

3GPP R12 GTP-C Load and Overload Control Support on the P-GW, SAEGW, and S-GW

This chapter describes the 3GPP Release 12 GTP-C Load and Overload Control feature on the P-GW, SAEGW, and S-GW.

- Feature Description, on page 1
- How It Works, on page 2
- Creating and Configuring a 3GPP R12 GTP-C Load Control Profile, on page 3
- Creating and Configuring a 3GPP R12 GTP-C Overload Control Profile, on page 8
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Feature Description

This section describes the 3GPP R12 GTP-C Load and Overload Control feature.

Important Use of the 3GPP R12 Load and Overload Control feature requires that a valid license key be installed. Contact your Cisco account or support representative for information on how to obtain a license.

The 3GPP R12 GTP-C Load and Overload Control feature is a licensed, optional feature which allows a GTP control plane node to send its load information to a peer GTP control plane node which the receiving GTP control plane peer node uses to augment existing GW selection procedure for the P-GW and S-GW. Load information reflects the operating status of the resources of the originating GTP control plane node.

Nodes using GTP control plane signaling may support communication of overload control information in order to mitigate overload situations for the overloaded node through actions taken by the peer node(s). This feature is supported over the S4, S11, S5 and S8 interfaces via the GTPv2 control plane protocol.

A GTP-C node is considered to be in overload when it is operating over its nominal capacity resulting in diminished performance (including impacts to handling of incoming and outgoing traffic). Overload control information reflects an indication of when the originating node has reached such a situation. This information, when transmitted between GTP-C nodes, may be used to reduce and/or throttle the amount of GTP-C signaling traffic between these nodes. As such, the overload control information provides guidance to the receiving node to decide upon the correct actions, which leads to mitigation towards the sender of the information.

To summarize, load control and overload control can be described in this manner:

- **Load Control**: Load control enables a GTP-C entity (for example, an P-GW/SAEGW/S-GW) to send its load information to a GTP-C peer (for example, an MME/SGSN, ePDG, TWAN) to adaptively balance the session load across entities supporting the same function (for example, an S-GW cluster) according to their effective load. The load information reflects the operating status of the resources of the GTP-C entity.
- **Overload Control**: Overload control enables a GTP-C entity becoming or being overloaded to gracefully reduce its incoming signaling load by instructing its GTP-C peers to reduce sending traffic according to its available signaling capacity to successfully process the traffic. A GTP-C entity is in overload when it operates over its signaling capacity, which results in diminished performance (including impacts to handling of incoming and outgoing traffic).

Load and Overload Factor Calculation Enhancement

In capacity testing and also in customer deployments it was observed that the chassis load factor for the 3GPP R12 Load and Overload Support feature was providing incorrect values even when the sessmgr card CPU utilization was high. The root cause is that when the load factor was calculated by taking an average of CPU utilization of sessmgr and demux cards, the demux card CPU utilization never increased more than the sessmgr card CPU utilization. As a result, the system did not go into the overload state even when the sessmgr card CPU utilization was high.

The 3GPP R12 Load/Overload Control Profile feature has been enhanced to calculate the load factor based on the higher value of similar types of cards for CPU load and memory. If the demux card's CPU utilization value is higher than the sessmgr card's CPU utilization value, then the demux card CPU utilization value is used for the load factor calculation.

A new CLI command, **gtpc-system-param-poll interval**, is introduced to configure different polling intervals for the resource manager so that the demuxmgr can calculate the load factor based on different system requirements.

Relationships to Other Features

Note the following before configuring the GTPP R12 GTP-C Load and Overload Control feature:

- One of the following services must be configured on the node before GTP-C Load and Overload Control can be configured.
  - P-GW
  - SAEGW
  - S-GW
- Once configured, the GTP-C Load and Overload Control profiles must be associated with a P-GW, SAEGW, or S-GW service to function properly in the network.

How It Works

The node periodically fetches various parameters (for example, License-Session-Utilization, System-CPU-Utilization, and System-Memory-Utilization), which are required for Node level load control information. The node then calculates the load/overload control information itself either based on the weighted factor provided by the user or using the default weighted factor.

Node level load control information is calculated every 30 seconds. The resource manager calculates the system-CPU-utilization and System-Memory-Utilization at a systems level.

For each configured service, load control information can be different. This can be achieved by providing a weightage to the number of active session counts per service license, for example, [(number of active sessions per service / max session allowed for the service license) * 100].

The node's resource manager calculates the system-CPU-utilization and System-Memory-Utilization at a systems level by averaging CPU and Memory usage for all cards and which might be different from that calculated at the individual card level.

Creating and Configuring a 3GPP R12 GTP-C Load Control Profile

This section describes how to create and configure a 3GPP R12 GTP-C load control profile.

Configuration Overview

Creating and configuring a 3GPP R12 GTP-C load control profile consists of the following procedures:

Procedure

Step 1 Create a load control profile. Refer to Creating the GTPP R12 Load Control Profile, on page 3.

Step 2 Configure the load control weightage settings. Refer to Configuring the 3GPP R12 Load Control Profile Weightage Settings, on page 4.

Step 3 Configure the load control inclusion frequency. Refer to Configuring the 3GPP R12 Load Control Profile Inclusion Frequency, on page 4.

Step 4 P-GW Only. Configure the load control threshold. Refer to Configuring the 3GPP R12 Load Control Threshold, on page 5.

Step 5 Configure load control information handling. Refer to Configuring 3GPP R12 Load Control Information Handling, on page 5.

Step 6 Configure load control information publishing. Refer to Configuring 3GPP R12 Load Control Information Publishing, on page 5.

Step 7 Configure the 3GPP R12 GTP-C Polling Parameter Interval. Refer to Configuring the 3GPP R12 GTP-C Polling Parameter Interval, on page 6

Step 8 Associate the load control profile with a P-GW, SAEGW, or S-GW service. Refer to Associating the 3GPP R12 Load Control Profile with a P-GW, SAEGW, or S-GW Service., on page 7.

Step 9 Verify the configuration settings. Refer to Verifying the 3GPP R12 Load Control Configuration , on page 7.

Step 10 Save the configuration. Refer to Saving the Configuration, on page 8.

Creating the GTPP R12 Load Control Profile

Use the following example to create a load control profile on the P-GW/SAEGW/S-GW:

```
config
   gtpc-load-control-profile  profile_name
   end
```

Notes:

- The profile name must be an alphanumeric string from 1 to 64 characters in length.
- Once you have created the load control profile, you will enter *GTP-C Load Control Profile Configuration Mode*.

Configuring the 3GPP R12 Load Control Profile Weightage Settings

This section describes how to set weightage percentages for system CPU, memory, and license session utilization as part of a GTP-C load control profile configuration. These settings constitute the basic load control profile for this network element. These parameters allow the P-GW/S-GW/SAEGW to send its load information to a peer GTP control plane node which the receiving GTP control plane peer node uses to augment existing GW selection procedures for the P-GW and S-GW. Load information reflects the operating status of the resources of the originating GTP control plane node.

Use the following example to configure the load control profile weightage settings on the P-GW/SAEGW/S-GW:

```
config
   gtpc-load-control-profile profile_name
   weightage system-cpu-utilization percentage system-memory-utilization
 percentage license-session-utilization percentage
   end
```

Notes:

- **system-cpu-utilization** *percentage*: Configures system CPU utilization weightage as a percentage of 100.

  percentage must be an integer from 0 to 100. The default is 40.

- **system-memory-utilization** *percentage*: Configures system memory utilization weightage as a percentage of 100. *percentage* must be an integer from 0 to 100. The default is 30.

- **license-session-utilization** *percentage*: Configures license session utilization weightage as a percentage of 100. *percentage* must be an integer from 0 to 100. The default is 30.



Important All parameters must be specified. The total of all three parameter settings should equal, but not exceed, 100.

Configuring the 3GPP R12 Load Control Profile Inclusion Frequency

This section describes how to set the parameters that determine the inclusion frequency of the Load Control Information Element (LCI) for a GTP-C Load Control Profile configuration. The LCI is a 3GPP-specific Information Element that is sent to peers when a configured threshold is reached. This parameter specifies how often the operator wants to send this information to the node's peers.

Use the following example to configure the load control profile inclusion frequency on the P-GW/SAEGW/S-GW.

```
config
   gtpc-load-control-profile profile_name
      inclusion-frequency { advertisement-interval interval_in_seconds |
```

```
change-factor change_factor  }
      end
```

Notes:

- **inclusion frequency**: Configures parameters to determine the inclusion frequency of the LCI.
- **advertisement-interval** *interval_in_seconds*: Configures advertisement-interval for the LCI in seconds. This specifies how often load control information should be sent to the peers. If configured to 0, the node will send load control information in each and every outgoing message to the peers. *interval_in_seconds* must be an integer from 0 to 3600. The default is 300.
- **change-factor** *change_factor*: Configures the change factor for the load control profile. If the load control change factor changes by the configured factor, whether it is an increase or decrease in load, the load control information is sent to the peers. This information is only sent to the peers when the load factor changes by the factor configured. *change_factor* must be an integer from 1 to 20. The default is 5.

Configuring the 3GPP R12 Load Control Threshold

This section describes how to configure the minimum threshold value above which P-GW-provided load control information should be utilized for calculating the P-GW effective weight during initial node selection.

Use the following example to configure Load Control Profile threshold on the P-GW.

```
config
   gtpc-load-control-profile profile_name
      threshold time_in_seconds
      end
```

Notes:

- The default threshold value is 50.

Configuring 3GPP R12 Load Control Information Handling

The handling of load control information for the home or visited PLMN can be enabled/disabled via this procedure.

Use the following example to enable/disable load control profile information handling on the SAEGW/S-GW/P-GW.

```
config
   gtpc-load-control-profile  profile_name
      load-control-handling { home | visited }
      no load-control-handling { home | visited }
      end
```

Notes:

- **no** disables load-control-handling for the specified option.

Configuring 3GPP R12 Load Control Information Publishing

The publishing of load control information can be enabled/disabled for the home or visited PLMN.

Use the following example to enable/disable load control profile information publishing on the P-GW/SAEGW/S-GW.

```
config
   gtpc-load-control-profile profile_name
      load-control-publishing { home | visited }
      no load-control-publishing { home | visited }
      end
```

Notes:

- **no** disables load control profile information publishing for the specified option.

Configuring the 3GPP R12 GTP-C Polling Parameter Interval

In capacity testing and also in customer deployments it was observed that the chassis load factor for the 3GPP R12 Load and Overload Support feature was providing incorrect values even when the sessmgr card CPU utilization was high. The root cause is that when the load factor was calculated by taking an average of CPU utilization of sessmgr and demux cards, the demux card CPU utilization never increased more than the sessmgr card CPU utilization. As a result, the system did not go into the overload state even when the sessmgr card CPU utilization was high.

The 3GPP R12 Load/Overload Control Profile feature has been enhanced to calculate the load factor based on the higher value of similar types of cards for CPU load and memory. If the demux card's CPU utilization value is higher than the sessmgr card's CPU utilization value, then the demux card CPU utilization value is used for the load factor calculation.

Beginning with StarOS release 21, a new CLI command, **gtpc-system-param-poll interval**, is introduced in *Context Configuration Mode* to configure different polling intervals for the resource manager so that the demuxmgr can calculate the load factor based on different system requirements. This command sets the time period over which to monitor the chassis level CPU, Memory, and Session count information from the resource manager.

To configure the GTP-C polling parameter interval:

```
config
   context context_name
      gtpc-system-param-poll interval seconds
      default gtpc-system-param-poll interval
      end
```

- Where *seconds* is the time period over which to monitor the chassis level CPU, Memory, and Session count information from the resource manager. Valid entries are from 15 to 300 seconds. The default setting is 30 seconds.
- **default** returns the setting to its default value of 30 seconds.

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Caution Setting the time interval to a low value may impact system performance.

Associating the 3GPP R12 Load Control Profile with a P-GW, SAEGW, or S-GW Service.

Once the 3GPP R12 GTP-C load control profile is created, it must be associated with an existing P-GW, SAEGW, or S-GW service.

Use the following examples to associate the GTP-C load control profile with an existing P-GW, SAEGW, or S-GW service.

P-GW Service Association:

```
configure
   context  context_name
      pgw-service pgw_service_name
         associate gtpc-load-control-profile profile_name
         no associate gtpc-load-control-profile
         end
```

Notes:

- **no** disables the service association for the GTP-C Load Control Profile.

S-GW Service Association:

```
configure
   context  context_name
      sgw-service sgw_service_name
         associate gtpc-load-control-profile profile_name
         no associate gtpc-load-control-profile
         end
```

Notes:

- **no** disables the service association for the GTP-C Load Control Profile.

SAEGW Service Association::

```
configure
   context context_name
      sgw-service sgw_service_name
         associate gtpc-load-control-profile profile_name
         exit
      pgw-service pgw_service_name
         associate gtpc-load-control-profile profile_name
         exit
      saegw-service saegw_service_name
         associate sgw-service sgw_service_name
         associate pgw-service pgw_service_name
         exit
```

Verifying the 3GPP R12 Load Control Configuration

Use the following command to view the load control profile configuration settings:

```
show gtpc-overload-control-profile full name load_control_profile_name
```

The output of this command provides the configuration settings of all load control parameters, including:

- Weightage
- Inclusion Frequency
- Load control information handling
- Load control information publishing
- Load threshold

Saving the Configuration

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*.

Creating and Configuring a 3GPP R12 GTP-C Overload Control Profile

This section describes how to create and configure a 3GPP R12 GTP-C overload control profile on the P-GW/SAEGW/S-GW.

Configuration Overview

Procedure

Step 1	Create the GTP-C overload control profile. Refer to Creating the GTPP R12 Overload Control Profile, on page 9.
Step 2	Configure the weightage settings. Refer to Configuring 3GPP R12 Overload Control Weightage Settings, on page 9.
Step 3	Configure the inclusion frequency. Refer to Configuring the 3GPP R12 Overload Control Inclusion Frequency, on page 10.
Step 4	Configure the validity period. Refer to Configuring the 3GPP R12 Overload Control Validity Period, on page 10.
Step 5	Configure the tolerance settings. Refer to Configuring 3GPP R12 Overload Control Tolerance Limits, on page 11.
Step 6	Configure the throttling behavior for the node. Refer to Configuring 3GPP R12 Overload Control Throttling Behavior, on page 11.
Step 7	Configure the message prioritization. Refer to Configuring 3GPP R12 Overload Control Message Prioritization, on page 12.
Step 8	Configure self-protection behavior for the node. Refer to Configuring 3GPP R12 Overload Control Self-Protection Behavior, on page 12.
Step 9	Configure overload control information handling. Refer to Configuring 3GPP R12 Overload Control Information Handling, on page 13.
Step 10	Configure overload control information publishing. Refer to Configuring 3GPP R12 Overload Control Information Publishing, on page 13.
Step 11	Configure the GTP-C polling parameter interval . Refer to Configuring the 3GPP R12 GTP-C Polling Parameter Interval, on page 6.

Step 12 Associate the overload control configuration with an existing P-GW/SAEGW/S-GW service. Refer to Associating the 3GPP R12 Overload Control Configuration with a P-GW, SAEGW, or S-GW Service, on page 14.

Step 13 Verify the overload control configuration. Refer to Verifying the 3GPP R12 Overload Control Configuration , on page 15.

Step 14 Save the configuration. Refer to Saving the 3GPP R12 Overload Control Configuration, on page 16.

Creating the GTPP R12 Overload Control Profile

Use the following example to create the GTP-C Overload Control Profile:

```
configure
   gtpc-overload-control-profile  profile_name
   no gtpc-overload-control-profile  profile_name
   end
```

Notes:

- **no**: Removes specified GTP-C Overload Control profile.
- *profile_name* must be an alphanumeric string from 1 to 64 characters in length.

Configuring 3GPP R12 Overload Control Weightage Settings

This section describes how to configure GTP-C Overload Control weightage parameters. These parameters constitute the basic settings for this GTP-C Overload Control Profile. Communication of these parameters indicate to peers when this network element is becoming or being overloaded. When this occurs, the NE will be able to instruct its peers to gracefully reduce its incoming signaling load by instructing the peers to reduce sending traffic according to its available signaling capacity to successfully process the traffic. A GTP-C entity is in overload when it operates over its signaling capacity, which results in diminished performance (including impacts to handling of incoming and outgoing traffic).

Use the following example to configure the GTP-C Overload Control Weightage settings on the P-GW/SAEGW/S-GW.

```
configure
   gtpc-overload-control-profile  profile_name
      weightage system-cpu-utilization percentage system-memory-utilization
 percentage license-session-utilization percentage.
      default weightage
      end
```

Notes:

- Total weightage for all parameters should be 100.
- **system-cpu-utilization** *percentage*: Configures system cpu utilization weightage as a percentage of 100. *percentage* must be an integer from 0 to 100. The default is 40.
- **system-memory-utilization** *percentage*: Configures system memory utilization weightage as a percentage of 100. *percentage* must be an integer from 0 to 100. The default is 30.
- **license-session utilization** *percentage*: Configures license session utilization weightage as a percentage of 100. *percentage* must be an integer from 0 to 100. The default is 30.

Configuring the 3GPP R12 Overload Control Inclusion Frequency

This section describes how to set the parameters that determine the inclusion frequency of the Overload Control Information Element (OCI) for a GTP-C Load Control Profile configuration. The OCI is a 3GPP-specific IE that is sent to peers when a configured threshold is reached. This parameter specifies how often the operator wants to send this information to the peers.

Use the following example to configure the overload control profile inclusion frequency on the P-GW/SAEGW/S-GW.

```
configure
   gtpc-overload-control-profile  profile_name
      inclusion-frequency { advertisement-interval interval_in_seconds |
change-factor change_factor }
     default inclusion-frequency { advertisement-interval | change-factor
 }
      end
```

Notes:

- **inclusion frequency**: Configures parameters to decide inclusion frequency of the OCI information element.
- **advertisement-interval** *interval_in_seconds*: Configures the advertisement-interval for overload control in seconds. Specifies how often overload control information should be sent to the peers. If configured to 0, the node will send overload control information in each and every outgoing message to the peers.*interval_in_seconds* must be an integer from 0 to 3600. The default is 300.
- **change-factor** *change_factor*: P-GW only. Configures the change factor for overload control. If the overload control factor changes by a configured factor, whether by an increase or decrease, the overload control information should be sent to the peers. This information is only sent to the peers when the overload factor changes by the factor configured.*change_factor* must be an integer from 1 to 20. The default is 5.

Configuring the 3GPP R12 Overload Control Validity Period

This section describes how to configure the overload control validity period. The validity period is the length of time during which the overload condition specified by the overload control information element is to be considered as valid, unless overridden by subsequent new overload control information.

Use the following example to configure the GTP-C Overload Control validity period on the P-GW/SAEGW/S-GW.

```
configure
   gtpc-overload-control-profile profile_name
      validity-period seconds
      default validity-period
      end
```

Notes:

- **validity-period** *seconds*: Configures the validity of overload control information. *seconds* must be an integer from 1 to 3600. The default is 600 seconds.

Configuring 3GPP R12 Overload Control Tolerance Limits

Use this example to configure GTP-C Overload Control Tolerance limits.

```
configure
   gtpc-overlaod-control-profile  profile_name
      tolerance { initial-reduction-metric percentage | threshold
report-reduction-metric percentage self-protection-limit percentage  }
      default tolerance { initial-reduction-metric | threshold }
      end
```

Notes:

- **initial-reduction-metric** *percentage*: Configures initial overload reduction metric value to be advertised upon reaching minimum overload tolerance limit. When reaching the configured minimum threshold, this parameter specifies how much the node wants the peers to reduce incoming traffic.*percentage* must be an integer from 1 to 100. The default is 10.
- **threshold report-reduction-metric** *percentage*: Configures the minimum overload tolerance threshold for advertising overload reduction metric to the peer. When the minimum threshold is reached, the node will report this information to peers. When the maximum limit is reached, the node will go into self-protection mode. *percentage* must be an integer from 1 to 100. The default is 80.
- The **threshold report-reduction-metric** should always be lower than the **self-protection-limit**.
- **self-protection-limit** *percentage*: Configures the maximum overload tolerance threshold after which node will move to self protection mode. When the maximum limit is reached, the node will start rejecting all incoming messages, except for delete messages. The node will not initiate any new messages to the peers. This is to mitigate the overload condition.*percentage* must be an integer from 1 to 100. The default is 95.

Configuring 3GPP R12 Overload Control Throttling Behavior

Use this command to configure throttling behavior based on peer's overload reduction-metric by excluding some or all emergency events and/or messages with configured EARP. Message throttling applies only to initial messages. Triggered request or response messages should not be throttled since that would result in the retransmission of the corresponding request message by the sender.

If **throttling-behavior** is configured, the profile can be associated with an S-GW or P-GW service. If a P-GW specific keyword is configured, and the profile is associated with an S-GW service, the S-GW will ignore the P-GW specific configuration. Only the parameters specific to S-GW or P-GW will be utilized.

Use this example to configure GTP-C overload control throttling behavior on the P-GW/SAEGW/S-GW.

```
configure
   gtpc-overlaod-control-profile  profile_name
      throttling-behavior { earp [ 1 | 2 | 3 | 4 | 5 | 6 | 7 |8 | 9 | 10
 | 11 | 12 | 13 | 14 | 15 ]* exclude } | emergency-events exclude }
      no throttling-behavior [ earp [ 1 |2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
 10 | 11 | 12 | 13 | 14 | 15 ]* exclude | emergency-events exclude ]
      end
```

Notes:

- **throttling-behavior**: Configures throttling behavior based on peer's overload reduction-metric.

- **earp**: Excludes the specified messages with configured earp from throttling due to peer's overload-reduction metric. If a bearer with configured EARP is created or updated, it will be excluded from throttling.
- *****: Indicates that more than one of the keywords can be entered within a single command.
- **emergency-events exclude**: P-GW Only. Excludes all emergency events from throttling due to the peer's overload reduction-metric. While reducing messages towards the peer based on the overload information received from the peer, the P-GW will exclude events sent for emergency sessions.

Configuring 3GPP R12 Overload Control Message Prioritization

In the R12 GTP-C Load Overload control feature, it is possible to apply message throttling, (when a peer indicates it is overloaded), based on message priority. To apply message prioritization it is necessary to configure the percentage of two groups of messages that each node (P-GW or ePDG) is expected to generate. The operator can define the expected number of messages as a percentage for each message group.

Use the following example to configure message prioritization.

```
configure
   gtpc-overload-control-profile profile_name
      message-prioritization  group1 percentage group2 percentage
      no message-prioritization
      default message-prioritization
      end
```

Notes:

- **group1** specifies the message priority percentage for the following messages:
  - Update Bearer Request message for default bearer generated from P-GW ingress
  - Update Bearer Request message for dedicated bearer generated from P-GW ingress
  - Handoff Create Session Request message generated from ePDG egress.
- **group2** specifies the message priority percentage for the following messages:
  - Create Bearer Request message for default bearer generated from P-GW ingress
  - PDN connection requested Create Session Request message from ePDG egress
- The total percentage for the message groups should equal 100.
- **group1** messages will have the highest priority (1) and are dropped last. **group2** messages will have the lowest priority (2) and are dropped first.
- **default** returns the group message priority settings to their default value. The default for each group is 50.
- The default behavior for this command is enabled. To disable the command use the **no** option.

Configuring 3GPP R12 Overload Control Self-Protection Behavior

This functionality enables the operator to configure APN names and EARP priority level values for self-protection mode so that incoming request messages for emergency packet data node (PDN) connections and/or configured EARP priority values are not rejected even if the system is under self-protection mode.

Use this example to configure GTP-C overload control self-protection behavior.

```
configure
   gtpc-overload-control-profile profile_name
      self-protection-behavior { apn apn_name* exclude | earp { 1 | 2 | 3
| 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15* } exclude } }
      no self-protection-behavior { apn apn_name* exclude | earp { 1 | 2 |
 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15* } exclude } }
      end
```

Notes:

- **apn** configures up to three APN names to be allowed under self-protection behavior.
- **earp** configures up to three EARP priority level values so that incoming request messages for the configured evolved ARP priority values are not rejected even if the system is under self-protection mode.
- **no** disables the specified options.

Configuring 3GPP R12 Overload Control Information Handling

Use this command to enable/disable the handling of overload control information for the home or visited PLMN.

```
configure
   gtpc-load-control-profile profile_name
      overload-control-handling { home | visited }
      no overload-control-handling { home | visited }
      default overload-control-handling
      end
```

Notes:

- **home**: Enables the handling of load control information for the home PLMN.
- **visited** enables the handling of load control information for the visited PLMN.
- **default**: Returns load control handling to its default behavior (enabled).

Configuring 3GPP R12 Overload Control Information Publishing

Enables or disables the publishing of load control information towards the home or visited PLMN.

```
configure
   gtpc-overload-control-profile profile_name
      overload-control-publishing { home | visited }
      no overload-control-publishing { home | visited }
      default overload-control-publishing
      end
```

Notes:

- **home**: Enables the publishing of load control information towards the home PLMN.
- **visited**: Enables the publishing of load control information towards the visited PLMN.
- **default**: Returns load control handling to its default behavior (enabled).

Configuring the 3GPP R12 GTP-C Polling Parameter Interval

In capacity testing and also in customer deployments it was observed that the chassis load factor for the 3GPP R12 Load and Overload Support feature was providing incorrect values even when the sessmgr card CPU utilization was high. The root cause is that when the load factor was calculated by taking an average of CPU utilization of sessmgr and demux cards, the demux card CPU utilization never increased more than the sessmgr card CPU utilization. As a result, the system did not go into the overload state even when the sessmgr card CPU utilization was high.

The 3GPP R12 Load/Overload Control Profile feature has been enhanced to calculate the load factor based on the higher value of similar types of cards for CPU load and memory. If the demux card's CPU utilization value is higher than the sessmgr card's CPU utilization value, then the demux card CPU utilization value is used for the load factor calculation.

Beginning with StarOS release 21, a new CLI command, **gtpc-system-param-poll interval**, is introduced in *Context Configuration Mode* to configure different polling intervals for the resource manager so that the demuxmgr can calculate the load factor based on different system requirements. This command sets the time period over which to monitor the chassis level CPU, Memory, and Session count information from the resource manager.

To configure the GTP-C polling parameter interval:

```
config
  context context_name
    gtpc-system-param-poll interval seconds
    default gtpc-system-param-poll interval
    end
```

- Where *seconds* is the time period over which to monitor the chassis level CPU, Memory, and Session count information from the resource manager. Valid entries are from 15 to 300 seconds. The default setting is 30 seconds.
- **default** returns the setting to its default value of 30 seconds.

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Caution Setting the time interval to a low value may impact system performance.

Associating the 3GPP R12 Overload Control Configuration with a P-GW, SAEGW, or S-GW Service

Once the 3GPP R12 overload control profile has been configured, it must be associated with an existing P-GW, SAEGW, or S-GW service.

Use the following examples to associate the overload control configuration to an existing service.

P-GW Service Association:

```
configure
   context context_name
      pgw-service pgw_service_name
         associate gtpc-overload-control-profile profile_name
         no associate gtpc-overload-control-profile
         end
```

Notes:

- **no** disables the service association for the GTP-C Load Control Profile.

S-GW Service Association:

```
configure
   context context_name
      sgw-service sgw_service_name
         associate gtpc-overload-control-profile profile_name
         no associate gtpc-overload-control-profile
         end
```

Notes:

- **no** disables the service association for the GTP-C Load Control Profile.

SAEGW Service Association::

```
configure
   context context_name
      sgw-service sgw_service_name
         associate gtpc-overload-control-profile profile_name
         exit
      pgw-service pgw_service_name
         associate gtpc-overload-control-profile profile_name
         exit
      saegw-service saegw_service_name
         associate sgw-service sgw_service_name
         associate pgw-service pgw_service_name
         exit
```

Verifying the 3GPP R12 Overload Control Configuration

Use the following command to view the overload control configuration settings.

show gtpc-overload-control-profile full name *overload_control_profile_name*

The output of this command provides all overload control profile configuration settings, including:

- Weightage
- Tolerance
- Inclusion Frequency
- Validity Period
- Throttling Profile
- Self-Protection Behavior
- Overload control information Handling
- Overload control information Publishing
- Message Prioritization

Saving the 3GPP R12 Overload Control Configuration

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*.

Monitoring and Troubleshooting the 3GPP R12 GTP-C Load and Overload Control Feature

This section provides information to assist operators in monitoring the 3GPP R12 GTP-C Load and Overload Control feature.

3GPP R12 GTP-C Load and Overload Show Commands

This section provides information regarding show commands in support of the 3GPP R12 Load and Overload Control feature.

show egtpc statistics egtp-service <egtp-service name>

The output of this command provides detailed granular statistics for 3GPP R12 load and overload control profile statistics that have been transmitted (TX) and received (RX). Statistics are provided on a per egtp-service basis.

show gtpc-load-control-profile full all

The output of this command provides all configuration settings for all 3GPP R12 load control profiles configured on the node. Use this command to determine if the load control profile is configured as intended.

show gtpc-load-control-profile full name <name>

Use this command to view all configuration settings for the specified 3GPP R12 load control profile.

show gtpc-overload-control-profile full all

The output of this command provides all configuration settings for all 3GPP R12 overload control profiles configured on the node. Use this command to determine if the overload control profile is configured as intended.

show gtpc-overload-control full name <name>

The output of this command provides all configuration settings for all 3GPP R12 Overload Control Profiles configured on the node. Use this command to determine if the Overload Control Profile is configured as intended.

show pgw-service all

Use this command to obtain the names of all 3GPP R12 load control and 3GPP R12 overload control profiles configured on the P-GW.

show sgw-service all

Use this command to obtain the names of all 3GPP R12 Load Control and Overload Control profiles configured on the S-GW.

eGTP-C Bulk Statistics

The following statistics are included in the eGTP-C Schema in support of the 3GPP R12 Load and Overload Control feature:

- load-overload-own-lci
- load-overload-own-oci
- load-overload-num-msg-throttled
- load-overload-num-ovrload-cond-reached

For descriptions of these variables, see "eGTP Schema Statistics" in the *Statistics and Counters Reference*.