



CHAPTER 7

Configuring Enhanced Service-Aware Billing

This chapter describes how to implement the Cisco Gateway GPRS Support Node (GGSN) as a service-aware GGSN that is capable of real-time credit-control for prepaid users, as well as service-aware billing for postpaid and prepaid users.



Note

for IPv4 PDP contexts only.

For a complete description of the GGSN commands in this chapter, refer to the *Cisco GGSN Command Reference*

This chapter includes the following sections:

- [Service-Aware GGSN Overview, page 7-1](#)
[Configuring a Service-Aware GGSN, page 7-5](#)
[Configuration Example, page 7-28](#)

Service-Aware GGSN Overview

/Diameter Credit Control Application (DCCA) to support real-time credit-control for prepaid users and service-aware billing for postpaid and prepaid users.



Note

As an alternate online billing solution that does not include DCCA, the GGSN can be configured to support Online Charging Server (OCS) address selection. OCS address selection enables online credit control for prepaid users to be provided by an external OCS to which the Cisco CSG2 has a direct GTP' interface. When this support is configured, the GGSN functions as a quota server for postpaid subscribers only and does not generate enhanced G-CDRs (eG-CDRs) for prepaid users.

For more information about the OCS address selection support on the GGSN, see the [“Configuring OCS Address Selection Support” section on page 7-27](#).

The GGSN and Cisco CSG together, function as a service-aware GGSN.

The Cisco CSG categorizes traffic, reports usage, and management quota. The GGSN provides a Diameter interface to the DCCA server via which the Cisco CSG can request quota and report usage. The GGSN also maintains all PDP contexts and determines if they are prepaid or postpaid.

inspects the service categories and reports usage back to the GGSN. If the user is to be treated as a postpaid user (offline charging), the GGSN records usage information that is reported by the Cisco CSG in eG-CDRs. If the user is to be treated as a prepaid user (online charging), the GGSN records the reported usage information in eG-CDRs, and translates and sends the information to a DCCA server.

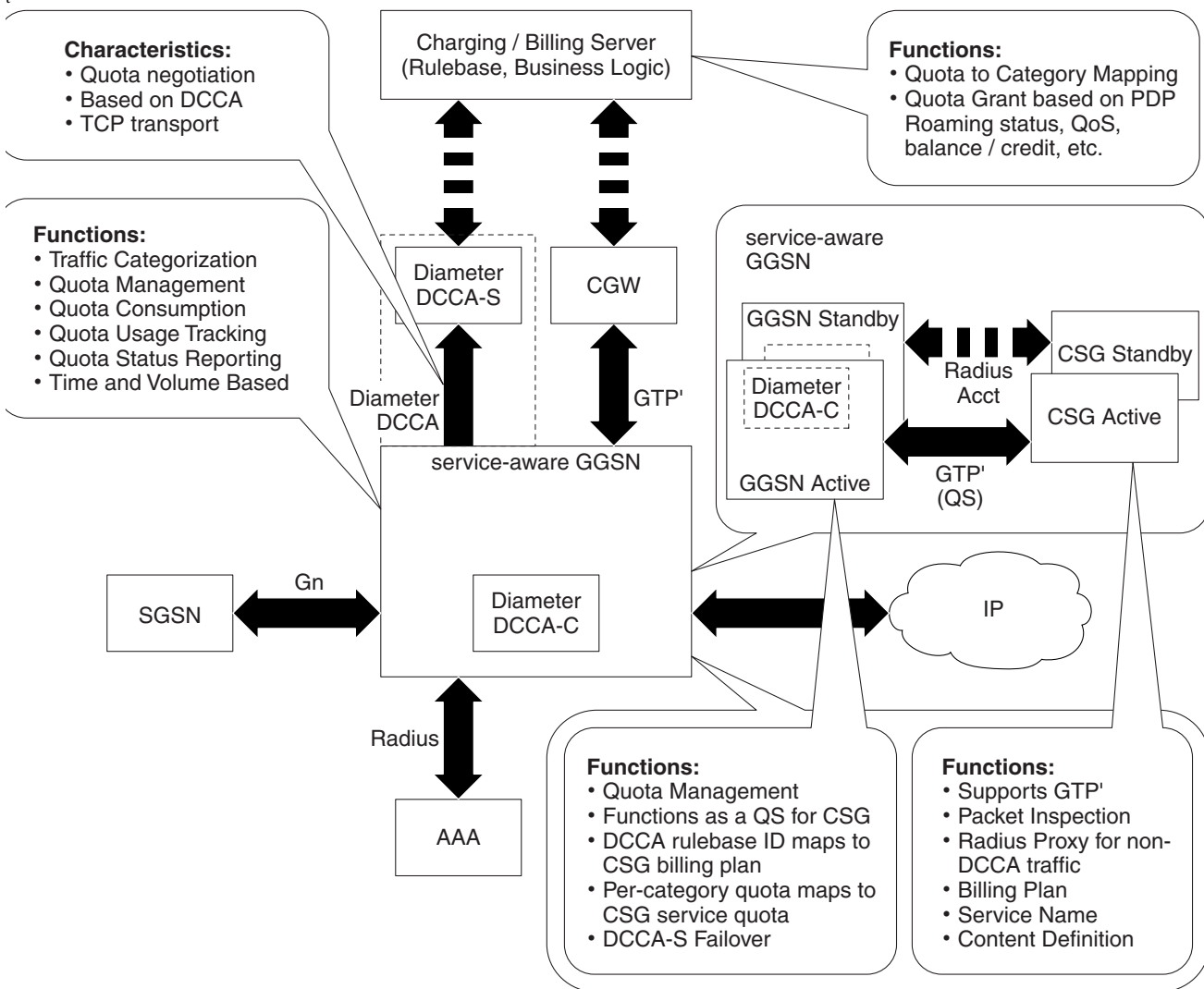
The GGSN also handles Gn-side triggers for quota reauthorization and server-initiated reauthorization or termination requests. The Cisco CSG sends the authorization requests, quota reports, and service stops to the GGSN, which in turn translates them into DCCA messages for transport over the Diameter interface. When the DCCA server responds with additional quota, the GGSN pushes it to the Cisco CSG.



Note If RADIUS is not being used, the Cisco CSG must be configured as a RADIUS proxy.

Figure 7-1 provides illustrates the functions and characteristics the service-aware GGSN with DCCA providing online charging support.

Figure 7-1 High-Level Overview of Service-Aware GGSN Functions with DCCA being used for Online Charging Support



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Supported Features

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- Quota server functionality and interface to Cisco CSG for per-service billing
- Enhanced G-CDRs for service-based CDRs for prepaid and postpaid subscribers

Additionally, GGSN Release 5.2 and later provides enhancements to the following existing interfaces:

- AAA authentication interface—DCCA rulebase support and charging profile selection
AAA accounting interface—Required for Cisco CSG Known User Table (KUT) population and Cisco CSG-based proxies
Ga—Enhanced offline charging interface

Unsupported Features

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- Network Management
Cell identity
PDP contexts for both online DCCA exchange and offline service-based usage
Dynamic configuration for blocking/forwarding traffic while waiting for quota reauthorization
Diameter proxy, relay, or redirection
Diameter transport layer security
SCTP transport
No Dual Quota Support (for receiving Volume and Time quota)

Service-Aware GGSN Data Flows

PDP Context Creation Data Flow for Prepaid Users

- 1.
- 2.
- 3.
- 4.

- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

PDP Context Creation Data Flow for Postpaid Users

- 1.
- 2.
- 3.
- 4.
- 5.

Prerequisites

- A Cisco 7600 series router in which a Cisco Supervisor Engine 720, with a Multilayer Switch Feature Card (Cisco Product ID: SUP720-MSFC3-BXL), running Cisco IOS Release 12.2(33)SRB1 or later.

For details on upgrading the Cisco IOS release running on the supervisor engine, see the “Upgrading to a New Software Release” section in the Release Notes for Cisco IOS Release 12.2SR.



The Cisco IOS software required on the supervisor engine is dependent on the supervisor engine being used and the Cisco IOS software application running on the Cisco SAMI PCCs. For information on these hardware and software requirements, refer to the documentation of the Cisco IOS mobile wireless application that you are implementing on the Cisco SAMI.

Cisco Service and Application Module for IP (Cisco Product Number: WS-SVC-SAMI-BB-K9), running Cisco IOS Release 12.4(15)XQ and later on the SAMI processors. (The image is automatically loaded onto each processor during an image upgrade.)

IPSec VPN Services Module (for security)

A Cisco SAMI running the Cisco Content Services Gateway - 2nd Generation (CSG2) software in each Cisco 7600 series router.

- On the SGSN, the values configured for the number GTP N3 requests and T3 retransmissions must be larger than the sum of all possible server timers (RADIUS, DCCA, and Cisco CSG).

Specifically the SGSN $N3 * T3$ must be greater than:

$2 \times \text{RADIUS timeout} + \quad \times \text{DCCA timeout} + \text{Cisco CSG2 timeout}$

where:

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Limitations and Restrictions

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Configuring a Service-Aware GGSN

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Enabling Service-Aware Billing Support

Command	Purpose
Router(config)# gprs service-aware	
Router(access-point-config)#	
Router(config)# gprs gtp response-message wait-accounting	

Enabling Enhanced G-CDRs

gprs charging cdr-option service-record [1-100]	
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Configuring the Quota Server Interface

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http://www.cisco.com/en/US/products/sw/wirelssw/ps779/products_configuration_guide_book09186a0080856678.html

The GGSN:

Functions as a quota server to the Cisco CSG2

Provides the Diameter interface to the DCCA server for quota requests and returns

Manages the quota requested by the Cisco CSG2 and received from the DCCA server

Maps DCCA server rulebases to Cisco CSG2 billing plans

Maps DCCA server category quota to Cisco CSG2 service quota

To configure the quota server interface on the GGSN, complete the tasks in the following sections:

[Configuring a Cisco CSG2 Server Group, page 7-7](#) (Required)

[Configuring the Quota Server Process on the GGSN, page 7-8](#) (Required)

[Configuring the GGSN to use the Cisco CSG2 as an Authentication and Accounting Proxy, page 7-10](#) (Required if RADIUS is not being used)

[Monitoring and Maintaining, page 7-11](#)

Configuring a Cisco CSG2 Server Group

Step 1	<i>csg-group-name</i>	
	virtual-address <i>ip-address</i>	
	<i>port-number</i>	
	<i>ip-address</i>	

Configuring the Quota Server Process on the GGSN

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In addition, the quota server process supports the following TLVs:

- Quota Consumption Timer (QCT). The QCT is assumed to be zero.
- Quota Holding Timer (QHT)
- Quota Threshold

For more information on enhancements to the quota server interface, billing plans, and the QCT and QHT, see the



One quota server process can be configured per GGSN. Configuring more than one quota server process will overwrite the existing process.

ggsn quota-server <i>server-name</i>	
Router(config-quota-server)# interface <i>interface-name</i>	
<i>60-65535</i>	<i>0 </i>
n3-requests <i>1-65535</i>	
t3-response <i>1-65535</i>	
csg-group <i>csg-group-name</i>	

Advertising the Next Hop Address For Downlink Traffic

Command	Purpose
<pre>GGSN(access-point-config)# advertise downlink next-hop</pre>	

Configuring the GGSN to use the Cisco CSG2 as an Authentication and Accounting Proxy

- 1.
- 2.
- 3.
- 4.

<pre>radius-server host {hostname ip-address} [[Router(config)# radius-server key 0 7</pre>	
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<pre>aaa group server radius</pre>	
<pre>Router(config-sg-radius)# server ip_address auth-port port-number port-number</pre>	

	Command	Purpose
Step 1	<i>group-name</i> <i>list-name</i>	
	group aaa authorization network	
	start-stop group aaa accounting network	
	aaa-group authentication	
	aaa-group accounting	

Monitoring and Maintaining

clear ggsn quota-server statistics	
show ggsn quota-server [parameters statistics]	
show ggsn csg [parameters statistics]	

Configuring Diameter/DCCA Interface Support

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Messaging

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diameter vendor support

timer watchdog

Configuring the Diameter Base

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Configuring a Diameter Peer

	Command	Purpose
Step 1		Defines a Diameter peer and enters Diameter peer configuration mode.
Step 2	<code>address ipv4</code>	
	<code>transport tcp sctp</code> port	
	<code>security ipsec</code>	
	<code>source interface</code>	

transaction watchdog timer connection	
destination host	

Step 8

domain “@ ”) in which a Diameter peer is located.

The realm might be added by the AAA client when sending a request to AAA. However, if the client does not add the attribute, then the value configured while in Diameter peer configuration mode is used when sending messages to the destination Diameter peer. If a value is not configured while in Diameter peer configuration mode, the value specified globally using the **diameter destination realm**

Enabling Diameter AAA

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Defining the Diameter AAA Server Group

Step 2

Step 3

```
Router(config-sg-diameter) # 1645  
1646
```

Defining an Authorization Method List for Prepaid Subscribers

```
Router(config) #  
[ ]
```

Configuring Diameter Protocol Parameters Globally

```
Router(config)#          {  
|           |           }  
|           |           }
```

```
Router(config)#
```

```
Router(config)#
```

	<p>Configures the Fully Qualified Domain Name (FQDN) of the host of this Diameter node.</p> <p>The origin host information is sent in requests to a Diameter peer.</p>
<code>{Cisco 3gpp Vodafone}</code>	

Monitoring and Maintaining the Diameter Base

<code>show diameter peer</code>	

Configuring the DCCA Client Process on the GGSN

Failure Handling Defaults on the DCCA Client

- `session-failover`
- `ccfh`

CCA fails (for example, a CCA with a permanent failure notification [Result-Code 5xxx]) is received).

Failure-to-send condition exists (the DCCA client is not able to communicate with the desired destination).

An invalid answer is received

gprs dcca profile	
Router(config-dcca-profile)# authorization	
Router(config-dcca-profile)# tx-timeout	

```
Router(config-dcca-profile)# ccfh {continue |  
terminate | retry_terminate}
```

retry_terminate

	sgsn-change
	qos-change
	rat
	plmn-id
	plmn-change rat-change
	charging service record gprs

Enabling Support for Vendor-Specific AVPs in DCCA Messages

Table 7-1 *Vodafone Vendor-Specific AVPs in CCRs*

Number	Vendor-Proprietary Attribute	Description
		Type of PDP context (PRIMARY). For secondary PDP contexts, no CCR is sent. This AVP is sent in CCR (Initial) only.
	User-Location-Info	Cell Global Identification (CGI) is used as geographical location type. RAI, obtained from the SGSN, is sent.

Command	Purpose
	Configures the GGSN to send Vodafone vendor-specific AVPs in DCCA messages to the server.

Configuring Charging

Specifying a Default Rulebase ID

Rulebases contain the rules for defining categories of traffic; categories on which decisions such as whether to allow or disallow traffic, and how to measure the traffic, are based. The GGSN maps Diameter rulebase IDs to Cisco CSG2 billing plans.

To configure a default rulebase ID to apply to PDP contexts using a particular charging profile, use the following command while in charging profile configuration mode:

Command	Purpose
Router (ch-prof-conf) # <code>content rulebase</code>	

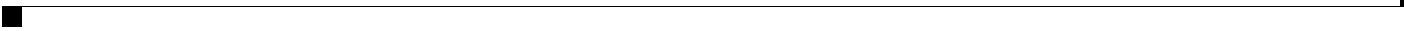


Note

The rulebase value presented in a RADIUS Access Accept message overrides the default rulebase ID configured in a charging profile. A rulebase ID received in a CCA initial message from a DCCA server overrides the rulebase ID received from the RADIUS server and the default rulebase ID configured in a charging profile.

Specifying a DCCA Client Profile to Use for Online Billing

<code>content dcca profile</code>	



cdr suppression prepaid	







<p>content postpaid qos-change sgsn-change plmn-change rat-change</p>	
<p>content postpaid time</p>	
<p>validity content postpaid</p>	
<p>content postpaid volume</p>	

TP-Session Redundancy for Service-Aware PDPs Overview

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GTP-SR for Service-Aware PDP Sessions Guidelines

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Configuring the Hot Standby Router Protocol

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<pre>Router(conf)# gprs radius attribute quota-server ocs-address</pre>	
-------------------------------------------------------------------------	--

Configuration Example

```
Current configuration :3537 bytes
!
! Last configuration change at 15:26:45 UTC Fri Jan 7 2005
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
service gprs ggsn
!
hostname sup-samiA
!
boot-start-marker
boot-end-marker
!
enable password abc
!
aaa new-model
!
!
!Configures the CSG2 RADIUS server group
!
aaa group server radius CSG-group
server 10.10.65.100 auth-port 1812 acct-port 1813

aaa group server diameter DCCA
server name DCCA

aaa authentication ppp CSG-list group CSG-group
aaa authorization prepaid DCCA group DCCA
aaa authorization network CSG-list group CSG
aaa accounting network CSG-list start-stop group CSG-group

ip subnet-zero
!
!
```

```
ip cef
!
!
...
!
!
gprs access-point-list gprs
!
...
!
!
!Enables service-aware billing on the GGSN
!

!
gprs access-point-list gprs
  access-point 10
    access-point-name cisco.com
    access-mode non-transparent

charging profile any 1 override

advertise downlink next-hop 10.10.150.2
!
access-point 20
  access-point-name yahoo.com
  access-mode non-transparent

!
!
!Configures a DCCA client profile
!

!
gprs charging profile 1
  limit volume 64000
  limit duration 64000
  content rulebase PREPAID
  content dcca profile 1
  content postpaid volume 64000
  content postpaid time 1200
  content postpaid qos-change
  content postpaid sgsn-change

ggsn quota-server qs
  interface Loopback2
  csg group csg_1
```

```
ggsn csg-group csg_1
virtual-address 10.10.65.10
port 4386
real-address 10.10.65.2
```

```
radius-server host 10.10.65.100 auth-port 1812 acct-port 1813
radius-server host 10.20.154.201 auth-port 1812 acct-port 1813
radius-server key abc
```

```
diameter origin realm corporationA.com
diameter origin host sup-sami42.corporationA.com
diameter vendor supported cisco
```

```
diameter peer DCCA
address ipv4 172.18.43.59
transport tcp port 4100
timer connection 20
timer watchdog 25
destination realm corporationA.com
```