption in the base profile is deducted from the current slice period in the penalty profile and any remaining quota in the base profile is not added to the corresponding slice period in the penalty profile.

To carryforward the remaining quota, add the `maintain_excess_consumption_history_with_multi_bucket_config` parameter under the QuotaManager section in the p3sm.cfg file and disable the parameter by setting the value to false. The carryforwarded quota is added to the next penalty profile but is not used in post penalty decisions.

Enabling the `maintain_excess_consumption_history_with_multi_bucket_config` parameter affects only the current slice period and not the previous slice periods.

**Multiple Thresholds of Subscriber Quota**

The Multiple Thresholds of Subscriber Quota allows differentiating quota use among the groups of subscribers.

The Quota Manager manages a bucket per subscriber and when a defined threshold is crossed, the Quota Manager changes the profile of the subscriber to the penalty profile according to the configuration. Subscribers who breach their quota are put in the penalty profile for a period of time. After
Multiple Thresholds of Subscriber Quota

The penalty time expires, Quota Manager verifies subscriber quota consumption and moves the subscriber to the appropriate profile based on the configuration. Quota Manager also identifies the quota consumption under a certain threshold during the penalty period.

For multiple penalty quota profile configuration example, see the “Configuring the Quota Manager—Example” section on page 3-9.

Configuring the sliding window algorithm to $n$ slices allows the sliding window algorithm to account for the penalty calculation for the $N-1$ last slices and the current slice.

For example, if $N = 3$ and the quota threshold is configured to $x$ bytes over the aggregation time. The algorithm will take the consumption for the last two time slices and the consumption report received for the current time slice to calculate the average consumption for three time slices. If the subscriber consumed more than the average $x$ bytes over the time slices, the subscriber is switched to the penalty package.

If a subscriber exceeds one of the thresholds, the subscriber is switched to the package for a penalty time. If during the penalty time the subscriber again exceeds one of the thresholds, the subscriber is switched to the penalty package according to the configuration and the penalty timer is reset (counting the penalty time from zero).

Multiple Quota Thresholds—Example

In the following example, the requirement is to distinguish between the three groups of the subscribers over the aggregation time. The three subscriber groups are, namely:

- Regular subscribers.
- Heavy subscribers—Subscribers who consumed more than 500 KB in the last 30 minutes.
- Very heavy subscribers—Subscribers who consumed more than 1000 KB in the last 30 minutes.

Regular subscribers are untouched, heavy subscribers are lightly controlled when the interface is close to congestion, and very heavy subscribers are forcefully controlled when the interface is close to congestion.

The Cisco SCE sends RDRs to the Quota Manager. The Quota Manager detects heavy subscribers based on the amount of bandwidth (BW) these subscribers consumed in the last $x$ minutes. Heavy subscribers are divided into two groups based on their consumption (those who crossed first threshold and those who crossed first and second thresholds) and each group is assigned a different package. The Quota Manager manages a bucket for each subscriber and when a threshold is crossed, the Quota Manager changes the subscriber package to either the heavy package or very-heavy package.

The finite state machine (FSM), as shown in Figure 1-3, illustrates the new quota algorithm. Immediately after the subscriber is moved to a new package, the current status is verified. As a result of this, the subscriber might immediately move two steps in a row.
During the aggregation period, if the subscriber exceeds the high threshold, the subscriber is moved to another package and the aggregation period start is reset to be the package change time. In addition, a penalty timer is reset.

On the first RDR after the aggregation period, the QM checks if the penalty time has passed and if the quota was below the low threshold. During the last aggregation period, if the quota was below the low threshold and the penalty time has passed, the package is changed.

**Table 1-3 Quota Threshold Parameters**

<table>
<thead>
<tr>
<th></th>
<th>Quota Profile/Package 1</th>
<th>Quota Profile/Package 2</th>
<th>Quota Profile/Package 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold on quota greater than/Move to</td>
<td>L/2</td>
<td>H/3</td>
<td>H/3</td>
</tr>
<tr>
<td>Threshold on quota less than/Move to</td>
<td>L/1</td>
<td>L/1</td>
<td>H/2</td>
</tr>
<tr>
<td>Assurance level</td>
<td>10</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Comments:
(*) Aggregation period is restarted when subscriber is switched to a new package
(*) Penalty time must be a product of the aggregation period (Tmin)
Support for Multiple Bucket Quota Provisioning with Penalty Profile

Cisco SCE supports multiple bucket quota provisioning with the penalty profile. Upstream flows, downstream flows, or both flows, can be used as quota buckets with the penalty profile. Cisco Service Control Quota Manager treats all flows as individual buckets.

Based on the bucket usage, the penalty profile is defined. Penalty switch occurs on breach of at least one of the configured buckets, rather than all the configured buckets. Each bucket in the quota profile must be associated with the penalty profile. The number of quota buckets and the number of penalty profiles must always be equal in the quota profile. If the subscriber breaches more than one bucket simultaneously, the penalty switch moves the first bucket to the penalty profile.

Even if a subscriber has breached only one bucket, and has not breached or used any other bucket, penalty switch occurs based on the first bucket. If a subscriber who is present in the penalty profile reaches the threshold, the subscriber moves to the presently configured postpenalty profile.

While configuring postpenalty thresholds, use the logical or OR (|) separators to configure different thresholds for different buckets. If the consumption is less than the configured threshold within a penalty period, the subscriber will be switched to the corresponding postpenalty profile.

**post_penalty.[10|20]=QP11**
The subscriber will be moved to QP11 if the consumption of quota is less than 10 percentage of bucket 1 or less than 20 percentage of bucket 2.

**post_penalty.[90]=QP22**
The subscriber will be moved to QP22 if the consumption of quota is less than 90 percentage of bucket 1 or less than 90 percentage of bucket 2.

**Note**
The number of quota buckets should always be equal in all the quota profiles in a penalty profile chain.

If data consumption history is maintained across the penalty profile switch in a multiple bucket penalty profile configuration, that is, if the reset_quota_on_penalty_profile_switch parameter is set to false, any excess consumption from the breached buckets is deducted from the penalty profile. The remaining quota from non-breached buckets is not added to the penalty profile.

To carryforward the remaining quota from the non-breached buckets, add the maintain_excess_consumption_history_with_multi_bucket_config parameter under the QuotaManager section in the p3sm.cfg file and disable the parameter by setting the value to false. The carryforwarded quota from the non-breached buckets is added to the next penalty profile but is not used in post penalty decisions.

Support for Multiple Cisco SCEs

When a subscriber is connected from two Cisco SCEs—Cisco SCE fixed and Cisco SCE mobile—both Cisco SCEs request quota for the subscriber according to the configured service. When the Quota Manager receives a quota request from Cisco SCE mobile, it replenishes the previous dosage given to Cisco SCE fixed and associates the subscriber to Cisco SCE mobile instead of Cisco SCE fixed. This may mislead the quota calculation on the Quota Manager and the subscriber may be dissociated from Cisco SCE fixed.
The Quota Manager supports quota consumption monitoring from multiple Cisco SCEs. The quota consumed is calculated from the moment the subscriber simultaneously logs in from one or more Cisco SCEs. Dosage is allocated to all the Cisco SCEs until the subscriber moves to a depleted or breached state.

The Cisco Service Control Quota Manager keeps track of the quota allocated to the Cisco SCEs and the quota consumed by the Cisco SCEs for a specific subscriber to compute the quota calculations accurately.

Definitions for aggregation period and slice period remain same even if multiple Cisco SCE support is enabled.

**Quota Allocation Modes**

When a subscriber is allowed to log in from multiple Cisco SCEs, because of the asynchronous nature of quota consumption, quota consumed may be greater than or less than the bucket size.

When the quota usage approaches the bucket value, the Cisco SCE decides whether the subscriber be allowed to consume the quota greater than or less than the bucket size. The additional quota or lesser quota that is provisioned is equal to the value of dosage size multiplied by the number of Cisco SCEs from which the subscriber is logged in.

To minimize the amount of quota divergence consumed by a subscriber, you must configure the quota profile in the Cisco Service Control Quota Manager. We recommend that the dosage size be as minimum as possible to minimize the quota loss/gain consumption. Configure the dosage size as a fraction of the bucket size and based on the number of Cisco SCEs that are configured. Make sure you configure the dosage in such a way that the Cisco Quota Manager can allocate the required quota to all the configured Cisco SCEs upon login.

Two quota allocation modes are supported, namely:

- Consumption
- Provisioned

**Consumption Mode**

In this mode, the dosage allocation to the Cisco SCEs is based on the actual quota consumption. The subscriber may consume more quota than the bucket size per aggregation period, because the actual quota consumption for a subscriber is calculated based on the Quota Status RDRs and QUOTA_BELOW_THRESHOLD RDRs received from the Cisco SCEs.

The potential gain for each bucket for each aggregation period can be up to the value equal to the dosage value multiplied by the number of Cisco SCEs from which the subscriber is logged in.

The available quota is considered to be equal to the quota available in the Cisco Service Control Quota Manager. If the available quota is greater than 0, a dosage is provisioned to the Cisco SCE. Otherwise, the request is discarded.

For the configuration example, see the “Consumption Quota Allocation Mode with Multiple Cisco SCEs” section on page 2-12.

**Provisioned Mode**

In this mode, the dosage allocation is based on the dosages provisioned to the Cisco SCEs when a Quota Request RDR is sent to the Quota Manager. After a dosage is provisioned to the Cisco SCE, the Quota Manager assumes that this dosage has been consumed irrespective of whether the Cisco SCE consumes the dosage or not.
In this mode, there might be a potential loss to the subscriber if the provisioned dosage is not consumed by that particular Cisco SCE. The amount of this loss per bucket for each aggregation period can be up to a value equal to the dosage value multiplied by the number of Cisco SCEs from which a subscriber is logged in.

The available quota is considered to be equal to the quota available in the Cisco Service Control Quota Manager minus the sum of remaining quota from all the Cisco SCEs. If the available quota is greater than 0, a dosage is provisioned to the Cisco SCE. Otherwise, the request is discarded.

For the configuration example, see the “Provisioned Quota Allocation Mode with Multiple Cisco SCEs” section on page 2-13.

**Limitations**

There are some limitations to providing support for multiple Cisco SCEs:

- This feature is applicable only to the Cisco SCEs within a domain.
- A subscriber can be in breached state in one SCE and in normal mode in the other SCE.
  
  This implies that, a subscriber might continue to be on a base package without getting penalized even after the subscriber breaches the quota on one Cisco SCE. The subscriber is penalized only after the subscriber breaches the quota on all configured Cisco SCEs. To overcome this limitation, control the quota consumption using appropriate breach actions available through Cisco SCC AB.
- If there are frequent logouts by a subscriber, there might be additional loss or gain in the quota consumption.
- All Cisco SCEs should have similar profiles. The number of buckets in each profile is limited to one and no slices should be configured on these buckets.
- The configured dosage size is treated as the dosage allocated to the single Cisco SCE per subscriber.
- This feature supports only volume-based quota management.
- This feature supports simultaneous subscriber login from a maximum of eight Cisco SCEs.

**Recommendations**

We recommend that:

- If the probability of concurrent logins from different Cisco SCEs is high for a subscriber, configure a lower dosage value to minimize the additional factor or the quota consumption.
- If the subscriber logouts from different Cisco SCEs are more frequent, use actuals quota mode.
- We recommend that you do not enable the GT_SLS_IGNORE_EXCESS_QUOTA_UPDATE tunable in a multiple Cisco SCE configuration.
Introduction

This chapter describes a number of scenarios to help you better understand how the Cisco Service Control Quota Manager works and to understand the messages between the Cisco Service Control Subscriber Manager and the Cisco SCE. It consists of the following sections:

- Quota Preservation Across Subscriber Sessions, page 2-2
- Aggregation Period Changeover, page 2-3
- Quota Breach, page 2-5
- Maximizing Quota Accuracy, page 2-7
- Cisco Service Control Subscriber Manager Startup Sequence, page 2-8
- EM Agent Startup Sequence, page 2-8
- Subscriber Login, page 2-8
- Subscriber Logout, page 2-9
- Quota-Status Notification, page 2-9
- Quota Below Threshold Notification, page 2-9
- Quota Depleted Notification, page 2-10
- Quota Replenishment, page 2-10
- Penalty Flows, page 2-10
- Removing Cisco SCE from a Configuration, page 2-11
- Subscriber Manager Failover, page 2-12
- Cisco SCE Failover, page 2-12
- Consumption Quota Allocation Mode with Multiple Cisco SCEs, page 2-12
- Provisioned Quota Allocation Mode with Multiple Cisco SCEs, page 2-13
Quota Preservation Across Subscriber Sessions

This section describes how the subscriber quota is preserved across sessions. Figure 2-1 depicts this scenario.

Figure 2-1 Quota Preservation Across Subscriber Sessions

The following steps describe what happens in this scenario:

1. The subscriber logs in to the Cisco Service Control Subscriber Manager.
2. The SM performs a logon operation to the Cisco SCE, which responds with a Quota State Restore indication. This indication is a request by the Cisco SCE to the SM to find out how much quota the subscriber has left.
3. The SM queries the database, and then responds to the Cisco SCE with a quota set operation. This sets the amount of quota that is allocated to the subscriber based on the subscriber package and the associated quota profile.

4. During the subscriber session and while the subscriber is consuming quota, the Cisco SCE sends remaining quota indications. These are periodic, and the frequency at which they are sent is defined when configuring the PQB file with Cisco SCA BB console.

5. When the Cisco Service Control Subscriber Manager receives each remaining quota indication, the quota manager removes the required amount of quota from the subscriber buckets.

---

**Note**

A high rate of remaining quota indications results in a higher accuracy for the subscriber quota value. However, it also increases the number of management messages on the network.

6. When the subscriber session is finished, the Cisco Service Control Subscriber Manager performs a logout operation on the Cisco SCE, which responds with a remaining quota indication. The SM uses the value contained in the indication to delete the quota consumed by the subscriber.

7. The quota value is written to the database to be stored until the next subscriber log in.

---

**Note**

The quota is subtracted from the subscriber quota account only after the quota is consumed, not when it is provisioned. This ensures that in cases of Cisco SCE fail-over, the quota inaccuracy is calculated in favor of the subscriber.

---

**Note**

In certain scenarios, such as the subscriber being inactive for a certain period if the Inactive Subscriber Removal feature is enabled in the p3sm.cfg file, cable modem changed, or removal of the subscriber using a Cisco Service Control Subscriber Manager command, the subscriber is removed from the Cisco Service Control Subscriber Manager and as a result, subscriber quota information is deleted from the Cisco Service Control Subscriber Manager database. When the subscriber logs in the next time, the subscriber gets the full quota again. For example, if a subscriber with a monthly aggregation of 100 GB is removed from Cisco Service Control Subscriber Manager after consuming 50 GB, when the subscriber logs in again, the subscriber gets a fresh monthly aggregation of 100 GB.

---

**Aggregation Period Changeover**

Figure 2-2 shows the actions taken for each subscriber when a new aggregation period begins.
In Figure 2-2, the subscriber is logged in and consumes quota.

1. The top half of the figure shows the Cisco SCE generating the remaining quota indications and the SM removing the used quota from the subscriber buckets.
2. According to the package and the associated quota profile, a new aggregation period starts.
3. After the start of the new aggregation period, the Cisco SCE sends a remaining quota indication.
4. When the Cisco Service Control Subscriber Manager receives a remaining quota indication, it replenishes the subscriber buckets with the quota amounts defined by the quota profile.
Owing to the configuration of the Cisco SCE, the first remaining quota indication may not occur immediately when the new aggregation period begins. This period of time is highlighted in blue in Figure 2-2. The quota consumed in this time period is consumed from the quota allocated to the previous aggregation period. The inaccuracy of the quota value is less than or equal to the quota dosage and is dependent on the rate of the remaining quota indications. This is a limitation of the application.

If the rate at which remaining quota indications are sent is high, the subscriber quota is replenished at a time in close proximity to the new aggregation period start time. However, this increases the number of management messages on the network.

**Quota Breach**

*Figure 2-3* shows the actions taken in the event that a subscriber completely depletes the quota.
In Figure 2-3, the subscriber consumes data from the quota buckets and the Cisco SCE generates the quota indications.

1. When the quota reaches a configurable threshold value, the Cisco SCE sends a quota threshold indication.

2. In cases in which the subscriber can be granted more quota, a quota set operation is performed. In Figure 2-3, no more quota is available for the subscriber.

3. The subscriber continues to consume quota until the quota buckets are empty. The Cisco SCE sends a quota breach indication when the quota buckets are empty. At the same time, the post-breach action, which was configured in the Cisco SCA BB console, is applied to the subscriber.
4. After a new aggregation period starts, the subscriber is eligible for more quota. However, quota is replenished only after the quota manager receives the remaining quota indication.

5. After the quota is replenished, a quota set operation is performed if the extra consumption reported by the Cisco SCE in remaining quota indication is greater than MAX_DOSAGE (1 GB). If the extra consumption reported by the Cisco SCE in remaining quota indication is lesser than MAX_DOSAGE (1 GB), a quota add operation is performed and the subscriber can continue consuming quota.

**Note**

Owing to the configuration of the Cisco SCE, the first remaining quota indication may not occur immediately after the new aggregation period begins. This period of time is highlighted in blue in Figure 2-3. Because the subscriber is breached and the first remaining quota indication has not arrived, the subscriber is not able to consume quota. This is the only case in which quota inaccuracy is not in favor of the subscriber.

## Maximizing Quota Accuracy

One of the most important aspects of the Cisco Service Control Quota Manager is accuracy of the quota levels for any subscriber. When you provision quota by using an external server, a trade-off exists between quota accuracy and the number of network messages.

To maximize accuracy, configure the rate of the periodic remaining quota indication to a high value, and configure the size of the quota dosage to a small value. A configuration causes performance degradation because of the high number of messages being generated in the network.

Quota inaccuracies may occur during the changeover from one aggregation period to the next, or because an Cisco SCE failover. The level of inaccuracy depends on the configuration of the following parameters:

- Rate of the periodic remaining quota indications
- Quota dosage value

During an aggregation period changeover, the following occurs until the first quota indication is received in the new aggregation period:

- The quota consumed by the subscriber is subtracted from the previous aggregation period.
- The quota dosage value limits the size of any quota error.
- The interval between the remaining quota indications limits the length of time during which the consumed quota is subtracted from the previous aggregation period.

In cases of Cisco SCE failover, the following occurs between the last quota indication in the failed Cisco SCE and the first quota indication in the new, active Cisco SCE:

- Any quota consumed by the subscriber is not removed from the subscriber buckets.
- The quota dosage value limits the size of any quota error.
- The length of time during which quota is consumed is limited by the interval between the remaining quota indications.

In all cases of inaccuracy, the quota remaining is calculated in favor of the subscriber. The only exception is if the aggregation period changeover occurs when the subscriber quota is already breached.
Cisco Service Control Subscriber Manager Startup Sequence

The Cisco Service Control Subscriber Manager startup sequence is as follows:

1. The network model notifies the Cisco Service Control Quota Manager with a list of new Cisco SCEs added to the configuration.
2. The Cisco Service Control Quota Manager creates a PPRC_SCESubscriberApi instance for each new Cisco SCE added to the configuration.
3. The Cisco Service Control Quota Manager creates a QuotaListenerImpl instance and registers it on the API instance for each new Cisco SCE added to the configuration.
4. The active Cisco Service Control Subscriber Manager connects to all the Cisco SCEs using the API instance. The standby Cisco Service Control Subscriber Manager does not connect.
5. The Cisco Service Control Subscriber Manager identifies if the Cisco Service Control Quota Manager configuration file was changed and performs a replenish quota operation for all subscribers based on the Cisco Service Control Quota Manager configuration file changes.

EM Agent Startup Sequence

The EM agent startup sequence is as follows:

1. The SCAS_BB MBean registers:
   - The QuotaRdrListener on the RDR server MBean to manage the quota RDRs received from the SML.
   - The QuotaOperationHandler on the SCESubscriberApiMBean to handle quota updates received from the Cisco SCE Subscriber API.
2. After the QuotaRdrListener and the QuotaOperationHandler are registered, SCESubscriberApiMBean waits for incoming PRPC connections from the Cisco Service Control Quota Manager.

Subscriber Login

When a subscriber tries to login:

1. The Cisco Service Control Subscriber Manager logs in the subscriber to the Cisco SCE.
2. The SML detects the login and generates a quota-state-restore RDR for the subscriber.
3. The QuotaRdrListener receives the RDR and generates a PRPC quota-state-restore notification by using the SCESubscriberApiMBean.
4. The Cisco Service Control Quota Manager receives the notification and checks the existing quota for the subscriber on all buckets.
5. If quota is available for the subscriber, the Cisco Service Control Quota Manager invokes the quotaUpdate operation.
6. The SCESubscriberApiMBean manages the invocation and asks the QuotaOperationHandler to add the quota.
7. The QuotaOperationHandler updates the quota for the subscriber on the Cisco SCE (by using the quota-add operation).
Subscriber Logout

When a subscriber tries to log out:

1. The Cisco Service Control Subscriber Manager logs out the subscriber from the Cisco SCE.
2. As a result of the logout, the SML generates a remaining-quota RDR (with reason 1).
3. The QuotaRdrListener receives the RDR and generates a quota-status PRPC notification using the SCESubscriberApiMBean.
4. The Cisco Service Control Quota Manager receives the notification, compares the current quota with the last reported quota of the Cisco SCE, and decrements the difference between the current quota and the last reported quota.

Quota-Status Notification

The SML periodically generates a remaining-quota RDR (reason 0):

1. The QuotaRdrListener receives the RDR and generates a quota-status PRPC notification by using the SCESubscriberApiMBean.
2. The Cisco Service Control Quota Manager receives the notification, compares the current quota with the last reported quota of the Cisco SCE, and decrements the difference between the current quota and the last reported quota.
3. If the current quota is negative, the Cisco Service Control Quota Manager checks whether more quota is available, and invokes quotaUpdate (PRPC invocation) if more quota is available.
4. The SCESubscriberApiMBean manages the invocation and asks the QuotaOperationHandler to add the quota.
5. The QuotaOperationHandler updates the quota for the subscriber (by using the quota-add operation).

Quota Below Threshold Notification

When the SML generates a quota-below-threshold RDR:

1. The QuotaRdrListener receives the RDR and generates a PRPC notification by using the SCESubscriberApiMBean.
2. The Cisco Service Control Quota Manager receives the notification, compares the current quota with the last reported quota of the Cisco SCE and decrements the difference between the current quota and the last reported quota.
3. The Cisco Service Control Quota Manager then checks whether more quota is available, and invokes quotaUpdate (PRPC invocation) if additional quota is available.
4. The SCESubscriberApiMBean manages the invocation and asks the QuotaOperationHandler to add the quota.
5. The QuotaOperationHandler (of SCAS_BBMBean) updates the quota for the subscriber (by using the quota-add operation).
Quota Depleted Notification

When the SML generates quota-breach (quota-depleted) RDR:

1. The QuotaRdrListener receives the RDR and generates a PRPC notification by using the SCESubscriberApiMBean.
2. The Cisco Service Control Quota Manager receives the notification, compares the current quota with the last reported quota of the Cisco SCE, and decrements the difference between the current quota and the last reported quota.
3. The Cisco Service Control Quota Manager then checks whether more quota is available, and invokes quotaUpdate (PRPC invocation) if additional quota is available.
4. The SCESubscriberApiMBean manages the invocation and asks the QuotaOperationHandler to add the quota.
5. The QuotaOperationHandler updates the quota for the subscriber (by using the quota-add operation).

Quota Replenishment

Quota replenishment occurs in the following scenarios:

- A new aggregation period occurs when the number of the slice is equal to 1 (old quota model support).
- The first quota notification occurs in the life of a subscriber.
- When the Cisco Service Control Quota Manager is started. Because the last configuration is not saved, it is not known if the configuration was changed. The Cisco Service Control Quota Manager assumes that the configuration changed and invokes a quota replenishment.
- If the customer configures the global flag reset_quota_on_profile_change and one of the following has occurred:
  - The quota profile (packageID) of the subscriber is changed (through SM CLU or because of the move to or out of the penalty package).
  - The static configuration of the quota policies is modified, and a new configuration is loaded on the Cisco Service Control Quota Manager.

Penalty Flows

The subscriber enters the penalty mode when the subscriber uses the entire quota before the window (aggregation period) ends and enters the configured penalty profile for their subscriber package. When such a situation is identified:

- The subscriber is moved to the configured “penalty” package for the configured period of time.
- If configured, subscriber quota usage history before the penalty is kept in the Cisco Service Control Subscriber Manager Database.
When the penalty period passes, the Cisco Service Control Quota Manager checks subscriber usage during the penalty period and moves the subscriber to the post-penalty package according to the configuration. If the subscriber quota usage did not fit any post-penalty threshold, the subscriber stays in penalty for another penalty period.

Penalty Profile

If configured, a penalty profile is applied only if the subscriber breaches the quota in all the active Cisco SCEs. If a subscriber breaches the quota in one Cisco SCE, the subscriber will be in the breached state until the subscriber breaches the quota in all the other active Cisco SCEs.

A Cisco SCE is treated being active for a subscriber if Quota State Restore is generated from that Cisco SCE.

Even when a subscriber is in penalty state, the subscriber may consume a quota that is greater than or less than the bucket size, based on the configuration.

Postpenalty Profile

If configured, a postpenalty profile defines the quota profile to which a subscriber should be moved if the usage during the last aggregation period was lower than the configured threshold.

To define the aggregation period for postpenalty profile, configure the value of the handle_out_penalty_on_aggregation_period_end property as true.

The base profile in a quota profile is called a START profile, profiles listed after START profile that contains both penalty profile and postpenalty profiles are called MIDDLE profiles. The profile in which the postpenalty profile is NONE is called the LAST profile.

To configure a valid penalty chain, you must define:

- A penalty profile in the START profile.
- Both the penalty and postpenalty profiles in the MIDDLE profiles.
- A postpenalty profile for the LAST profile.
- The penalty profile as none for the LAST profile.

Removing Cisco SCE from a Configuration

When a Cisco SCE is removed from the configuration:

1. The network model notifies the Cisco Service Control Quota Manager that a Cisco SCE was removed from the configuration.
2. The Cisco Service Control Quota Manager unregisters the quota listener from the removed Cisco SCE and the Cisco Service Control Quota Manager disconnects from the removed Cisco SCE.
Subscriber Manager Failover

When a Cisco Service Control Subscriber Manager fails:

1. The failed Cisco Service Control Subscriber Manager disconnects from each Cisco SCE without unregistering the quota listener.
2. The quota notifications accumulate on the each Cisco SCE internal buffer.
3. The standby Cisco Service Control Subscriber Manager connects to each Cisco SCE and the quota notifications are sent to the new active Cisco Service Control Subscriber Manager.

Cisco SCE Failover

The Cisco Service Control Quota Manager stores the Cisco SCE that sent the last quota notification. When the Cisco Service Control Quota Manager receives a notification from a different Cisco SCE, it does not calculate the quota usage (it ignores the last Cisco SCE bucket sizes, which are not relevant), and updates the last Cisco SCE bucket sizes according to the notification. The quota that was consumed on the failed Cisco SCE since the last notification is not accounted for.

Consumption Quota Allocation Mode with Multiple Cisco SCEs

In this mode, the dosage allocation to the Cisco SCEs is based on the actual quota consumption. subs1 is the subscriber here.

```plaintext
[QuotaProfile.QP11]
packages=11
bucket_sizes=1000
dosage_sizes=500
aggregation_period=30 minutes
penalty_period=none
penalty_profile=none.
```

**Step 1**
The Cisco Service Control Quota Manager receives a quota-state-restore notification from SCE1 for the subscriber subs1 with the package11. Because the first QSR quota is not calculated, quota is allocated based on the dosage size mentioned in the p3qm.cfg file.

- Cisco Service Control Quota Manager remaining Quota = 1000
- Last quota reported by SCE = 500

**Step 2**
The Cisco Service Control Quota Manager receives a quota-status notification from SCE1, 100 for bucket 1. Because the SCE has a remaining quota of 100, there is no need to provide quota to the SCE.

- Cisco Service Control Quota Manager remaining Quota = 600
- Last quota reported by SCE = 100

**Step 3**
The Cisco Service Control Quota Manager receives a quota-state-restore notification from SCE2 for the subscriber subs1 with the package11. If the quota available in the Cisco Service Control Quota Manager is greater than 0, Cisco Service Control Quota Manager provides the quota to SCE2.

- Cisco Service Control Quota Manager remaining Quota = 600
- Last quota reported by SCE = 500
Step 4 The Cisco Service Control Quota Manager receives NOTIFICATION_TYPE_QUOTA_BELOW_THRESHOLD notification from SCE2, 50 for bucket 1.

- Remaining quota = 150
- Minimum of remaining quota and dosage size is allocated to the requested SCE
- In this case, a quota of 150 is allocated to SCE2
- SCE1 has a quota of 100 as remaining from the provisioned quota

QM remaining Quota = 150
Last quota reported by SCE = 50

Subscriber subs1 on SCE1 can consume its remaining quota of 100 before moving to the breached state, and subs1 on SCE2 can consume the allocated dosage of 150 before moving to the breached state. In this scenario, a subscriber can consume more than the actual bucket size. If SCE1 and SCE2 consume the quota, the total consumed quota will be 1100, which is 100 more than the actual bucket size. This additional consumption needs to be considered as a potential loss for the service provider, if opted for this mode.

Step 5 If the subscriber consumes the 150 dosage, the subscriber is in breached state on SCE2.

Because the remaining Cisco Service Control Quota Manager quota is lesser than or equal to 0, the subscriber is in breached state.

Quota bucket 1 is depleted for the subscriber subs1 until Mon Aug 02 17:12:00 IST 2010.

---

Provisioned Quota Allocation Mode with Multiple Cisco SCEs

In this mode, the dosage allocation is based on the dosages provisioned to the Cisco SCEs when a Quota Request RDR is sent. In this example, the subscriber is subs1 and the configuration is QuotaProfile.QP11.

```
[QuotaProfile.QP11]
packages=11
bucket_sizes=1000
dosage_sizes=500
aggregation_period=30 minutes
penalty_period=none
penalty_profile=none.
```

Step 1 The Cisco Service Control Quota Manager receives a quota-state-restore notification from SCE1 for the subscriber subs1 with the package11.

Because this is the first QSR, the quota is not calculated. The quota is allocated based on the dosage size mentioned in the p3qm.cfg file.

Quota Manager remaining Quota = 1000
Last quota reported by SCE = 500

Step 2 The Cisco Service Control Quota Manager receives a quota-status notification from SCE1, 100 for bucket 1. Because the SCE has a remaining quota of 100, no need to provide quota to the SCE.
Quota Manager remaining Quota = 600
Last quota reported by SCE = 100

**Step 3** The Cisco Service Control Quota Manager receives a quota-state-restore notification from SCE2 for the subscriber subs1 with the package1.

The quota is calculated as per the following formula and is provisioned to sce2:

\[
\text{Available quota in Quota Manager} - \text{Remaining quota from all SCEs} = \text{Available quota.}
\]

In this case, \(600 - 100 = 500\)

Quota Manager remaining Quota = 600
Last quota reported by SCE = 500

**Step 4** The Cisco Service Control Quota Manager receives

NOTIFICATION_TYPE_QUOTA_BELOW_THRESHOLD from SCE2, 50 for bucket 1.

The quota is calculated as per the following formula:

\[
\text{Available quota in Quota Manager} - \text{Remaining quota from all SCEs} = \text{Available quota.}
\]

The quota is provisioned to sce2.

In this case, remaining quota = \(600 - 450 = 150\); \(150 - (100 + 50) = 0\)

Remaining quota from SCE1 is 100
Remaining Quota from SCE2 is 50
QM remaining Quota = 150
Last quota reported by SCE = 50

Because there is no free quota available in the Cisco Service Control Quota Manager, no quota is allocated to SCE2. If sub1 consumes the remaining quota (50), sub1 is moved to breached state in SCE2 and a subscriber will be in normal mode in SCE1, until the remaining quota is consumed.

**Step 5** If the subscribers logs out of SCE1 without consuming the quota, the remaining chunk of the provided dosage should be considered as a potential loss to the subscriber, after moving the subscriber into breached state in SCE2.

Quota bucket 1 is depleted for subscriber subs1 until Mon Aug 02 17:12:00 IST 2010.
Configuring the Quota Manager

Published: September 23, 2015

Introduction

This chapter describes how to configure the Cisco Service Control Quota Manager. This chapter contains the following sections:

- Configuring the Cisco Service Control Quota Manager, page 3-1
- Configuring the Cisco SCA BB Application, page 3-10

Configuring the Cisco Service Control Quota Manager

This section describes how to configure the Cisco Service Control Quota Manager. You must properly configure the Cisco SCE platform and the Cisco Service Control Subscriber Manager.

- Configuration Guidelines, page 3-1
- Configuring the Cisco Service Control Quota Manager in the Cisco Service Control Subscriber Manager, page 3-2
- Restrictions for Configuring the Quota RDR Server, page 3-8
- Configuring the Cisco Service Control Subscriber Manager, page 3-8

Configuration Guidelines

When configuring the Cisco Service Control Quota Manager, ensure that the following conditions are met:

- Anonymous subscribers should be assigned to a package that is not managed by an external quota server.
- For different packages, it is possible to configure external or internal quota management modes. However, packages with internal quota management should not have a quota profile configured in the Cisco Service Control Quota Manager. Quota indications are issued for internal quota management packages (for billing purposes), and the quota manager ignores them if no quota profile is assigned for them.
Buckets labeled “Number of Sessions” should be assigned a dosage value that is equal to the maximum bucket size. Indications that the quota is below the threshold are not generated for this type of bucket, so quota provisioning cannot be split into dosages (otherwise, the subscriber would become breached between subsequent dosage provisions).

You must configure the threshold value of the quota below the threshold indication to a value lower than the minimum quota dosage of all volume buckets.

**Note**

For the Cisco Service Control Quota Manager to properly function, you must add the IP address of the machine that the Cisco Service Control Quota Manager is running on to the /etc/hosts file.

---

### Configuring the Cisco Service Control Quota Manager in the Cisco Service Control Subscriber Manager

The Cisco Service Control Quota Manager is configured with the p3qm.cfg configuration file, which resides in the *sm-inst-dir*/sm/server/root/config directory (*sm-inst-dir* refers to the SM installation directory). Additionally, the Cisco Service Control Quota Manager is configured with additional parameters in the p3sm.cfg configuration file in the [Quota Manager] section of the file. The p3sm.cfg configuration file resides in the *sm-inst-dir*/sm/server/root/config directory (*sm-inst-dir* refers to the SM installation directory).

The configuration files consist of sections headed by a bracketed section title, for example [Quota Profile]<QUOTA-PROFILE-NAME>. Each section contains the definition for one quota profile given by QUOTA-PROFILE-NAME and consists of several parameters having the format parameter = value. The pound sign (#) at the beginning of a line signifies that it is a remark.

- Configuring the Quota Profile Settings, page 3-2
- Configuring the Quota Profile—Examples, page 3-5
- Configuring the Quota Manager Section, page 3-9
- Configuring the Quota Manager—Example, page 3-9
- Quota Manager Performance Recommendations, page 3-10

### Configuring the Quota Profile Settings

The [Quota Profile.QUOTA-PROFILE-NAME] section in the Cisco Service Control Quota Manager configuration file contains the following parameters:

**Note**

Starting from release 5.1.x, bucket size is increased to 10TB from 2TB and dosage size is increased to 100GB from 1GB.

- packages—The list of package IDs associated with the quota profile. The package values are listed as a comma-separated list of package ID values. If the profile is used as penalty profile, only one package can be defined.

  There is no default value for this parameter.

- bucket_size—The comma-separated list that defines, for each bucket, the quota limits within an aggregation period. You must arrange the list in such an order so that the first number is for bucket 1, the second number is for bucket 2, and so on. The units must also be of the correct corresponding
type such as Volume (Layer 3 kilobytes) or Number of Sessions. The minimum bucket size is 0, and the maximum bucket size is 10737418240. In a multiple-thresholds scenario, this parameter defines the threshold at which a subscriber is moved to the penalty profile.

For multiple bucket quota provisioning with the penalty profile, the number of penalty profiles and the number of buckets must be the same. If it is penalty profile, the number of buckets should be the same in all the quota profiles in the penalty chain.

There is no default value for this parameter.

- **dosage_sizes**—The comma-separated list that defines how much quota should be in each bucket after each quota provisioning operation. You must order the list in the same way as the bucket_size parameter and the list must be of the same length. The minimum dosage size is 0 and the maximum is 104857600 (100 GB Layer 3 kilobytes or 1 million sessions). Setting this parameter to a very low value causes a high rate of updates to and from the SCE. Setting this parameter to a very high value causes inaccuracy of quota in the event of a failure.

There is no default value for this parameter.

**Note** If maximum dosage size (i.e. 100GB) is configured then subscriber should log out at least once before 500 GB usage limit is reached since SCOS can maintain only 500 GB usage in single subscriber session (login to logout). If there is no logout till 500 GB then Quota Manage functionality and Subscriber state in SCE will be affected.

- **aggregation_period**—Defines the aggregation period; this is, the period of time for which an amount of quota or number of sessions is granted to the subscriber.

  The “none” value means that the period of time is not bound to an aggregation period, and that the quota is not replenished automatically. Quota can be replenished manually by using the command-line utility (CLU).

  Possible values are minutes, hourly, daily, weekly, monthly, or none.

  For minutes type, the format is n minutes and the minimum value is 30.

  The default value is daily.

- **day_of_month**—Defines the day of the month the aggregation period starts.

  Possible values for this parameter are from 1 to 31. The default value is 1.

  **Note** This parameter is valid only if aggregation_period is set to monthly.

- **day_of_week**—Defines the day of the week the aggregation period will start.

  Possible values are sunday, monday, tuesday, wednesday, thursday, friday, or saturday. The default value is sunday.

  **Note** This parameter is valid only if aggregation_period is set to weekly.

- **time_of_day**—Defines the time of day at which the aggregation period starts. This parameter is applicable for all values of aggregation_period.

  The format of this parameter is HH:mm, where the hours portion is based on a 24-hour clock.

  Possible values are hours from 0 to 23, minutes from 0 to 59. The default value is 00:00.
Chapter 3 Configuring the Quota Manager

Configuring the Cisco Service Control Quota Manager in the Cisco Service Control Subscriber Manager

Note

If aggregation_period is set to hourly, only the minute value is relevant.

- gap— Defines the distribution of the aggregation period start time between different subscribers. Distributing the aggregation period start times helps to avoid bursts of network activity when a new aggregation period begins.

  Possible values are from 0 to 100, where a gap of 0 means that the aggregation period starts at the same time for all subscribers (no distribution) and a gap of 100 means that the aggregation period start time is uniformly distributed over the entire aggregation period.

  The default value is 0.

  For example, if the aggregation period is daily and starts at midnight (00:00), a gap of 50 means that the update messages are sent between midnight and mid-day (12:00). If the gap is 25, the update messages are sent between midnight and 06:00.

- penalty_period— The length of the penalty period, in minutes, associated with the quota profile. Applicable if the current profile is used as the penalty profile. The penalty period must be expressed as a product of the slice period. This parameter is optional. The penalty_period parameter has no default value.

  Note

  If you use a monthly penalty profile, we recommend that you set the penalty period lower than the aggregation period.

- penalty_profile— The name of the quota profile that holds the definition of the package and quota for the penalty period. This parameter can be set to NONE only if it is present in the last penalty profile in the chain. This parameter is mandatory for a penalty profile. The penalty_profile parameter has no default value. For multibucket penalty support, the number of penalty profiles, and the number of buckets should be same. Penalty profiles should be separated using a comma (,).

  Note

  The bucket size value of the penalty_profile parameter should not be greater than the bucket size value of the base profile.

- post_penalty.<threshold>=<Quota Profile Name>—The post-penalty map that defines the quota profile to which the subscriber is moved if the usage during the last penalty period or aggregation period (if, handle_out_of_penalty_on_aggregation_period_end = true) is lower than the threshold.

  If multiple quota bucket with the penalty profile is being used, the thresholds may be provided as either a percentage of quota usage or as the number of quotas used. The postpenalty configuration may be any the following:

  - post_penalty.<threshold1>|<threshold2>|<threshold3>=<Quota Profile Name>—When the threshold values are in percentage form.

  - post_penalty.<threshold1>|<threshold2>|<threshold3>=<Quota Profile Name>—When the threshold values are in numerical form.

  If multiple post penalty parameters are configured, the value of threshold should be configured from low to high.

  Note

  Do not define a postpenalty profile for the START profile in a profile chain; define only the penalty profile. However, you must define both the penalty profile and the postpenalty profile for the MIDDLE profiles. Define the penalty profile as NONE for the LAST profile, and define any postpenalty profile.
• slice_period—The defined slice period, in minutes. This parameter is optional.

  This parameter is valid only when the aggregation_period parameter is set to minutes, hourly, daily or weekly. The minimum value is 10.

  When the aggregation period parameter is set to monthly or none (infinity), the slice_period parameter should not be used or should be set to a default value of -1. Default value means a slice period is equal to the aggregation period (backward compatible).

  Note that the following limitations are applicable while configuring multiple penalty quota profiles:
  • The aggregation period must be the same for all the profiles that are a part of a penalty chain.
  • The none keyword is not applicable.

Configuring the Quota Profile—Examples

This section contains the following examples:

• Example 1: Simple Quota Profile with Weekly Aggregation Period, page 3-5
• Example 2: Simple Quota Profile with Minutes Aggregation Period, page 3-5
• Example 3: Simple Quota Profile with Hourly Aggregation Period, page 3-5
• Example 4: Simple Quota Profile with Daily Aggregation Period, page 3-6
• Example 5: Multiple Penalty Quota Profile with Minutes Aggregation Period, page 3-6

Example 1: Simple Quota Profile with Weekly Aggregation Period

[QuotaProfile.QP1]
packages=1,2
bucket_sizes=1008, 2040, 3000
dosage_sizes=100,200,300
aggregation_period=weekly
day_of_week=monday
time_of_day=00:00
gap=10
slice_period=420

Example 2: Simple Quota Profile with Minutes Aggregation Period

[QuotaProfile.QP2]
packages=3,4
bucket_sizes=1002, 2004, 3000
dosage_sizes=100,200,300
aggregation_period=60 minutes
time_of_day=00:00
gap=10
slice_period=10

Example 3: Simple Quota Profile with Hourly Aggregation Period

[QuotaProfile.QP3]
packages=5
bucket_sizes=1002, 2001, 3000
dosage_sizes=100,200,300
aggregation_period=hourly
time_of_day=00:01
gap=10
slice_period=20
Example 4: Simple Quota Profile with Daily Aggregation Period

[QuotaProfile.QP3]
packages=5
bucket_sizes=1008, 2040, 3000
dosage_sizes=100, 200, 300
aggregation_period=daily
time_of_day=01:00
gap=10
slice_period=60

Example 5: Multiple Penalty Quota Profile with Minutes Aggregation Period

#QP11 is the root profile in the penalty profiles chain

[QuotaProfile.QP11]
packages=11
bucket_sizes=510
dosage_sizes=510
aggregation_period=90 minutes
penalty_period=none
penalty_profile=QP22
slice_period=30

[QuotaProfile.QP22]
packages=22
bucket_sizes=1002
dosage_sizes=1002
aggregation_period=90 minutes
penalty_period=180
penalty_profile=QP33
post_penalty.500=QP11
slice_period=30

[QuotaProfile.QP33]
packages=33
bucket_sizes=1002
dosage_sizes=1002
aggregation_period=90 minutes
penalty_period=270
penalty_profile=none
post_penalty.500=QP11
post_penalty.1000=QP22
slice_period=30

Example 6: Multiple Penalty Quota Profile with Monthly Aggregation Period Without Sliding Window

#QP11 is the root profile in the penalty profiles chain

[QuotaProfile.QP11]
packages=11
bucket_sizes=153600
dosage_sizes=51200
aggregation_period=monthly
penalty_period=none
penalty_profile=QP22

[QuotaProfile.QP22]
packages=22
bucket_sizes=153600
dosage_sizes=51200
aggregation_period=monthly
penalty_period=1440
penalty_profile=QP33
post_penalty.5000=QP11

[QuotaProfile.QP33]
packages=33
bucket_sizes=153600
dosage_sizes=51200
aggregation_period=monthly
penalty_period=1440
penalty_profile=none
post_penalty.5000=QP11
post_penalty.10000=QP22

Configuring the Quota RDR Server Section

You can move the RDR formatter to the Cisco Service Control Subscriber Manager from the EM-Agent, which is in the Cisco SCE. This improves the quota RDR handling rate. The Quota RDR Server section in the Cisco Quota Manager configuration file should be configured for this feature to operate.

If you move the RDR formatter to the Cisco Service Control Subscriber Manager, SM becomes the quota RDR server and every Cisco SCE connected to the quota RDR server becomes a client to the Cisco Service Control Subscriber Manager.

Note

To use this feature, you must configure RDR formatter as Cisco Subscriber Manager on your Cisco SCE with the default port number as 32145. In Cisco Service Control Subscriber Manager cluster topologies, the VIP of Cisco SM cluster should be used instead of Cisco SM IP.

The [Quota RDR Server] section in the Cisco Quota Manager configuration file contains the following parameters:

- **start**—Defines whether or not to start the Quota RDR server. Possible values are yes and no. The default value is no.
- **ip**—Defines the IP address of the Quota RDR server. Use this parameter only in cases where the IP address is not the main IP address of the Subscriber Manager machine; for example in cluster topologies.
- **port**—Specifies the Quota RDR server port. The default value is 32145.
- **max_connections**—Specifies the maximum number of Cisco SCE connections accepted by the server. The maximum value is 200. The default value is 8.
- **socket_recv_buffer**—Specifies the receiver buffer size which is used to scale up the TCP receive window to the configured buffer size. The default value is 64KB.
- **server_socket_backlog**—Specifies the requested maximum number of pending connections on the socket. The default value is 0. For example, if the maximum number of allowed connections is set to 200 and the socket backlog is set to 150, after starting the server, the remaining 50 Cisco SCE connections take more time to become operational due to the additional overhead involved in handling the extra connections. If the server_socket_backlog parameter were configured as 200, all Cisco SCE connections would become operational immediately after restarting the server. We recommend that you use the default value or configure the server_socket_backlog parameter based on the value of the maximum_connections parameter for better performance.
Restrictions for Configuring the Quota RDR Server

- The Cisco Subscriber Manager handles quota RDRs only if the quota RDRs are enabled under Category 4 and not CPA. If you want the Cisco Service Control Subscriber Manager to handle both the CPA and Quota RDR, set the UM-Agent as the quota RDR processor.
- You can specify the RDR formatter destination for Category 4 only as the UM-Agent or Cisco Subscriber Manager.
- We recommend that you configure the max_connections parameter based on the number of Cisco SCEs. For example, you cannot configure the max_connections parameter to one if you have two Cisco SCEs.
- Even if you remove the Cisco SCE from the Cisco Subscriber Manager, the Cisco SCE sends the quota RDRs to the Cisco Subscriber Manager for processing. To avoid this, disable the quota RDR formatter as Cisco Subscriber Manager in the Cisco SCE.

Note: We recommend that you configure the Cisco Service Control Subscriber Manager in pull mode if you move the RDR formatter to the Cisco Service Control Subscriber Manager from the EM-Agent.

Configuring the Cisco Service Control Subscriber Manager

To use the Cisco Service Control Quota Manager within the Cisco Service Control Subscriber Manager, you must configure the Cisco Service Control Subscriber Manager configuration file, p3sm.cfg. This configuration file resides in the sm-inst-dir/sm/server/root/config directory (sm-inst-dir refers to the Cisco Service Control Subscriber Manager installation directory). The configuration file consists of sections headed by a bracketed section title, for example [Quota Manager].
Configuring the Quota Manager Section

The [Quota Manager] section in the Cisco Service Control Subscriber Manager configuration file contains the following parameters:

- **start**—Defines whether to start the Quota Manager or not.
  Possible values are yes and no. The default value is no.
- **reset_quota_on_profile_switch**—Defines whether the Quota Manager should reset quota history across global profiles.
  Possible values are true and false. The default value is true.
- **reset_quota_on_penalty_profile_switch**—Defines whether the quota manager should reset quota history across penalty profiles.
  Possible values are true and false. The default value is false.
- **log_all**—Defines whether the Quota Manager should add all messages to the user log.
  Possible values are true and false. The default value is false.
- **log_failures**—Defines whether the Quota Manager should add messages about failures to the user log.
  Possible values are true and false. The default value is true.
- **log_breach_events**—Setting the log_breach_events parameter to true logs only events of subscriber bucket breach and new aggregation period starts.
  Possible values are true or false. The default value is false.
- **handle_out_of_penalty_on_aggregation_period_end**—Determines whether to allow a subscriber to come out of penalty at the end of an aggregation period. The default value is false.
- **multiple_sce_support**—Determines whether to enable multiple Cisco SCE support.
  Possible values are true or false. The default value is false.
- **quota_allocation_based_on**—Determines which flavor to choose for multiple Cisco SCE support.
  The possible values are consumption and provisioned. The default value is consumption.
- **handle_multi_bucket_in_grace_period**—(Applicable only to multibucket quota profile configurations). Enables accounting of quota notifications that the Quota Manager has received around the last quota provisioning time.

Configuring the Quota Manager—Example

The following is an example of a Cisco Service Control Quota Manager configuration:

```plaintext
start=yes
reset_quota_on_profile_switch=true
reset_quota_on_penalty_profile_switch=false
log_failures=true
log_all=false
log_breach_events=false
multiple_sce_support=true
quota_allocation_based_on=consumption
handle_multi_bucket_in_grace_period=false
```
Quota Manager Performance Recommendations

You are recommended to configure Quota RDR server in Cisco Service Control Subscriber Manager to achieve the high TPS. In this approach, quota RDRs are sent directly to the Cisco Service Control Subscriber Manager and converted to quota message and handled in Cisco Service Control Subscriber Manager.

To achieve the required TPS per SCE, you need to configure the following options in QuotaRDRServer section of p3qm.cfg.

```
max_processing_thread=2
socket_recv_buffer=1MB
rdr_queue_size=200k
```

Configuring the Cisco SCA BB Application

For the Cisco SCA BB application to be able to use the Cisco Service Control Quota Manager, the Quota Management parameters in the Service Configuration File (PQB) must be configured correctly. Specifically, the following are required:

- **Package configurations**
  - Set the quota management to external.
  - When configuring buckets, set the appropriate bucket type. Available types are Volume (Layer 3 kilobytes) or Number of Sessions.
  - In the usage limit definitions for the appropriate service rules, select the appropriate buckets. Service traffic consumes quota from the selected buckets.
  - Use the breach handling action of the rule to configure the level of service to assign to this traffic while the bucket is depleted.

- **Raw Data Records**
  - Set which quota RDRs should be generated and the rate for the remaining quota RDRs.

This section contains information about:

- **Setting the Quota RDRs**, page 3-23
- **Enabling the RDR Formatter to Issue Quota-Related Indications**, page 3-24
- **Configuring Cisco SCE for Quota Management Provisioning**, page 3-24

To enable the application to issue quota-related indications, the QM indications should be enabled in the Cisco Service Control Application for Broadband GUI. See the *Cisco Service Control Application for Broadband User Guide* for configuration description.

For information on why and when to set the quota management mode and quota buckets, see the *Cisco Service Control Application for Broadband User Guide*.

To configure the Cisco Service Control Quota Manager using the Cisco SCA BB, complete the following steps:

**Step 1**  Add a quota profile. See the “Adding a Quota Profile” section on page 3-11.
Adding a Quota Profile

Step 1  From the Policies tab in the left pane, choose Configuration > Policies > Quota Settings to open the Quota Profile Editor.

Step 2  Click the SCE Subscriber API radio button. The Subscriber API enables the external applications (policy servers) to connect directly to the Cisco SCE for subscriber provisioning. For more information, see Cisco Service Control SCE Subscriber API Programmer Guide.

Step 3  Click the Quota Profile Edit tab. (By default, the Quota Profile Edit tab is selected).
Chapter 3 Configuring the Quota Manager

Configuring the Bucket Settings for the Quota Profile

Step 4 Click Add.

Step 5 In the Add Quota Profile dialog box, from the Type drop-down list choose Subscriber Sce Api.

Step 6 In the name field, enter a unique name for the profile, for example, My Quota Profile.

Step 7 Click Finish.

Configuring the Bucket Settings for the Quota Profile

Step 1 From the Policies tab in the left pane, choose Configuration > Policies > Quota Settings to open the Quota Profile Editor.

Step 2 Click the Quota Profile Edit tab.

Step 3 Select the quota profile for which you want to configure the bucket settings.
Chapter 3 Configuring the Quota Manager

Adding Services to a Bucket

Step 4 Click the bucket line of the bucket that you want to edit.
Step 5 In the Quota Bucket Editor, click the Bucket tab.
Step 6 Select the type of bucket from the Type drop-down list.
Step 7 Click Finish.

Adding Services to a Bucket

A service may be any of the following types:

- Upload
- Download
- Sessions

Step 1 From the Policies tab in the left pane, choose Configuration > Policies > Quota Settings to open the Quota Profile Editor.
Step 2 Click the Quota Profile Edit tab.
Step 3 Select the Quota Profile you want to edit.
Step 4 Click the bucket line of the bucket that you want to edit.
Step 5 In the Quota Bucket Editor window, click the Service tab.

Step 6 Move the required services from Non attached services pane to the Attached services pane by selecting the services and clicking >>. You may choose any of the services from any of the tabs (Download, Upload, Sessions) in the Non attached services.

Step 7 Click Finish.

The bucket description for the selected quota profile is updated with the details.
Chapter 3 Configuring the Quota Manager

Adding a Package and Adding Quota Profiles to the Package

Step 1  In the Service Configuration Editor, Click the Policies tab.
Step 2  Select the Subscriber Policies.
Step 3  Click the Add Package icon or right-click the policy and select Add Package.
Step 4  (Optional) Click the General Tab.
Step 5  (Optional) Modify the package name, and enter a description for the package.

Step 8  Click Finish.
Step 6  Click the Quota Management tab.

Step 7  From the Select Quota Profile drop-down list, select the quota profile to add the package.
Step 8  Click OK.
Adding Rules to a Package and Setting General Rules

Step 1  In the Service Configuration Editor window, click the Policies tab.

Step 2  Select the package from the list of Subscriber Policies.

Step 3  Click the Add Rules icon or right-click the Default Rule and select Add Rule.

Step 4  Click the General tab.

Step 5  From the Service drop-down list, select the service for which you need to set the rule.
**Step 6**  
In the Rule State area, define the state of the rule

**Step 7**  
Click **OK**.
Configuring Control Rules

Step 1 In the Service Configuration Editor window, click the Policies tab.
Step 2 Select the package from the list of Subscriber Policies.
Step 3 Click the Add Rules icon or right-click the Default Rule and select Add Rule.
Step 4 Click the Control tab.

Step 5 Click any of the following controls:
- Block the flow—This blocks the flow when a subscriber initiates a download, upload, or a session for the linked bucket.
- Control the flow’s characteristics.

Step 6 (Optional) Select a redirect profile for the service.
Step 7 (Optional) Select the server group to which the traffic should be mirrored. Traffic mirroring is not available if you block the flow.
Step 8 Click OK.
Configuring Breach Handling Rules

Step 1 In the Service Configuration Editor window, click the Policies tab.
Step 2 Select the package from the list of Subscriber Policies.
Step 3 Click the Add Rules icon or right-click the Default Rule and select Add Rule.
Step 4 Click the Breach Handling tab.
Step 5 Set the rules to be applied when a subscriber's usage exceeds the quota.

Step 6 Click OK.
Viewing the Usage Limit

Step 1  In the Service Configuration Editor window, click the Policies tab.
Step 2  Select the package from the list of Subscriber Policies.
Step 3  Click the Add Rules icon or right-click the Default Rule and select Add Rule.
Step 4  Click the Usage Limits tab.

Click OK.
Setting the Quota RDRs

This section describes how to set the quota RDRs. For information on why and when to set the quota RDRs, see the Cisco Service Control Application for Broadband User Guide.

**Step 1**  
In the Service Configuration Editor, click the Classification tab.

**Step 2**  
Choose Configuration > Classification > RDR Settings.

**Step 3**  
Click the Quota RDRs tab.

**Step 4**  
Select the quota RDRs to be generated.

- **a.** If you want to generate an RDR when the quota is breached, set the Quota Breach RDRs. We recommend that you set this.

- **b.** If you want to keep the Quota Manager updated with the remaining quota, set the Remaining Quota RDRs.

  It is possible to set the frequency with which these RDRs are generated and the quantity generated per second.
Enabling the RDR Formatter to Issue Quota-Related Indications

To enable the RDR formatter to issue quota-related indications, configure the RDR formatter destination.

```
RDR-formatter destination 127.0.0.1 port 33001 category number 4 priority 100
```

By default, Quota RDRs tags are mapped to category 4. If another category is required, use the following CLI command:

```
RDR-formatter rdr-mapping add tag-ID tag number category-number number
```

**Note** For Quota RDR tag IDs, see the *Cisco Service Control Application for Broadband User Guide*.

Configuring Cisco SCE for Quota Management Provisioning

To configure Cisco SCE to provision quota management, follow these steps:

**Step 1** Service the RDR formatter:

```
SCE10000(config)#> service RDR-formatter
```

**Step 2** Enable, through a PQB file or CLU, the Quota RDRs in the service configuration file to get quota indications:

```
SCE10000(config if)#> tunable GT_REP_QP_RemainQuota_Enable value true
SCE10000(config if)#> tunable GT_REP_QP_QuotaBreach_Enable value true
SCE10000(config if)#> tunable GT_REP_QP_ThresholdBreach_Enable value true
SCE10000(config if)#> tunable GT_REP_QP_RemainQuota_MaxFrequency value 1000
SCE10000(config if)#> tunable GT_REP_QP_RemainQuota_Rate value 60
```

**Step 3** Set the quota management mode to External in Cisco SCA BB console.

While switching a package, Cisco SCE does not generate a Session Creation RDR (SCR) by default. To generate an SCR while switching a package, set the value of the `GT_QSR_forAnyExternalPackageSwitch` tunable to TRUE. For example:

```
SCE10000(config if)#> tunable GT_QSR_forAnyExternalPackageSwitch value true
```
Provisioning Multiple Quota Buckets with Penalty Profile

Ensure the following to successfully configure the Cisco SCE for multiple quota buckets with penalty profile:

- The number of buckets and the number of penalty_profile in a quota profile must be same.
- The profiles in the penalty profile list must be separated using comma.
- The post_penalty parameter should be defined as done in any of the following examples:
  - post_penalty.[10|20]=QP11
  - post_penalty.[90]=QP11
  - post_penalty.1000=QP11
  - post_penalty.1000|2000=QP11

- If you are configuring a threshold based on the percentage of threshold usage, define the postpenalty threshold values within square brackets ([ ]). If your configuration is based on numerical values, you need not use square brackets.
- If more than one postpenalty threshold is defined, the threshold values must be separated by a pipe symbol (|) to denote an OR operation.
- You must configure at least one threshold value in a postpenalty parameter.
- You can configure more than one value for postpenalty threshold. However, the number of postpenalty threshold values in a postpenalty parameter must be equal to the number of buckets.
- Do not use the profiles in multiple penalty chains, if the number of buckets in these penalty chains varies.
- All profiles associated with a penalty profile should be added sequentially in the Cisco Service Control Quota Manager configuration file—first the START profile, then all MIDDLE profiles, and then the LAST profile.

Provisioning Multiple Quota Buckets with Penalty Profile—Example

In this example, Bucket 1 is Downstream, and Bucket 2 is Upstream. Quota Profile QP11 is the base profile, QP22 is the downstream subscriber penalty profile, and QP33 is an upstream subscriber penalty profile.

QP22 and QP33 are the penalty profiles for Bucket 1 and Bucket 2 respectively for QP11. If the buckets breaches the quota, the subscriber is switched to the respective penalty profiles. Assume that Bucket 1 is breached and the subscriber is moved to quota profile QP22. The subscriber is moved to QP11 if the quota consumed is less than 10% of Bucket 1 or less than 20% of the Bucket 2. The subscriber is moved to QP22 if the quota consumed is less than 90% of Bucket 1 or less than 90% of the Bucket 2.

```
[QuotaProfile.QP11]
packages=1
bucket_sizes=10086,20016
dosage_sizes=1000,2000
aggregation_period=60 minutes
penalty_period=none
penalty_profile=QP22,QP33
slice_period=10

[QuotaProfile.QP22]
```
packages=2
bucket_sizes=5084,20016
dosage_sizes=1000,2000
aggregation_period=40 minutes
penalty_period=30
penalty_profile=QP44,QP55
post_penalty.[10|20]=QP11
post_penalty.[90]=QP22
slice_period=10

[QuotaProfile.QP33]
packages=3
bucket_sizes=10083,10014
dosage_sizes=1000,2000
aggregation_period=30 minutes
penalty_period=30
penalty_profile=QP66,QP77
post_penalty.[10|20]=QP11
post_penalty.[90]=QP33
slice_period=10

[QuotaProfile.QP44]
packages=4
bucket_sizes=5082,20016
dosage_sizes=1000,2000
aggregation_period=30 minutes
penalty_period=30
penalty_profile=QP44,QP55
post_penalty.[10|20]=QP11
post_penalty.[90]=QP22
slice_period=10

[QuotaProfile.QP55]
packages=5
bucket_sizes=10086,10014
dosage_sizes=1000,2000
aggregation_period=30 minutes
penalty_period=30
penalty_profile=QP66,QP77
post_penalty.[10|20]=QP11
post_penalty.[90]=QP33
slice_period=10

[QuotaProfile.QP66]
packages=6
bucket_sizes=5082,20016
dosage_sizes=1000,2000
aggregation_period=60 minutes
penalty_period=20
penalty_profile=QP44,QP55
post_penalty.[10|40]=QP11
post_penalty.[90]=QP22
slice_period=10

[QuotaProfile.QP77]
packages=7
bucket_sizes=5082,20016
dosage_sizes=1000,2000
aggregation_period=60 minutes
penalty_period=60
penalty_profile=none
post_penalty.[10|40]=QP11
post_penalty.[90]=QP22
slice_period=10
Saving the Cisco Service Control Quota Manager and VLM Logs Separately

On Cisco SCE releases prior to 4.1.0, the Cisco Service Control Subscriber Manager saves the Cisco Service Control Quota Manager, VLM, and LEGs log messages in the umlog file. Effective with Cisco SCE Release 4.1.0, you can configure the Cisco Service Control Subscriber Manager to save the logs separately.

These log messages are saved in cablelog and qmlog files. You can enable this feature by configuring the log4j.ini file which is located at pcubehome/sm/server/root/. The default file size is 6 MB.

**Sample Configuration**

The following is sample configuration of the log4j.ini file.

```ini
# CableFileAppender - used to log messages in the cablelog file.
log4j.appender.CableFileAppender=org.apache.log4j.RollingFileAppender
log4j.appender.CableFileAppender.layout=org.apache.log4j.PatternLayout
log4j.appender.CableFileAppender.layout.ConversionPattern=
  %d{'dd-MMM yyyy', 'HH:mm:ss.SSS zzz'},'[%t]',%-5p,'%c','%m'
log4j.appender.CableFileAppender.File=${com.pcube.filemanager.defaultPath}cablelog
log4j.appender.CableFileAppender.ImmediateFlush=true
log4j.appender.CableFileAppender.MaxFileSize=6000000
log4j.appender.CableFileAppender.MaxBackupIndex=5

# QMFileAppender - used to log messages in the qmlog file.
log4j.appender.QMFileAppender=org.apache.log4j.RollingFileAppender
log4j.appender.QMFileAppender.layout=org.apache.log4j.PatternLayout
log4j.appender.QMFileAppender.layout.ConversionPattern=
  %d{'dd-MMM yyyy', 'HH:mm:ss.SSS zzz'},'[%t]',%-5p,'%c','%m'
log4j.appender.QMFileAppender.File=${com.pcube.filemanager.defaultPath}qmlog
log4j.appender.QMFileAppender.ImmediateFlush=true
log4j.appender.QMFileAppender.MaxFileSize=6000000
log4j.appender.QMFileAppender.MaxBackupIndex=5

# Below package info, warning and debug messages are excluded from umlog
log4j.additivity.com.scms.vlink=false
log4j.additivity.com.scms.qm=false

# Below package info, warning and debug messages are included from cablelog
log4j.logger.com.scms.vlink=DEBUG, CableFileAppender, Chainsaw
log4j.logger.com.scms.vlink=INFO, CableFileAppender
log4j.logger.com.scms.vlink=INFO, CableFileAppender, stdout
# Below package info, warning and debug messages are included from qmlog
log4j.logger.com.scms.qm=DEBUG, QMFileAppender, Chainsaw
log4j.logger.com.scms.qm=INFO, QMFileAppender
log4j.logger.com.scms.qm=INFO, QMFileAppender, stdout
```

Cisco Service Control Quota Manager User Guide
Using the Quota Manager Command-Line Utility

Published: September 23, 2015

Introduction

This chapter describes the Quota Manager (QM) command-line utility (CLU) and Quota RDR CLU.

- Quota Manager CLU Description
- Quota RDR CLU Description

Quota Manager CLU Description

The QM CLU (p3qm) displays the Cisco Service Control Quota Manager configuration, status, and statistics. The command format is `p3qm <operation>`. Table 4-1 lists the p3qm operations.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--show-config [--package packageId]</td>
<td>Displays all the Cisco Service Control Quota Manager profiles. To display only a certain profile, use the --package option.</td>
</tr>
<tr>
<td>--show-quota -s subscriber name [--detail]</td>
<td>Displays the quota status of a specific subscriber. To specify a subscriber name, use the -s option. To display each slice period detail for the subscriber consumption, add the --detail tag. For configuration with multiple Cisco SCEs enabled, displays the Cisco SCE details that reported the quota.</td>
</tr>
<tr>
<td>--show-statistics [-n/--ne-name=NAME]</td>
<td>Displays counters of Cisco Service Control Quota Manager messages handled. To display the statistics of a specific Cisco SCE, use the -n option.</td>
</tr>
</tbody>
</table>
### Table 4-1  p3qm Operations (continued)

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--show-connections [-n/-ne-name=NAME]</td>
<td>Displays all the Cisco SCE connections to the Cisco Service Control Quota Manager along with their connection status. Use the -n option to display the connection status of a specific Cisco SCE.</td>
</tr>
<tr>
<td>--show-subs-in-breach [-q/-quota-profile=QUOTA-PROFILE-NAME]</td>
<td>Displays all the subscribers that are currently breached. If the --quota-profile option is used, this command displays the subscribers that are in breach and belong to a certain quota profile.</td>
</tr>
<tr>
<td>--show-subs-in-penalty [-q/-quota-profile=QUOTA-PROFILE-NAME]</td>
<td>Displays all the subscribers that are currently in penalty. If the --quota-profile option is used, this command displays the subscribers that are in penalty and belong to a certain quota profile.</td>
</tr>
<tr>
<td>--set-quota -s subscriber name -b/-bucket bucket ID=bucket value</td>
<td>Sets the quota for a specific bucket of a subscriber. After the quota is set, the Cisco Service Control Quota Manager initiates a remaining quota RDR from the Cisco SCE. Therefore, if the subscriber was breached, the new quota is available immediately.</td>
</tr>
<tr>
<td>--add-quota -s subscriber name -b/-bucket bucket ID=bucket value</td>
<td>Adds quota to a specific bucket of a subscriber. After the quota is added, the Cisco Service Control Quota Manager initiates a remaining quota RDR from the Cisco SCE. Therefore, if the subscriber was breached, the new quota is available immediately.</td>
</tr>
<tr>
<td>--replenish-quota -s subscriber name</td>
<td>Replenishes the quota buckets for a specific subscriber without starting a new aggregation period. To specify the subscriber name, use the -s option. Use this CLU in cases when it is required to bypass the Quota Manager internal replenishment logic.</td>
</tr>
<tr>
<td>--get-quota -s subscriber name [--detail]</td>
<td>Triggers a remaining quota indication to be sent from the Cisco SCE for a specific subscriber. To specify the subscriber name, use the -s option. To display each slice period detail for the subscriber consumption, add the --detail tag. After using this CLU, the output is the same as the show-quota CLU. However, after using this get-quota CLU, the quota manager is up-to-date with the Cisco SCE and so the displayed information is the latest available. Use this CLU if the quota dosage is large and the rate of the remaining quota indications is low.</td>
</tr>
</tbody>
</table>
### Viewing the Quota Manager Configuration

The following example shows the `p3qm` CLU using the `show-config` command:

```plaintext
> p3qm --show-config

Quota-profile1:
Bucket Sizes = 1000,1000
Dosage Sizes = 10,10
Aggregation Period = Daily
Day of Week = Sunday
Time of Day = 00:00
Aggregation Period Gap = 0
Modification Timestamp = Thu Aug 17 14:50:300 IDT 2006
Command terminated successfully
```

The following example shows the `p3qm` CLU using the `show-config` command output when multiple quota buckets with penalty profile is configured:

```plaintext
> p3qm --show-config

QP11:
Packages = 1
Bucket Sizes = 10086,20016
Dosage Sizes = 1000,2000
Number of slice = 6
Slice period = 10
Penalty Profile = QP22,QP33
Penalty Period = NONE
Post-Penalty Profile(s):
Aggregation Period = 60 Minutes
Time of Day = 00:00
Aggregation Period Gap = 0%
Modification Timestamp = Mon Mar 12 18:59:42 IST 2012
```
QP22:
Packages = 2
Bucket Sizes = 5084,20016
Dosage Sizes = 1000,2000
Number of slice = 4
Slice period = 10
Penalty Profile = QP44,QP55
Penalty Period = 30 minutes
Post-Penalty Profile(s):
  Bucket 1, quota consumption < 508 = QP11
  Bucket 2, quota consumption < 4003 = QP11
  Bucket 1, quota consumption < 4575 = QP22
  Bucket 2, quota consumption < 18014 = QP22
Aggregation Period = 40 Minutes
Time of Day = 00:00
Aggregation Period Gap = 0%
Modification Timestamp = Mon Mar 12 18:59:42 IST 2012

QP13:
Packages = 3
Bucket Sizes = 10083,10014
Dosage Sizes = 1000,2000
Number of slice = 3
Slice period = 10
Penalty Profile = QP66,QP77
Penalty Period = 30 minutes
Post-Penalty Profile(s):
  Bucket 1, quota consumption < 1008 = QP11
  Bucket 2, quota consumption < 2002 = QP11
  Bucket 1, quota consumption < 9074 = QP33
  Bucket 2, quota consumption < 9012 = QP33
Aggregation Period = 30 Minutes
Time of Day = 00:00
Aggregation Period Gap = 0%
Modification Timestamp = Mon Mar 12 18:59:42 IST 2012

QP44:
Packages = 4
Bucket Sizes = 5082,20016
Dosage Sizes = 1000,2000
Number of slice = 3
Slice period = 10
Penalty Profile = QP44,QP55
Penalty Period = 30 minutes
Post-Penalty Profile(s):
  Bucket 1, quota consumption < 508 = QP11
  Bucket 2, quota consumption < 4003 = QP11
  Bucket 1, quota consumption < 4573 = QP22
  Bucket 2, quota consumption < 18014 = QP22
Aggregation Period = 30 Minutes
Time of Day = 00:00
Aggregation Period Gap = 0%
Modification Timestamp = Mon Mar 12 18:59:42 IST 2012

QP55:
Packages = 5
Bucket Sizes = 10086,10014
Dosage Sizes = 1000,2000
Number of slice = 3
Slice period = 10
Penalty Profile = QP66,QP77
Penalty Period = 30 minutes
Post-Penalty Profile(s):
Bucket 1, quota consumption < 1008 = QP11
Bucket 2, quota consumption < 2002 = QP11
Bucket 1, quota consumption < 9077 = QP33
Bucket 2, quota consumption < 9012 = QP33
Aggregation Period = 30 Minutes
Time of Day = 00:00
Aggregation Period Gap = 0%
Modification Timestamp = Mon Mar 12 18:59:42 IST 2012

QP66:
Packages = 6
Bucket Sizes = 5082,20016
Dosage Sizes = 1000,2000
Number of slice = 6
Slice period = 10
Penalty Profile = QP44,QP55
Penalty Period = 20 minutes
Post-Penalty Profile(s):
Bucket 1, quota consumption < 508 = QP11
Bucket 2, quota consumption < 8006 = QP11
Bucket 1, quota consumption < 4573 = QP22
Bucket 2, quota consumption < 18014 = QP22
Aggregation Period = 60 Minutes
Time of Day = 00:00
Aggregation Period Gap = 0%
Modification Timestamp = Mon Mar 12 18:59:42 IST 2012

QP77:
Packages = 7
Bucket Sizes = 5082,20016
Dosage Sizes = 1000,2000
Number of slice = 6
Slice period = 10
Penalty Profile = none
Penalty Period = 60 minutes
Post-Penalty Profile(s):
Bucket 1, quota consumption < 508 = QP11
Bucket 2, quota consumption < 8006 = QP11
Bucket 1, quota consumption < 4573 = QP22
Bucket 2, quota consumption < 18014 = QP22
Aggregation Period = 60 Minutes Time of Day = 00:00
Aggregation Period Gap = 0%
Modification Timestamp = Mon Mar 12 18:59:42 IST 2012

Command terminated successfully

### Viewing the Current Quota Status

The following example shows the `p3qm` CLU using the `show-quota` command:

> `p3qm --show-quota -s subscriber name`

Package ID = 1
Last SCE that consumed quota = 10.56.217.84
Aggregation Period:
Last Replenish Time = Tue May 05 13:22:01 IDT 2009
Aggregation Period End = Tue May 05 13:23:00 IDT 2009

Quota Buckets:
Bucket 1 - Quota size = 500, Remaining Quota = 500, Last quota reported by SCE = 50
Bucket 2 - Quota size = 500, Remaining Quota = 500, Last quota reported by SCE = 50

Penalty start = TIME_NOT_SET
Next penalty monitor = TIME_NOT_SET
Command terminated successfully

The following example shows the p3qm CLU using the show-quota command with multiple SCEs enabled:

> p3qm --show-quota -s sub1 --detail

Package ID = 11
Last SCE that consumed quota = 10.78.242.197

Aggregation Period:
Last Replenish Time = Thu Aug 19 13:21:19 IST 2010
Aggregation Period End = Thu Aug 19 13:24:00 IST 2010

Quota Buckets:
Bucket 1 - Quota size = 1000, Remaining Quota = -50, Last quota reported by SCE = -50

Slices info:
Slice 1: Start = Thu Aug 19 13:21:00 IST 2010, Consumed Quota = -50
SCE that reported Quota = 10.78.241.198, Remaining SCE quota = 300
SCE that reported Quota = 10.78.242.197, Remaining SCE quota = -50

Subscriber is breached on SCE: 10.78.242.197
Subscriber is breached on the following SCE’s:
10.78.242.197   Thu Aug 19 15:33:00 IST 2010
Command terminated successfully

Viewing the Quota Manager Statistics

The following example shows the p3qm CLU using the show-statistics command (the number in parenthesis is the rate):

> p3qm --show-statistics

Quota Manager Statistics:
=========================
SCE2000 (10.56.209.197): connected
Quota State Restore Notifications: 34 (0.4)
Quota Status Notifications: 0 (0)
Quota Below Threshold Notifications: 10 (0)
Quota Depleted Notifications: 0 (0)
Quota Update Sent: 128 (45.4)
Quota Update Success Acknowledge: 128 (45.4)
Quota Update Failure Acknowledge: 0 (0)
Command terminated successfully

>
Viewing the SCE Connections

The following example shows the p3qm CLU using the `show-connections` command:

```
> p3qm --show-connections
sce1 (10.56.217.81): connected
sce2 (10.56.217.82): not connected
Command terminated successfully
>
```

Viewing the Breached Subscribers

The following example shows the p3qm CLU using the `show-breached-subs` command:

```
> p3qm --show-subs-in-breach [-q/--quota-profile=QUOTA-PROFILE-NAME]
Subscriber1
Subscriber2
Subscriber3
Subscriber4
Subscriber5
System found 5 subscribers
Command terminated successfully
>
```

Viewing the Subscribers in Penalty

The following example shows the p3qm CLU using the `show-subs-in-penalty` command:

```
> p3qm --show-subs-in-penalty [-q/--quota-profile=QUOTA-PROFILE-NAME]
Subscriber1
Subscriber2
Subscriber3
Subscriber4
Subscriber5
System found 5 subscribers
Command terminated successfully
>
```

Setting Subscriber Quota

The following example shows the p3qm CLU using the `set-quota` command:

```
> p3qm --set-quota -s sub1 -b 1=1000,2=2000
Command terminated successfully
>
This command sets the sub1 quota bucket 1 to 1000 and quota bucket 2 to 2000.
```

Adding to Subscriber Quota

The following example shows the p3qm CLU using the `add-quota` command:
> p3qm --add-quota -s sub1 -b 1=1000,2=2000

Command terminated successfully
>
This command adds 1000 to the sub1 quota bucket 1 and 2000 to the sub1 quota bucket 2.

**Replenishing Subscriber Quota**

The following example shows the p3qm CLU using the **replenish-quota** command:

> p3qm --replenish-quota -s subscriber name

Quota was replenished:
Bucket 1: 1000
Bucket 2: 500
Command terminated successfully
>

**Getting Subscriber Quota**

The following example shows the p3qm CLU using the **get-quota** command:

> p3qm --get-quota -s subscriber name

Quota status was sent from SCE:
Package ID = 1
Last SCE that consumed quota = 10.56.217.81
Aggregation Period:
Last Replenish Time = Thu Aug 17 15:41:23 IDT 2006
Aggregation Period End = Fri Aug 18 00:00:00 IDT 2006
Quota Buckets:
Bucket 1 - Remaining Quota 495 (Last quota reported by SCE is 5)
Bucket 2 - Remaining Quota 1000 (Last quota reported by SCE is 10)
Command terminated successfully
>

The **get-quota** command is different from the **show-quota** command in that it requests the SCE to send a remaining quota indication, waits for the response, and displays the quota. The **show-quota** command displays the quota without getting the latest update from the SCE. Therefore, the **get-quota** command gives more accurate results.

**Enabling Logging on a Subscriber**

The following example shows the p3qm CLU using the **enable-logging** command:

> p3qm --enable-logging -s subscriber name

Command terminated successfully
>

**Disabling Logging on a Subscriber**

The following example shows the p3qm CLU using the **disable-logging** command:
> p3qm --disable-logging -s subscriber name

Command terminated successfully
>

## Resetting Statistics

The following example shows the p3qm CLU using the `reset-statistics` command:

> p3qm --reset-statistics [-n|--ne-name=NAME]

Command terminated successfully
>

## Obtaining Help

The following example shows the p3qm CLU using the `help` command:

> p3qm --help

Usage: p3qm <OPERATION> [OPTION]

QM operations:

- **--show-config** Displays the Quota Manager server configuration parameters. Can be used with --package to display a specific profile.
- **--show-quota** Displays the remaining quota of a subscriber.
- **--show-connections** Displays the current devices connected to the server.
- **--show-statistics** Displays statistics counters related to the Quota Manager. Can be used with -n to display statistics of a specific SCE.
- **--reset-statistics** Resets statistics counters related to the Quota Manager. Can be used with -n to reset statistics of a specific SCE.
- **--replenish-quota** Replenish all quota buckets for a subscriber without starting a new aggregation period.
- **--set-quota** Sets quota buckets of a subscriber to new values without starting a new aggregation period.
- **--add-quota** Adds quota to specific quota buckets of a subscriber without starting a new aggregation period.
- **--get-quota** Requests a quota-status indication to be sent from the SCE.
- **--enable-logging** Enable logging of all quota indications and provisions for a specific subscriber.
- **--disable-logging** Disable logging of all quota indications and provisions for a specific subscriber.
- **--show-subs-in-breach** Displays all subscribers that are currently breached. If --quota-profile option is used this operation displays the subscribers that are in breach and belong to a certain Quota Profile.
- **--show-subs-in-penalty** Displays all the subscribers that are currently in penalty. If --quota-profile option is used, this operation displays the subscribers that are in penalty and belong to a certain Quota Profile.

QM options:
Quota RDR CLU Description

The Quota RDR CLU (p3qrdr) displays quota RDR server configuration, status, connections, and statistics. Use the p3qrdr command as p3qrdr operation.

Table 4-2 Quota RDR CLU Operations

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--show</td>
<td>Displays the Quota RDR server configuration and other general information.</td>
</tr>
<tr>
<td>--show-config</td>
<td>Displays the configuration parameters of the Quota RDR server.</td>
</tr>
<tr>
<td>--show-stats [-n</td>
<td>--ne-name=NAME]</td>
</tr>
<tr>
<td>--show-connections</td>
<td>Displays a list of active connections to the Quota RDR server.</td>
</tr>
<tr>
<td>--reset-stats [-n</td>
<td>--ne-name=NAME]</td>
</tr>
<tr>
<td>--help</td>
<td>Displays a list of available operations and arguments, with a short explanation of their meanings.</td>
</tr>
</tbody>
</table>

Examples

The following command displays the status of the Quota RDR server and the current configuration:

```
p3qrdr --show
Quota RDR Server:
=================
Active:  true
```
Port: 32145
Connections:
   Max-limit: 8 connections
   Current: 2 connections

Command terminated successfully

The following command displays the Quota RDR server configuration:

```
p3qrdr -show-config
```

Quota RDR Server Configuration:
==============================
start =false
port =32145
socket_recv_buffer =65536
server_socket_backlog =0
server_socket_timeout =0
client_socket_timeout =0
max_processing_thread =1
max_connections =8
rdr_queue_size =100000
queue_threshold =90
max_attempts =6

The following command displays the counters of Quota RDRs and rates:

```
p3qrdr --show-stats
```

Quota RDR Client Statistics:
===========================
Connection from 10.78.241.211 statistics: (rate) (peak rate)
   Received RDRs: 1 (0.1) (0.1)
   Dropped RDRs: 0 (0) (0)
   Bad RDRs: 0 (0) (0)
   Invalid RDRs out of received: 0 (0) (0)
   Failed RDRs out of received: 0 (0) (0)

Quota RDR Server Statistics:
===========================
   Received RDRs: 1
   Dropped RDRs: 0
   Bad RDRs: 0
   Invalid RDRs out of received: 0
   Failed RDRs out of received: 0

Command terminated successfully

The following command resets the counters of the processed quota RDR messages and rates:

```
p3qrdr --reset-stats
```

Command terminated successfully

The following command displays a list of active connections to the Quota RDR server:

```
p3qrdr -show-connections
```

The following clients are connected:
10.78.241.211 - 1 connection
10.78.246.97 - 1 connection

Command terminated successfully