Overcharging Protection Support

This chapter describes the Overcharging Protection Support feature and explains how it is configured. The product administration guides provide examples and procedures for configuration of basic services on the system. It is recommended that you select the configuration example that best meets your service model and configure the required elements for that model, as described in the *P-GW Administration Guide*, the *S-GW Administration Guide*, or the *SAEGW Administration Guide* before using the procedures in this chapter.

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Overcharging Protection Feature Overview

Overcharging Protection helps in avoiding charging the subscribers for dropped downlink packets while the UE is in idle mode. In some countries, it is a regulatory requirement to avoid such overcharging, so it becomes a mandatory feature for operators in such countries. Overall, this feature helps ensure subscriber are not overcharged while the subscriber is in idle mode.

Important This feature is supported on the P-GW, and S-GW. Overcharging Protection is supported on the SAEGW only if the SAEGW is configured for Pure P or Pure S functionality.

P-GW will never be aware of UE state (idle or connected mode). Charging for downlink data is applicable at P-GW, even when UE is in idle mode. Downlink data for UE may be dropped at S-GW when UE is in idle mode due to buffer overflow or delay in paging. Thus, P-GW will charge the subscriber for the dropped packets, which isn't desired. To address this problem, with Overcharging Protection feature enabled, S-GW will inform P-GW to stop or resume charging based on packets dropped at S-GW and transition of UE from idle to active state.

If the S-GW supports the Overcharging Protection feature, then it will send a CSReq with the PDN Pause Support Indication flag set to 1 in an Indication IE to the P-GW.

If the P-GW supports the Overcharging Protection feature then it will send a CSRsp with the PDN Pause Support Indication flag set to 1 in Indication IE and/or private extension IE to the S-GW.

Once the criterion to signal "stop charging" is met, S-GW will send Modify Bearer Request (MBReq) to P-GW. MBReq would be sent for the PDN to specify which packets will be dropped at S-GW. The MBReq will have an indication IE and/or a new private extension IE to send "stop charging" and "start charging" indication to P-GW. For Pause/Start Charging procedure (S-GW sends MBReq), MBRes from P-GW will have indication and/or private extension IE with Overcharging Protection information.

When the MBReq with stop charging is received from a S-GW for a PDN, P-GW will stop charging for downlink packets but will continue sending the packets to S-GW.

P-GW will resume charging downlink packets when either of these conditions is met:

- When the S-GW (which had earlier sent "stop charging" in MBReq) sends "start charging" in MBReq.
- When the S-GW changes (which indicates that maybe UE has relocated to new S-GW).

This feature aligns with the 3GPP TS 29.274: 3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunneling Protocol for Control plane (GTPv2-C) specification.

Important When Overcharging Protection feature is configured at both P-GW service and APN, configuration at APN takes priority.

License

Overcharging Protection is a license enabled feature and a new license key has been introduced for Overcharging Protection for P-GW functionality.

Important Contact your Cisco account representative for information on how to obtain a license.

Configuring Overcharging Protection Feature

This section describes how to configure overcharging protection support on the P-GW and S-GW.

Configuring Overcharging Support on the P-GW

This command enables overcharge protection for APNs controlled by this APN profile and configures overcharging protection by temporarily not charging during loss of radio coverage. Each overcharging protection option is a standalone configuration and it does not override the previous option set, if any. Use this command to specify P-GW to pause charging on abnormal-s1-release, DDN failure notification, or if the number of packets or bytes dropped exceeds the configured limit.

Important This configuration sequence is valid for the P-GW only.

```
configure
   apn-profile apn_profile_name
```

```
      overcharge-protection { abnormal-s1-release | ddn-failure |
drop-limit drop_limit_value { packets | bytes } }
     [ remove ] overcharge-protection { abnormal-s1-release | ddn-failure
 | drop-limit }
      end
```

Notes:

- **remove:**

  Removes the specified configuration.

- **abnormal-s1-release:**

  (for future use) If overcharging protection is enabled for abnormal-s1-release, S-GW would send MBR to pause charging at P-GW if Abnormal Release of Radio Link signal occurs from MME.

- **ddn-failure:**

  If overcharging protection is enabled for ddn-failure message, MBR would be sent to P-GW to pause charging upon receiving DDN failure from MME/S4-SGSN.

- **drop-limit *drop_limit_value* { packets | bytes } }**

  Send MBR to pause charging at P-GW if specified number of packets/bytes is dropped for a PDN connection.

  drop_limit_value is an integer from 1 through 99999.

  - **packets:** Configures drop-limit in packets.
  - **bytes:** Configures drop-limit in bytes.

Configuring Overcharging Support on the S-GW

The following configuration is required for overcharging support on the S-GW:

```
configure
   context context_name
      egtp-service service_name
         gtpc private-extension overcharge-protection
         end
```

Notes:

- Enabling this command indicates that the S-GW has to interact with a release 15 P-GW for the overcharging protection feature which does not support 3GPP TS 29.274 Release 12 – *3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunneling Protocol for Control plane (GTPv2-C); Stage 3*.
- When the **gtpc private-extension overcharge-protection** command is configured, the S-GW includes a Private Extension in the Create Session Request (CSReq) and Modify Bearer Request (MBReq) messages.
- Whenever a P-GW receives a CSReq with an Indication IE with the PDN Pause Support Indication flag set to 1, it responds only with an Indication IE.
- When a CSReq does not have an Indication IE with the PDN Pause Support Indication flag set to 1, but the P-GW supports Overcharging Protection, then it responds with both an Indication and Private Extension IE.

Monitoring and Troubleshooting

P-GW Schema

The following bulk statistics have been added to the P-GW schema for Overcharging Protection:

For descriptions of these variables, see the *Statistics and Counters Reference* guide.

- sessstat-ovrchrgprtctn-uplkpktdrop
- sessstat-ovrchrgprtctn-uplkbytedrop
- sessstat-ovrchrgprtctn-dnlkpktdrop
- sessstat-ovrchrgprtctn-dnlkbytedrop

show apn statistics all

The following counters display overcharging protection stats for this APN:

- UL Ovrchrg Prtctn byte drop
- UL Ovrchrg Prtctn pkt drop
- DL Ovrchrg Prtctn byte drop
- DL Ovrchrg Prtctn pkt drop

show pgw-service all

The following field display configuration information for Overcharging Protection on this P-GW service:

- EGTP Overcharge Protection

show pgw-service statistics all

The following counters display Overcharging Protection for this P-GW node:

- Drops Due To Overcharge Protection
  - Packets
  - Bytes

show sgw-service statistics name <sgw_service_name>

The output of this command shows the total number of PDNs where charging was paused:

- PDNs Total:
  - Paused Charging: <Total number of PDNs where charging was paused>

show subscribers full

The following counters display Overcharging Protection for all subscribers:

- in packet dropped overcharge protection
- in bytes dropped overcharge protection
- out packet dropped overcharge protection
- out bytes dropped overcharge protection

Important When a session is in overcharge protection state, not all the downlink packets will be dropped; however, downlink packets will be rate limited. Current configuration allows one downlink packet per minute towards S-GW without charging it, if any downlink packets come to P-GW. P-GW will not generate any packets of its own.; separate debug stats have been added for P-GW.

show subscribers pgw-only full all

The following field and counters display Overcharging Protection:

- Bearer State
  - in packet dropped overcharge protection
  - in bytes dropped overcharge protection
  - out packet dropped overcharge protection
  - out bytes dropped overcharge protection

show subscribers summary

The following counters display overcharging protection for all subscribers:

- in bytes dropped ovrchrgPtn
- in packet dropped ovrchrgPtn
- out bytes dropped ovrchrgPtn
- out packet dropped ovrchrgPtn

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