

Dynamic Guaranteed Bit Rate

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Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	• P-GW • SAEGW
Applicable Platform(s)	• ASR 5500 • VPC-DI • VPC-SI
Feature Default	Disabled - Configuration Required
Related Changes in This Release	Not Applicable
Related Documentation	• *Command Line Interface Reference* • *P-GW Administration Guide* • *SAEGW Administration Guide*

Revision History

Revision Details	Release
First introduced.	21.4

Feature Description

When a Guaranteed Bit Rate (GBR) dedicated bearer is used, the bandwidth of resources is reserved on the network. If the subscriber data flow is at lower bandwidth than the allocated values, then extra GBR is wasted on the network.

This feature adds flexibility where the Gateway periodically monitors the usage of the GBR on the bearer and depending on the usage. The Gateway steps-up or steps-down the allocated GBR accordingly.

How It Works

This section describes the working of Dynamic GBR functionality.

- Dedicated GBR Bearer is created using local policy configurations on a session setup or on certain call events.
- The SAEGW monitors the GBR after bearer creation for every interval of 30 seconds.
- After every interval, SAEGW verifies the average data-rate with the threshold value configured.
- In case, if the threshold breaches, then the GBR is stepped-up or stepped-down as per the configured value.
- SAEGW allows configuration of an upper and lower threshold of the GBR and also step-up or step-down value corresponding to the upper and lower threshold value.

Upper Threshold Breach

First Threshold Breach:

- Subscriber creates the dedicated bearer with QCI=qci1 with GBR as 1000 kbps with the upper threshold configured as 80%, that is, 800 kbps.
- Every 30 seconds the data-rate is evaluated. If the threshold limit is breached then SAEGW initiates the Update Bearer Request to upgrade the GBR value to step up by the configured percentage value.
- After 30 seconds if data-rate evaluated is more than 800 kbps, then the UBR is initiated to upgrade the GBR. The GBR is upgraded with the aggregate value of the initial configured GBR and the step-up configured percentage. For example, if the step-up increase is configured as 20% (200 kbps), then the Update Bearer Request if triggered with 1200 kbps.

Second Threshold Breach:

- As the GBR is increased to 1200 kbps, new upper threshold being monitored is 80% of 1200, that is, 960 kbps.
- On the next monitoring interval, if data-rate usage crosses 960 kbps, SAEGW again initiates the Update Bearer Request to upgrade the GBR values. These GBR values are upgraded to step-up by configured percentage value (20%). However, this 20% is of the base value, that is 1000, and not 1200 kbps. Hence, the increase is again by 200 kbps and the Update Bearer Request is 1400 kbps as the new GBR.

Important The step increase percentage is of the base(initial) value of the bearer and not the current negotiated value. The maximum value to which GBR can be stepped up is the configured MBR value.

Lower Threshold Breach

First Threshold Breach:

- Subscriber creates the dedicated bearer with QCI=qci1 with GBR as 1000 kbps with lower threshold is configured as 50%.
- Due to upper threshold breach, SAEGW has upgraded the GBR to 1400 kbps.
- When the usage on the bearer reduces below 700 kbps (50% of current GBR), SAEGW initiates the Update Bearer Request to downgrade the GBR. These GBR values are downgraded to step-down by configured value (say 20%), that is 1400 – 200 = 1200 kbps.

Important The step decrease percentage is of the base (initial) value of the bearer and not the current negotiated value. The GBR value will not be stepped down below the initial negotiated value.

Second Threshold Breach:

- As the GBR is decreased to 1200 kbps, the data decreases further to breach the new 50% lower threshold. That is, 50% of 1200 = 600 kbps.
- SAEGW initiates the Update Bearer Request to downgrade the GBR values to step down by configured value (20%). That is, 1200 – 200 = 1000 kbps.

Limitations and Restrictions

This section provides limitations and restrictions of this feature.

- The SAEGW monitors the bearer bandwidth on every 30-seconds interval.
- If GBR usage exceeds a configurable percentage of a configured threshold, SAEGW initiates a bearer modification procedure. SAEGW initiates this procedure with a bearer QoS update using an upper bound configured value. eNB and UER adjust GBR accordingly.
- If GBR usage falls below a configurable percentage of a configured threshold, SAEGW initiates a bearer modification procedure. This bearer modification procedure is initiated with a Bearer QoS update using a lower bound configured value. eNB and UER adjust GBR accordingly.
- In case multiple rules are configured on the same bearer, then QoS is enforced from the current negotiated bearer values. The individual values under charging action corresponding to the ruledef are not honored if this feature is enabled on the bearer.

- For the monitored bearer, if the bit rate is modified or rule is deleted, then the base value of GBR is changed. This change in base value of GBR leads to change in the step-up or step-down values.
- Session recovery and ICSR are supported.
- The step-up and step-down values are calculated as per the base values of the GBR of the bearer and not the current GBR applied on the bearer.

Configuring Dedicated GBR Bearer

This section provides the configuration commands added for this feature.

In addition to this, the following new configurations must be enabled.

1. Lower bound GBR (in %) to determine which GBR value to step-down.
2. Upper bound GBR (in %) to determine which GBR value to step-up.
3. Step-up the threshold (in %).
4. Step-down the threshold (in %). This value must be less than step-up threshold.

trigger

New CLI keywords **bearer-creation** and **monitor-bearer-bandwidth** have been added to this CLI command. The keyword **bearer-creation** triggers for every new bearer created. The keyword **monitor-bearer-bandwidth** triggers whenever the bearer bandwidth is evaluated.

```
configure
    active-charging service <service_name>
       service scheme <service_scheme_name>
          [ no ] trigger {  bearer-creation | flow-create | loc-update |
 monitor-bearer-bandwidth |  sess-setup }
         end
```

Notes:

This CLI is disabled by default.

- **no**: If previously configured, deletes the specified configuration.
- **bearer-creation**: Triggers for every new bearer.
- **flow-create**: Triggers for every new flow.
- **loc-update**: Triggers whenever location changes for the subscriber.
- **sess-setup**: Triggers at the session setup.
- **monitor-bearer-bandwidth**: Triggers whenever bearer bandwidth is evaluated.

committed-data-rate

This CLI command has been added under the ACS Trigger Condition configuration mode to configure the committed data rate of the current negotiated value.

```
configure
    active-charging service <service_name>
       trigger-condition <trigger_condn_name>
          [ no ] committed-data-rate { lower_threshold <value_in_percentage>
| upper_threshold <value_in_percentage> }
          end
```

Notes:

- **no**: Disables the committed data rate of the current negotiated value.
- **committed-data-rate**: Specifies the committed data rate of the current negotiated value.
- **lower threshold**: Configures the threshold as a percentage of the current negotiated value.
- **upper threshold**: Configures the threshold as a percentage of the current negotiated value.
- *value_in_percentage*: Specifies the percentage of initial configured committed-data-rate value. This is an integer value of 0 to 100.

step-up

This new CLI command has been added to the ACS Trigger Action Configuration mode to step up the value of committed data rate.

```
configure
    active-charging service <service_name>
       trigger-action <trigger_action_name>
          [ no ] step-up committed-data-rate <negotiated_value>
          end
```

Notes:

- **no**: If previously configured, deletes the specified configuration.
- **step-up** : Steps up the value of committed data rate by the percentage defined in the *negotiated_value*.
- **committed-data-rate**: Defines the committed data rate.

  negotiated_value: Specifies the percentage of initial configured committed-data-rate value. This is an integer value of 0 through 100.

step-down

This new CLI command has been added to the ACS Trigger Action Configuration mode to step down the value of committed data rate.

```
configure
```

```
active-charging service <service_name>
  trigger-action <trigger_action_name>
     [ no ] step-down committed-data-rate <negotiated_value>
     end
```

Notes:

- **no**: If previously configured, deletes the specified configuration.
- **step-down**: Steps down the value of the committed data rate by the percentage defined in the *negotiated_value*.
- **committed-data-rate**: Defines the committed data rate.

  negotiated_value: Specifies the percentage of initial configured committed-data-rate value. This is an integer value of 0 through 100.

Sample Configuration

This section lists the sample configuration of the CLI commands used in this feature.

```
config
  active-charging service ACS
  trigger-action ta1
      step-up  committed-data-rate  20
    exit
  trigger-action ta2
     step-down committed-data-rate  30
    exit
    trigger-condition tc1
      qci = 1
      committed-data-rate upper-threshold 80
    exit
    trigger-condition tc2
      qci = 1
      committed-data-rate lower-threshold 50
    exit
    service-scheme scheme1
      trigger monitor-bandwidth
        priority 1 trigger-condition tc1 trigger-action ta1
        priority 2 trigger-condition tc2 trigger-action ta2
      exit
    subs-class class1
      any-match = TRUE
    exit
    subscriber-base base1
      priority 1 subs-class class1 bind service-scheme scheme1
    exit
exit
```