



Subscriber Overcharging Protection

Subscriber Overcharging Protection is a proprietary, enhanced feature that prevents subscribers in UMTS networks from being overcharged when a loss of radio coverage (LORC) occurs. This chapter indicates how the feature is implemented on various systems and provides feature configuration procedures. Products supporting subscriber overcharging protection include Cisco's Gateway GPRS Support Node (GGSN) and Serving GPRS Support Node (SGSN).

The individual product administration guides provide examples and procedures for configuration of basic services. Before using the procedures in this chapter, we recommend that you select the configuration example that best meets your service model, and configure the required elements for that model, as described in the respective guide.



Important Subscriber Overcharging Protection is a licensed Cisco feature. A separate feature license may be required. Contact your Cisco account representative for detailed information on specific licensing requirements. For information on installing and verifying licenses, refer to the *Managing License Keys* section of the *Software Management Operations* chapter in the *System Administration Guide*.

This chapter covers the following topics in support of the Subscriber Overcharging Protection feature:

- [Feature Overview, on page 1](#)
- [Overcharging Protection - GGSN Configuration, on page 3](#)
- [Overcharging Protection - SGSN Configuration, on page 4](#)

Feature Overview

Subscriber Overcharging Protection enables the SGSN to avoid overcharging the subscriber if/when a loss of radio coverage (LORC) occurs.

When a mobile is streaming or downloading files from external sources (for example, via a background or interactive traffic class) and the mobile goes out of radio coverage, the GGSN is unaware of such loss of connectivity and continues to forward the downlink packets to the SGSN.

Previously, upon loss of radio coverage (LORC), the SGSN did not perform the UPC procedure to set QoS to 0kbps, as it does when the traffic class is either streaming or conversational. Therefore, when the SGSN did a Paging Request, if the mobile did not respond the SGSN would simply drop the packets without notifying the GGSN; the G-CDR would have increased counts but the S-CDR would not, causing overcharges when operators charged the subscribers based on the G-CDR.

Now operators can accommodate this situation, they can configure the SGSN to set QoS to 0kbps, or to a negotiated value, upon detecting the loss of radio coverage. The overcharging protection feature relies upon the SGSN adding a proprietary private extension to GTP LORC Intimation IE to messages. This LORC Intimation IE is included in UPCQ, DPCQ, DPCR, and SGSN Context Response GTP messages. One of the functions of these messages is to notify the GGSN to prevent overcharging.

The GGSN becomes aware of the LORC status by recognizing the message from the SGSN and discards the downlink packets if LORC status indicates loss of radio coverage or stops discarding downlink packets if LORC status indicates gain of radio coverage for the UE.

The following table summarizes the SGSN's actions when radio coverage is lost or regained and LORC overcharging protection is enabled.

Table 1: LORC Conditions and Overcharging Protection

Condition	Triggered by	SGSN Action	LORC Intimation IE - private extension payload
Loss of radio coverage (LORC)	RNC sends Iu release request with cause code matching configured value	Send UPCQ to GGSN Start counting unsent packets/bytes Stop forwarding packets in downlink direction	No payload
Mobile regains coverage in same SGSN area	MS/SGSN	Send UPCQ to GGSN Stop counting unsent packets/bytes Stop discarding downlink packets	New loss-of-radio-coverage state and unsent packet/byte counts
Mobile regains coverage in different SGSN area	MS/SGSN	Send SGSN Context Response message to new SGSN Stop counting unsent packets/bytes	Unsent packet/byte counts
PDP deactivated during LORC	MS/SGSN	Send DPCQ to GGSN Stop counting unsent packets/bytes	Unsent packet/byte counts
PDP deactivated during LORC	GGSN	Send DPCR to GGSN Stop counting unsent packets/bytes	Unsent packet/byte counts

Triggering Iu Release Procedure

When SGSN receives the RAB Release Request with cause "Radio Connection with UE Lost" from RNC, it triggers the Iu Release Command. RNC then sends the Iu Release Complete message to SGSN.

SGSN proceeds with the following steps when it receives the RAB Release Request with cause "Radio Connection with UE Lost":

- SGSN verifies if the **ranap rabrel-with-radiolost** CLI command is enabled.
- If the **ranap rabrel-with-radiolost** CLI command is enabled, then SGSN triggers the Iu Release Command towards the RNC to release the Iu connection for that specific UE.

Overcharging Protection - GGSN Configuration

This section provides a high-level series of steps and the associated configuration examples for configuring the GGSN to support subscriber overcharging protection.



Important This section provides the minimum instruction set to configure the GGSN to avoid the overcharging due to loss of radio coverage in UMTS network. For this feature to be operational, you must also implement the configuration indicated in the section *Overcharging Protection - SGSN Configuration* also in this chapter. Commands that configure additional function for this feature are provided in the *Command Line Interface Reference*.

These instructions assume that you have already configured the system-level configuration as described in *System Administration Guide* and the *Gateway GPRS Support Node Administration Guide*.

To configure the system to support overcharging protection on LORC in the GGSN service:

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- Step 1** Configure the GTP-C private extension in a GGSN service by applying the example configurations presented in the *GTP-C Private Extension Configuration* section below.
 - Step 2** Save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.
 - Step 3** Verify configuration of overcharging protection on LORC related parameters by applying the commands provided in the *Verifying Your GGSN Configuration* section in this chapter.
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GTP-C Private Extension Configuration

This section provides the configuration example to configure the GTP-C private extensions for GGSN service:

```
configure
context vpn_context_name
  ggsn-service ggsn_svc_name
    gtpc private-extension loss-of-radio-coverage
  end
```

Notes:

- *vpn_context_name* is the name of the system context where specific GGSN service is configured. For more information, refer *Gateway GPRS Support Node Administration Guide*.
- *ggsn_svc_name* is the name of the GGSN service where you want to enable the overcharging protection for subscribers due to LORC.

Verifying Your GGSN Configuration

This section explains how to display and review the configurations after saving them in a `.cfg` file (as described in the *Verifying and Saving Your Configuration* chapter in this book) and how to retrieve errors and warnings within an active configuration for a service.



Important All commands listed here are under Exec mode. Not all commands are available on all platforms.

These instructions are used to verify the overcharging protection support configuration.

Step 1 Verify that your overcharging support is configured properly by entering the following command in Exec Mode:

```
show ggsn-service name ggsn_svc_name
```

The output of this command displays the configuration for overcharging protection configured in the GGSN service *ggsn_svc_name*.

```
Service name:                ggsn_svc1
Context:                    service
Accounting Context Name:    service
Bind:                       Done
Local IP Address: 209.165.200.228      Local IP Port: 2123
...
...
GTP Private Extensions:
  Preservation Mode
  LORC State
```

Step 2 Verify that GTP-C private extension is configured properly for GGSN subscribers by entering the following command in Exec Mode:

```
show subscribers ggsn-only full
```

The output of this command displays the LORC state information and number of out packets dropped due to LORC.

Overcharging Protection - SGSN Configuration

This section provides a high-level series of steps and the associated configuration examples for configuring the SGSN to support subscriber overcharging protection.



Important This section provides a minimum instruction set to configure the SGSN to implement this feature. For this feature to be operational, you must also implement the configuration indicated in the section *Overcharging Protection - GGSN Configuration* also in this chapter.

Command details can be found in the *Command Line Interface Reference*.

These instructions assume that you have already completed:

- the system-level configuration as described in the *System Administration Guide*,

- the SGSN service configuration as described in the *Serving GPRS Support Node Administration Guide*, and
- the configuration of an APN profile as described in the *Operator Policy* chapter in this guide.

To configure the SGSN to support subscriber overcharging protection:

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- Step 1** Configure the private extension IE with LORC in an APN profile by applying the example configurations presented in the *Private Extension IE Configuration* section.
- Note** An APN profile is a component of the Operator Policy feature implementation. To implement this feature, an APN profile must be created and *associated* with an operator policy. For details, refer to the *Operator Policy* chapter in this book.
- Step 2** Configure the RANAP cause that should trigger this UPCQ message by applying the example configurations presented in the *RANAP Cause Trigger Configuration* section.
- Step 3** Save your configuration to flash memory, an external memory device, and/or a network location using the Exec mode command **save configuration**. For additional information on how to verify and save configuration files, refer to the *System Administration Guide* and the *Command Line Interface Reference*.
- Step 4** Verify the SGSN portion of the configuration for overcharging protection on LORC related parameters by applying the commands provided in the *Verifying the Feature Configuration* section.
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Private Extension IE Configuration

This section provides the configuration example to enable adding the private extension IE that will be included in the messages sent by the SGSN when a loss of radio coverage occurs in the UMTS network:

```
configure
  apn-profile apn_profile_name
    gtp private-extension loss-of-radio-coverage send-to-ggsn
  end
```

Note:

- *apn_profile_name* is the name of a previously configured APN profile. For more information, refer to the *Operator Policy* chapter, also in this book.

RANAP Cause Trigger Configuration

This section provides the configuration example to enable the RANAP cause trigger and define the trigger message value:

```
configure
  context context_name
    iups-service iups_service_name
      loss-of-radio-coverage ranap-cause cause
    end
```

Notes:

- *context_name* is the name of the previously configured context in which the IuPS service has been configured.

- *cause* is an integer from 1 to 512 (the range of reasons is a part of the set defined by 3GPP TS 25.413) that allows configuration of the RANAP Iu release cause code to be included in messages. Default is 46 (MS/UE radio connection lost).

RANAP RAB Release Configuration

This section provides the configuration example to configure the Iu Release Command when SGSN receives the RAB Release Request with cause 46 (radio connection with UE lost) is received.

```
configure
context context_name
  iups-service iups_service_name
  rnc id
  [ no ] ranap rab-release-with-radiolost
end
```

Notes:

- When **no ranap rab-release-with-radiolost** is configured, SGSN will send the RAB Assignment Request with RAB Release to RNC.
- This command is disabled by default.
- This command applies to Gn-SGSN only.

Verifying the Configuration

Execute the following command to verify the configuration of this feature:

```
show iups-service all
```

The **Rab release with Radio lost** field in the output of this command indicates whether RAB Release Request with cause 46 is enabled or disabled.

Verifying the Feature Configuration

This section explains how to display the configurations after saving them in a *.cfg* file as described in the *Verifying and Saving Your Configuration* chapter elsewhere in this guide.



Important All commands listed here are under Exec mode. Not all commands are available on all platforms.

These instructions are used to verify the overcharging protection support configuration.

Step 1 Verify that your overcharging support is configured properly by entering the following command in Exec Mode:

```
show apn-profile full name apn_profile_name
```

The output of this command displays the entire configuration for the APN profile configuration. Only the portion related to overcharging protection configuration in the SGSN is displayed below. Note that the profile name is an example:

```
APN Profile name:           : apnprofile1
Resolution Priority:       : dns-fallback
```

```
...
...
Sending Private Extension Loss of Radio Coverage IE
  To GGSN           : Enabled
  To SGSN           : Enabled
```

Step 2 Verify the RANAP Iu release cause configuration by entering the following command in the Exec Mode:

```
show iups-service name iups_service_name
```

The output of this command displays the entire configuration for the IuPS service configuration. Only the portion related to overcharging protection configuration (at the end of the display) is displayed below. Note that the IuPS service name is an example:

```
Service name           : iups1
Service-ID             : 1
...
...
Loss of Radio Coverage
Detection Cause in Iu Release : 46
```
