



QoS Profile Support

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Feature Description

Release 19.2 introduces the MME "QoS Profile" feature for support of Quality of Service (QoS) profiles and Bearer Control profiles. The QoS profile can be defined for a given APN for EPS or 4G subscribers. One or more Bearer Control profiles can be associated to a QoS profile on the basis of a QoS class identifier (QCI) or a range of QCI. Together, these profiles allow PDN-level and bearer-level control of APN-AMBR and QoS parameters received from an HSS and/or a PGW.

A QoS profile is defined by:

- a list of bearers to be rejected based on QCI, and
- operator-provided values for capping AMBR (UL and DL).

Bearer Control profile is defined by:

- remapping matrix for QCI,
- operator-provided values for capping ARP PL/PCI/PVI, and
- operator-provided values for capping MBR and GBR (UL and DL).



Important For Release 19.2, this feature is released with a feature license that will not be enforced until Release 20.0.

How It Works

Operational Controls

The MME provides the flexibility to configure a Quality of Service (QoS) profile for an APN and multiple Bearer Control profiles to associate with the QoS profile.

Profile Controls

QoS profile allows control of

- PDN-level QoS parameters, such as APN-AMBR,
- rejection of bearers based on QCI or range of QCI.

Bearer Control profile allows control of

- bearer-level QoS parameters such as ARP, ARP-PVI, ARP-PCI, MBR, and GBR, as well as the action to be taken, such as prefer-as-cap or pgw-upgrade
- remapping a QCI value for default and/or dedicated bearer, and pgw-upgrade action for QCI

Notes:

- For default bearer, the QCI of the bearer is initially determined by the subscription from the HSS or the value received from the peer-MME/S4-SGSN during inbound relocation.
- For dedicated bearer, the QCI of the bearer is initially determined by the QCI value received from the PGW during dedicated bearer activation or the value received from the peer-MME/S4-SGSN
- One or more Bearer Control profiles can be associated with a QoS profile for a specific QCI or a range of QCIs

Backward Compatibility

When a QoS Profile is associated to an APN profile for an EPS network then all QoS parameter configurations are taken from the QoS profile and override the APN profile QoS configurations. However, if there is no QoS profile for the given APN in EPS network, then QoS control falls back to the QoS configuration contained in the APN profile.

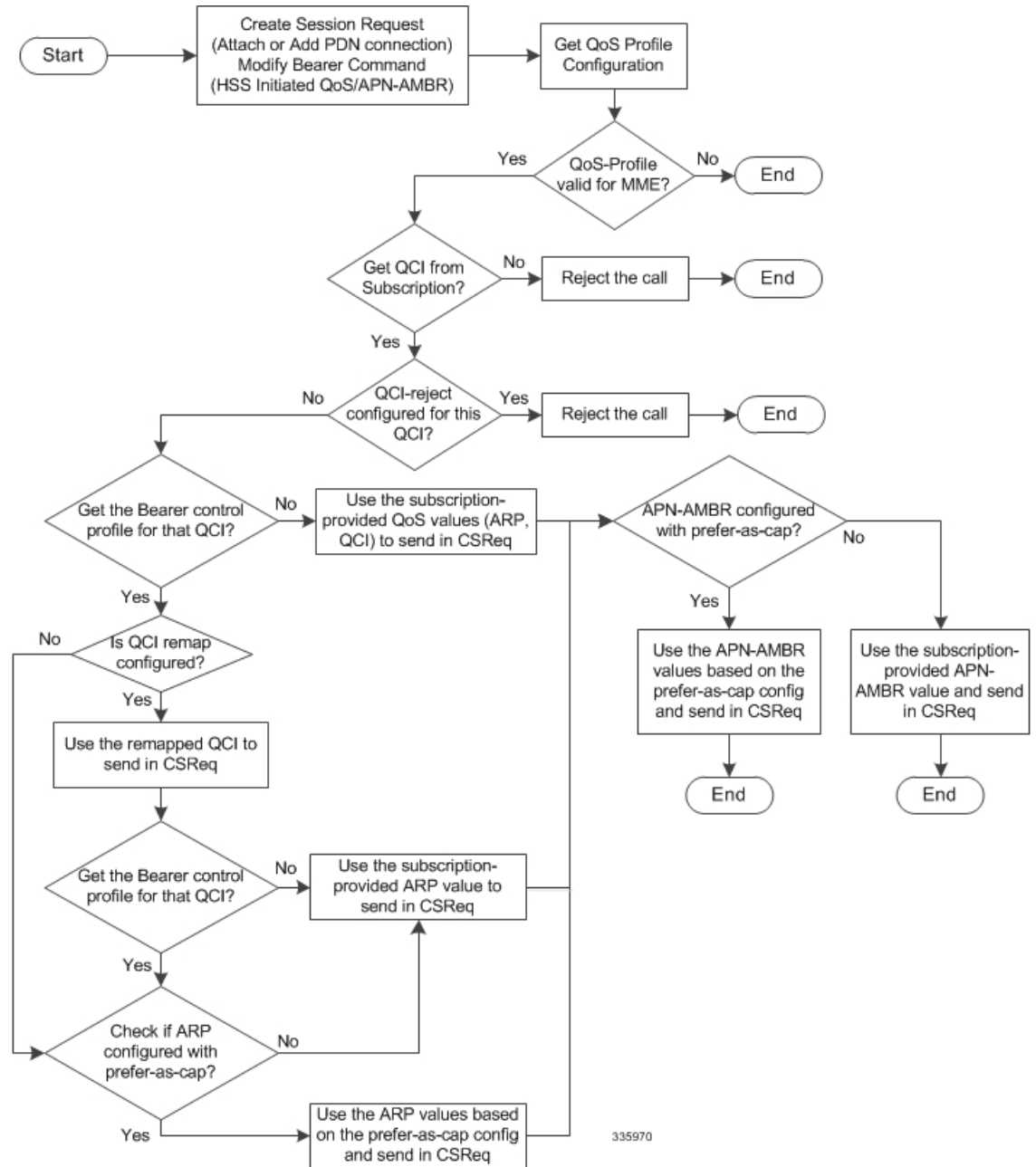
Flow for 4G QoS Control on Subscribed QoS Received from HSS

With this feature, the MME can override the EPS QoS profile (QCI, ARP) and APN-AMBR UL/DL received from the HSS, before applying the QoS to a Default Bearer (to be established or modified due to HSS). The overridden EPS QoS is sent in a Create Session Request message for either an Attach or an Additional PDN Connectivity procedure or in a Modify Bearer Command message in the case of an HSS-initiated QoS modification procedure. The following controls are available in MME QoS profile and Bearer Control profile for default bearers:

- Reject any default/dedicated bearers based on QCI
- Apply QCI Remapping
- Use operator-provided configured values for ARP (PL/PCI/PVI) and APN-AMBR instead of subscription or the minimum of the two (operator-provided and HSS) or reject if subscription exceeds operator-provided configured values.

The following diagram illustrates how QoS control is applied after QoS data is received from the HPLMN HSS over the S6a interface.

Figure 1: Flow for 4G QoS Control on Subscribed QoS Received from HSS



Flow for 4G QoS Control on QoS Received from PGW for non-GBR Default and Dedicated Bearers

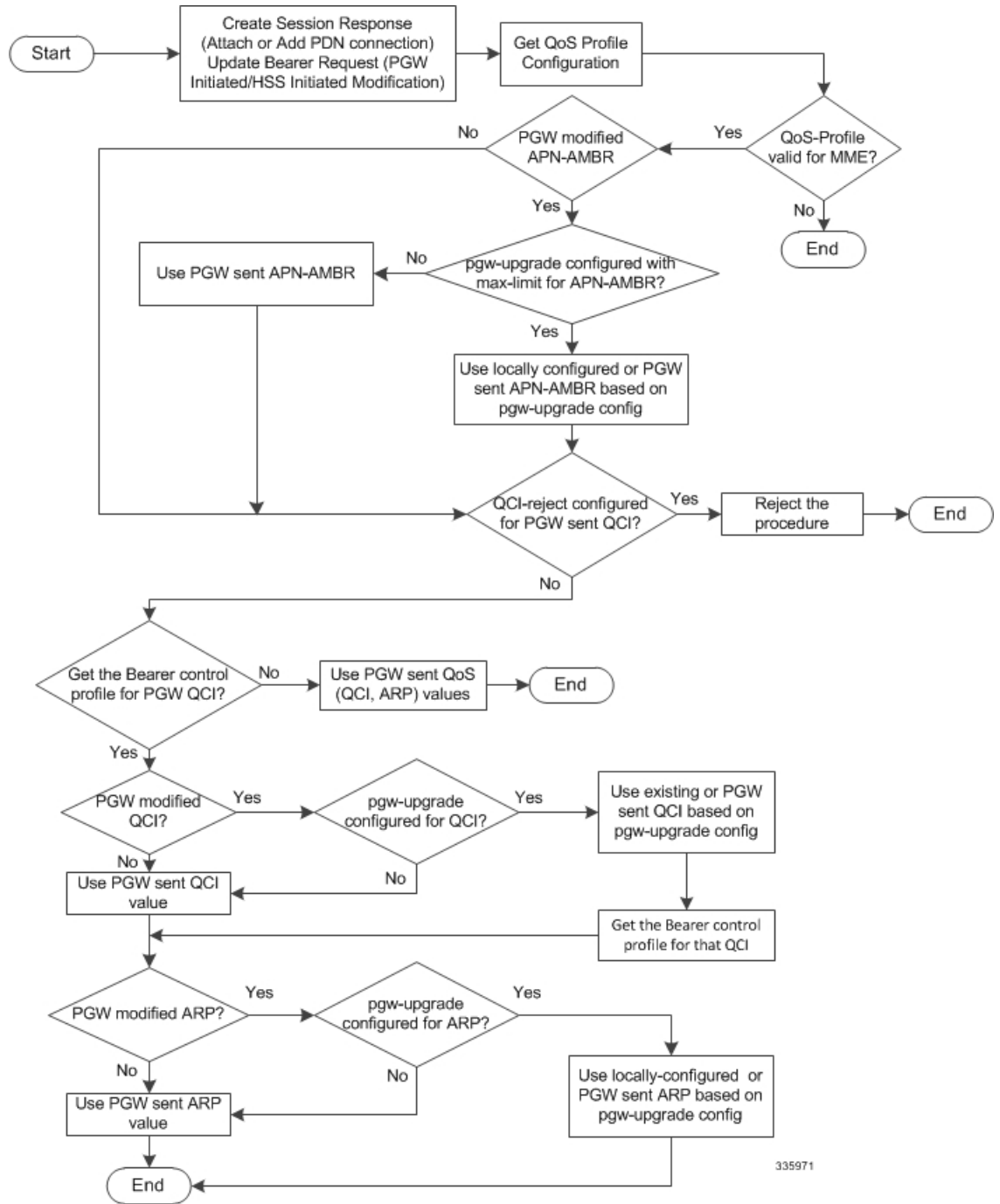
The MME can control EPS Bearer QoS (QCI, ARP) and APN-AMBR UL/DL that is received from the PGW (via SGW) in a Create Session Response or a Create/Update Bearer procedure that has been initiated by the PGW. The QoS control is applied and the resultant QoS is sent towards the UE in E-RAB modify message.

The following controls are available in MME QoS profile or Bearer Control profile for default/dedicated bearers:

- If QCI provided by the PGW is in the QCI-reject list, reject the procedure.
- Apply QCI Remapping (only for Create Bearer procedure)
- Use operator-provided values for ARP (PL/PCI/PVI) and APN-AMBR instead of PGW values or the minimum of the two (operator-provided and PGW) or reject if PGW provided value exceeds operator-provided values.

The following diagram illustrates how QoS control is applied after QoS data is received from the HPLMN PGW during Create Session Response or Update Bearer Request:

Figure 2: Flow for 4G QoS Control on QoS Received from PGW for non-GBR Default and Dedicated Bearers



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Flow for 4G QoS Control on QoS Received from PGW for GBR Dedicated Bearers

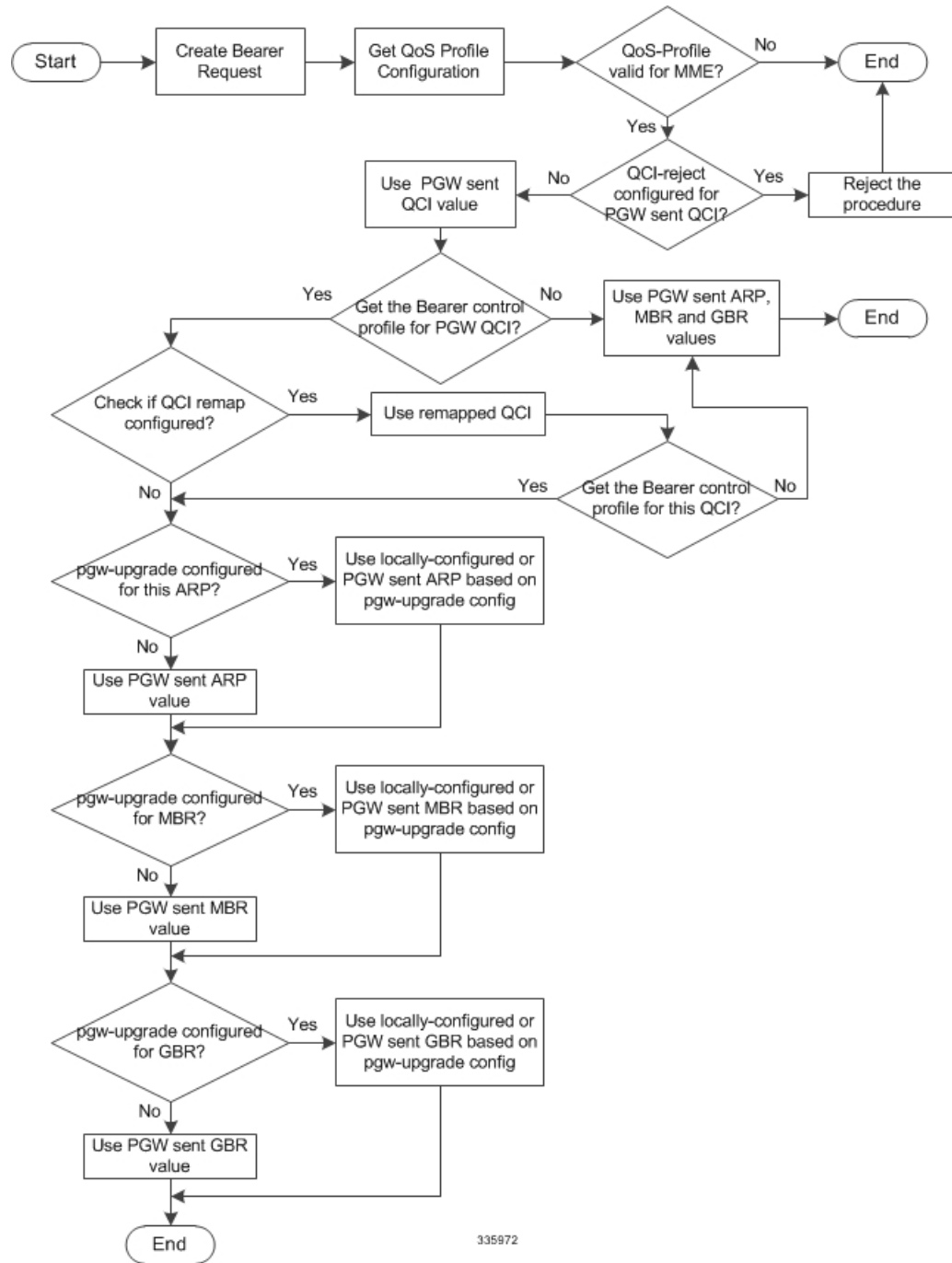
The MME can also control the EPS Bearer QoS (QCI, ARP) and MBR/GBR UL/DL received from the PGW (via SGW) in Create/Update Bearer procedures initiated by the PGW. The QoS control is applied and the

resultant QoS is sent towards the UE in an E-RAB Setup/Modify message. The following controls are available in MME QoS profile or Bearer Control profile for dedicated bearers:

- If QCI provided by the PGW is in the QCI-reject list, reject the procedure.
- Apply QCI Remapping (only for Create Bearer procedure)
- Use operator-provided values for ARP (PL/PCI/PVI), MBR and GBR instead of PGW values or the minimum of the two (operator-provided and PGW) or reject if PGW provided value exceeds operator-provided values.

The following diagram illustrates how QoS control is applied after QoS data is received from the HPLMN PGW during Create Bearer Request:

Figure 3: Flow for 4G Control on QoS Received from PGW for GBR Dedicated Bearers



Limitations

- Currently, 4G QoS controls are not applied during hand-off scenarios for dedicated bearers.
- Bearer-level QoS parameters are part of the Bearer Control profile, which is selected based on QCI. If subscription does not provide QCI, then the Bearer Control profile lookup fails resulting in Attach failure.

Standards Compliance

The QoS profile functionality complies with the following standard:

3GPP TS 23.401 v 12.0.0, Section 4.7.2.1

Configuring QoS Profile and Bearer Control Profile

There are multiple components that need to be configured to take full advantage of all aspects of this feature:

- [Creating the QoS Profile, on page 8](#)
- [Creating the Bearer Control Profile, on page 8](#)
- [Mapping QCI or QCI Range to the Bearer Control Profile, on page 9](#)
- [Configuring Rejection of Bearer Establishment per QCI, on page 10](#)
- [Configuring APN-AMBR Capping, on page 11](#)
- [Configuring ARP / GBR / MBR / QCI Capping for Dedicated/Default Bearers, on page 11](#)
- [Verifying the Configuration for the QoS Profile , on page 15](#)
- [Verifying the Configuration for the Bearer Control Profile , on page 15](#)
- [Associating the QoS Profile with an APN Profile, on page 16](#)
- [Verifying the Association Configuration, on page 16](#)



Important During configuration, to avoid the requirement to enter **-noconfirm** each time you create an entity (e.g., a profile), enter **autoconfirm** from the Global Configuration mode.

Creating the QoS Profile

This command is now available for the use of the MME in the Global Configuration mode. This command enables the operator to create and configure an instance of a QoS profile for the MME.

```
configure
  quality-of-service-profile qos_profile_name
end
```

Notes:

- *qos_profile_name* - The defined value identifies the name of the QoS profile being created for the MME. The name must be an alphanumeric string of 1 through 100 characters and we recommend that the profile name be unique for the system. This profile name will be needed for other configuration tasks. The system enters the QoS Profile configuration mode and presents the following prompt:
[local]host_name(quality-of-service-profile-qos_profile_name)#.
- Multiple QoS parameters can be configured for the QoS profile. Refer to the *QoS Profile* section of the *Command Line Interface Reference* for command information.

Creating the Bearer Control Profile

This command is new in the Global Configuration mode. This command enables the operator to create and configure an instance of a Bearer Control profile as part of the MME QoS Profile feature.


```

configure
  bearer-control-profile bc_profile_name
end

```

Notes:

- *bc_profile_name* - The defined value identifies the name of the Bearer Control profile being created for the MME. The name must be an alphanumeric string of 1 through 64 characters and we recommend that the profile name be unique for the system. This profile name will be needed for other configuration tasks. The system enters the Bearer Control Profile configuration mode and presents the following prompt: `[local]host_name(bearer-control-profile-bc_profile_name)#`.
- The Bearer Control Profile configuration mode provides commands to configure QoS parameters for dedicated bearers (see **dedicated-bearer** section below) and for default bearers (see **default-bearer** section below).
- Bearer level parameters such as ARP-PL, ARP-PVI, ARP-PCI, MBR, GBR, remap QCI value can be configured here independently for default/dedicated bearer along with the action to be taken, such as prefer-as-cap or pgw-upgrade.. Bearer Control profile can be applied for specific QCIs or range of QCIs.

Mapping QCI or QCI Range to the Bearer Control Profile

Use the new **associate** command in Quality of Service Profile configuration mode to associate the Bearer Control profile with the QoS profile and map a specific QCI or a range of QCI to the Bearer Control profile being associated with the QoS profile.

```

configure
  quality-of-service-profile qos_profile_name
    associate bearer-control-profile bc_profile_name qci qci_value [ to
end_qci_value ]
    remove associate bearer-control-profile bc_profile_name
  end

```

Notes:

- *qos_profile_name* - Identifies the name of the QoS profile.
- *bc_profile_name* - Identifies the name of the Bearer Control profile being associated with the QoS profile.
- **qci** - Identifies either a specific QoS class identifier (QCI) or a range of QCI:
 - *qci_value* - Enter an integer from 1 through 9 to identify a specific QCI.
 - **to** *end_qci_value* - Type "to" and then enter an integer from 2 through 9 that is greater than the QCI value entered for the beginning of the range.
- A specific QCI cannot be associated to more than one bearer control profile. The QCI of the bearer is used to identify the applicable bearer control profile.
 - For dedicated bearer, the QCI of bearer is initially determined by the QCI value received from PGW during dedicated bearer activation or the value received from peer MME/S4-SGSN.
 - For default bearer, the QCI of bearer is initially determined by the subscription from HSS or the value received from peer MME/S4-SGSN during inbound relocation.
- To delete the Bearer Control profile association with the QoS profile, issue the following command:

```

remove associate bearer-control-profile bc_profile_name

```

Earlier, MME rejected SRVCC procedures if a QCI value is not received from the subscription when a QoS profile is available. A new CLI **qci-when-missing-in-subscription** is added to the Quality of Service Profile

Configuration mode to assign a default QCI value when a QCI value is not received from the subscription. If this CLI is enabled, the configured QCI value is used as a default value for an available QoS profile.

A default QCI value can be assigned using the following configuration:

```
configure
  quality-of-service-profile profile_name
    [ remove ] qci-when-missing-in-subscription qci_value
  end
```



Note

- By default, this command is not enabled.
- **remove** disables its following configuration.
- **qci-when-missing-in-subscription** is used to assign a default QCI value when no value is received from the subscription for an available QoS profile.
-

Configuring Rejection of Bearer Establishment per QCI

Use the new **qci-reject** command in Quality of Service Profile configuration mode to identify a specific QCI or a range of QCI for which the MME must reject bearer establishment or modification.

```
configure
  quality-of-service-profile qos_profile_name
    qci-reject { default-bearer | dedicated-bearer } qci qci_value [ to
end_qci_value ]
    remove qci-reject
  end
```

Notes:

- *qos_profile_name* - Identifies the name of the QoS profile.
- **dedicated-bearer qci** - Identifies either a specific QoS class identifier (QCI) or a range of QCI for the dedicated-bearer:
 - *qci_value* - Enter an integer from 1 through 9 to identify a specific QCI.
 - **to end_qci_value** - Type "to" and then enter an integer from 2 through 9 that is greater than the QCI value entered for the beginning of the range.
- **default-bearer qci** - Identifies either a specific QoS class identifier (QCI) or a range of QCI for the default-bearer:
 - *qci_value* - Enter an integer from 5 through 9 to identify a specific QCI.
 - **to end_qci_value** - Type "to" and then enter an integer from 6 through 9 that is greater than the QCI value entered for the beginning of the range.
- The MME can reject default-bearers and dedicated-bearers based on QCI received from the subscription or the peer-MME/S4-SGSN during inbound relocation or the Create Session Response / Update Bearer Request / Create Bearer Request procedure.
- To delete the QCI rejection configuration issue the following command:


```
remove qci-reject
```

Configuring APN-AMBR Capping

Use the **apn-ambr** command in Quality of Service Profile configuration mode to set local values for capping type and action to be taken for APN-AMBR.

configure

```

quality-of-service-profile qos_profile_name
  apn-ambr max-ul max_ul_val max-dl max_dl_val { pgw-upgrade | prefer-as-cap
} { local | minimum | rej-if-exceed }
  remove apn-ambr
end

```

Notes:

- This keyword **max-ul** sets the local value for the maximum uplink bitrate. *max_ul_val* must be an integer from 0 through 1410065408.
- This keyword **max-dl** sets the local value for the maximum downlink bitrate. *max_dl_val* must be an integer from 0 through 1410065408.
- This command sets the QoS capping mechanism to be applied for APN-AMBR received from HSS/PGW/peer-node. One or both **prefer-as-cap** and/or **pgw-upgrade** must be configured to override the default behavior, which is to accept the received value from the HSS/peer-node/PGW.
- **prefer-as-cap** - This keyword configures the capping that is applied on the subscription value received from the HSS or the value received from the peer-node (MME/S4-SGSN) during inbound relocation. One of the following actions must be configured under **prefer-as-cap** -- Note that the resulting value is used for the QoS parameter and sent in the Create Session Request or the Modify Bearer Command (in case of HSS-initiated QoS/APN-AMBR modification) message:
 - **local** - The configured local value will be used.
 - **minimum** - The minimum (lowest) value of the configured local value or the HSS-provided value will be used.
 - **reject-if-exceed** - The request/procedure is rejected if the HSS-provided value exceeds the configured local value.
- **pgw-upgrade** - This keyword configures the QoS capping to be applied on the values received from the PGW during Attach / PDN-connectivity / Bearer-creation / Bearer-modification procedures. One of the following actions must be configured under **pgw-upgrade** -- Note that the resulting value is used for the QoS parameter and sent to the UE:
 - **local** - The configured local value will be used.
 - **minimum** - The minimum (lowest) value of the configured local value or the PGW-provided value will be used.
 - **reject-if-exceed** - The request/procedure is rejected if the PGW-provided value exceeds the configured local value.
- To delete the APN-AMBR capping configuration issue the following command:


```
remove apn-ambr
```

Configuring ARP / GBR / MBR / QCI Capping for Dedicated/Default Bearers

The **dedicated-bearer** and **default-bearer** commands, in the Bearer Control Profile configuration mode, configure the QoS control parameters separately for the default-bearers and dedicated-bearers. The

operator-provided values are configured for ARP-PL, ARP-PCI, ARP-PVI, MBR, GBR, and QCI, along with their prefer-as-cap or pgw-upgrade capping

```

configure
  bearer-control-profile bc_profile_name
    dedicated-bearer { arp { preemption-capability |
preemption-vulnerability | priority-level } pgw-upgrade | gbr gbr-up
gbr_up_value gbr-down gbr_down_value pgw-upgrade | mbr mbr-up mbr_up_value mbr-down
mbr_down_value pgw-upgrade | qci { remap | pgw-upgrade { local | minimum |
rej-if-exceed } } }
    default-bearer { arp { preemption-capability |
preemption-vulnerability | priority-level } { prefer-as-cap | pgw-upgrade
} { local | minimum | rej-if-exceed } | qci { remap | pgw-upgrade {
local | minimum | rej-if-exceed } } }
    remove { dedicated-bearer | default-bearer } { arp | gbr | mbr |
qci }
  end

```

Notes:

- Repeat the commands with different keywords to configure as many parameters as needed.
- The command **dedicated-bearer** sets the capping for the dedicated-bearer with the following parameters.
- The command **default-bearer** sets the capping for the default-bearer with the following parameters.
- The **arp** keyword configures the allocation and retention priority parameters:
 - **preemption-capability** - Enter an integer, either **0** (may) to specify that this bearer may pre-empt other lower priority bearers if required, or **1** (shall-not) to specify that this bearer shall not pre-empt other lower priority bearers.
 - **preemption-vulnerability** - Enter an integer, either **0** (pre-emptible) to specify that this bearer is pre-emptible by other high priority bearers, or **1** (not-pre-emptible) to specify that this bearer is not pre-emptible by other high priority bearers.
 - **priority-level** - Enter an integer 1 through 15, with 1 as the highest priority, to specify the allocation/retention priority level.
- The **pgw-upgrade** keyword can be included in the command with any of the other keywords. It identifies the capping mechanism to be used when QoS parameters are received from the PGW and the options include:
 - **local** - Instructs the MME to select locally configured values for QoS capping.
 - **minimum** - Instructs the MME to select the lower value, of the two values locally configured or received value, to use as the QoS capping value.
 - **rej-if-exceed** - Instructs the MME to reject the call if the received value exceeds the locally configured value.
- The **prefer-as-cap** keyword identifies the capping mechanism to be used when QoS parameters are received from the HSS and the options include:
 - **local** - Instructs the MME to select locally configured values for QoS capping.
 - **minimum** - Instructs the MME to select the lower value, of the two values locally configured or received value, to use as the QoS capping value.
 - **rej-if-exceed** - Instructs the MME to reject the call if the received value exceeds the locally configured value.

- The **gbr** keyword configures the Guaranteed Bit Rate values. This keyword is only used for the dedicated-bearer configuration.
 - **gbr-up** - Enter an integer from 1 though 256000 to identify the desired uplink data rate in kbps.
 - **gbr-down** - Enter an integer from 1 though 256000 to identify the desired downlink data rate in kbps.
- The **mbr** keyword configures the Maximum Bit Rate values. This keyword is only used for the dedicated-bearer configuration.
 - **mbr-up** - Enter an integer from 1 though 256000 to identify the desired uplink data rate in kbps.
 - **mbr-down** - Enter an integer from 1 though 256000 to identify the desired downlink data rate in kbps.
- The **qci remap** keyword maps an incoming QCI or a range of QCI to a configured QCI or range of QCI. QCI remap is the first configuration that is applied, among the bearer profile configuration, and it is applicable only during Create Session Request and Create Bearer Request procedures. The bearer control profile associated to the remapped QCI value is used for capping the remaining QoS parameters. Enter an integer from 1 through 9.
- Use the following command to delete either the default-bearer or dedicated bearer configuration:


```
remove { dedicated-bearer | default-bearer } { arp | gbr | mbr | qci }

```
- **QoS Computation** - The following explains how the resultant QoS values are derived for the **minimum** and **reject-if-exceed** actions configured under **prefer-as-cap** or **pgw-upgrade**.

- **QCI**

- Every standard GBR/non-GBR QCI is associated with a priority level as per 3GPP TS 23.203 v12.10.0, Table 6.1.7.

QCI	Resource Type	Priority
1	GBR	2
2	GBR	4
3	GBR	3
4	GBR	5
5	non-GBR	1
6	non-GBR	6
7	non-GBR	7
8	non-GBR	8
9	non-GBR	9

- Priority Level 1 has the highest priority and in case of congestion lowest priority level traffic would be the first to be discarded.
- **minimum**: The QCI with lower priority level will be used.
- **rej-if-exceed**: If the received QCI has higher priority level than the configured local QCI, then the procedure will be rejected.

- **ARP Priority Level**

- ARP Priority level decreases on increasing value (1 to 15). ARP Priority level 1 has the highest priority value.
- **minimum**: The lower ARP Priority level (i.e. higher value) will be used.
- **rej-if-exceed**: If the received ARP Priority level is higher (i.e. value is lesser) than the CLI configured local ARP Priority level, then the procedure will be rejected.

• ARP-PCI

- Pre-emption capability indicator can have either of the following two values, where may (0) > shall-not (1)
 - *may* - specifies that this bearer may pre-empt other lower priority bearers, if required
 - *shall-not* - specifies that this bearer shall-not pre-empt other lower priority bearers.
- Following table indicates the resultant pre-emption capability for the *minimum* prefer-as-cap or pgw-upgrade

Received value	Configured local value	Resultant value to be used
may	may	may
may	shall-not	shall-not
shall-not	may	shall-not
shall-not	shall-not	shall-not

- *rej-if-exceed*: If the received ARP-PCI value is *may* and the configured local value is *shall-not*, then the procedure will be rejected.
- Default value set by MME if not provided by HSS/PGW : *shall-not*

• ARP-PVI

- Pre-emption vulnerability indicator can have either of the following two values, where *not-pre-emptible* (1) > *pre-emptible* (0)
 - *pre-emptible* - specifies that this bearer is pre-emptible by other high priority bearers
 - *not-pre-emptible* - specifies that this bearer is NOT pre-emptible by other high priority bearers
- Following table indicates the resultant pre-emption vulnerability for the *minimum* prefer-as-cap or pgw-upgrade:

Received value	Configured local value	Resultant value to be used
pre-emptible	pre-emptible	pre-emptible
pre-emptible	not-pre-emptible	pre-emptible
not-pre-emptible	pre-emptible	pre-emptible
not-pre-emptible	not-pre-emptible	not-pre-emptible

- *rej-if-exceed*: If the received ARP-PVI value is *not-pre-emptible* and the configured local value is *pre-emptible*, then the procedure will be rejected.
- Default value set by the MME if not provided by the HSS/PGW : *pre-emptible*

• MBR / GBR

- *minimum*:
 - Uplink - The lower of the values, comparing the received values and the configured local value, will be used for APN-AMBR/MBR/GBR.
 - Downlink - The lower value of the received value and configured local value will be used for APN-AMBR/MBR/GBR.
- *rej-if-exceed*: If the received Uplink value is greater than the configured local Uplink value or the received Downlink value is greater than the configured local Downlink value, then the procedure will be rejected.

Verifying the Configuration for the QoS Profile

Use the **show quality-of-service-profile full all | name *profile_name*** command to view the configuration created for the QoS capping:

```
[local]MME# show quality-of-service-profile full all
Quality of Service (QoS) Profile Name      : mmeQoS1
Quality of Service Capping
  Prefer Type                               : Not ConfiguredQoS APN-AMBR:
QoS APN-AMBR                               :
  Max uplink                               : 3444
  Max downlink                             : 5266
  prefer-as-cap                             : rej-if-exceed
```

Verifying the Configuration for the Bearer Control Profile

Use the **show bearer-control-profile full all | name *bcprofile_name*** command to view the configuration created for the Bearer Control profile:

```
Bearer Control Profile Name: bcprofile_name
Default Bearer:
  QCI Remap Value : <val>
  QCI pgw-upgrade : local/minimum/rej-if-exceed
  ARP Priority Level : <val>
  prefer-as-cap : local/minimum/rej-if-exceed
  pgw-upgrade : local/minimum/rej-if-exceed
  ARP Preemption Capability : 0/1
  prefer-as-cap : local/minimum/rej-if-exceed
  pgw-upgrade : local/minimum/rej-if-exceed
  ARP Preemption Vulnerability: 0/1
  prefer-as-cap : local/minimum/rej-if-exceed
  pgw-upgrade : local/minimum/rej-if-exceed

Dedicated Bearer:
  MBR UP : <val> Kbps MBR DOWN: <val> Kbps
  pgw-upgrade : local/minimum/rej-if-exceed
  GBR UP : <val> Kbps GBR DOWN: <val> Kbps
  pgw-upgrade : local/minimum/rej-if-exceed
  QCI Remap Value : <val>
  QCI pgw-upgrade : local/minimum/rej-if-exceed
  ARP Priority Level : <val>
  pgw-upgrade : local/minimum/rej-if-exceed
  ARP Preemption Capability : 0/1
  pgw-upgrade : local/minimum/rej-if-exceed
  ARP Preemption Vulnerability : 0/1
  pgw-upgrade : local/minimum/rej-if-exceed
```

Associating the QoS Profile with an APN Profile

Use the **associate** command in the APN Profile Configuration Mode to associate the MME's QoS profile with an APN profile. A new option, **eps**, has been provided for the **access-type** keyword to indicate the QoS profile supports 4G/EPS network requirements.

configure

```
apn-profile apn_profile_name
  associate quality-of-service-profile qos_profile_name access type eps
  remove associate quality-of-service-profile access type eps
end
```

Notes:

- *qos_profile_name* This value identifies the name of the QoS profile for the MME. The name must be an alphanumeric string of 1 through 100 characters and we recommend that the profile name be unique for the system.



Important Only one QoS profile for the MME can be associated with a single APN profile.

- The **eps** option for the **access-type** keyword associates the EPS network-type with this QoS profile. Selecting this type is required to enable the MME QoS Profile support functionality.
- To delete the QoS profile association with the APN profile, issue the following command:


```
remove associate quality-of-service-profile access-type eps
```
- For additional information about the **apn-profile** commands and the QoS parameters that can be configured under the APN profile, refer to the section on *APN Profile Configuration Commands* in the *Command Line Interface Reference*.



Important Once the MME's QoS profile is configured, these QoS parameter values override the QoS configurations in the APN profile.



Important The APN profile, hence the QoS profile, will not be valid until the APN profile is associated with an operator policy via the **apn** command . For more information, refer to the *Operator Policy Configuration Mode* section in the *Command Line Interface Reference*

Verifying the Association Configuration

Use the **show apn-profile full { all | name *apn_profile_name* }** to verify the association of the MME's QoS profile with the APN profile. The output of this command will provide information similar to the following:

```
[local]MME# show apn-profile full all
APN Profile Name                : apnprof3
Associated Quality of Service Profile Name (EPS) : MMEqos
Validity                         : Invalid
Resolution Priority              : dns-fallback
```


Note that the Validity is "Invalid". This will switch to "Valid" once the QoS profile is associated with an APN profile.

Monitoring and Troubleshooting the QoS/Bearer Control Profiles

This section indicates how to troubleshoot the QoS profile and/or the Bearer Control profiles.

The MME sends out the QoS parameters (QCI, ARP, APN-AMBR/MBR, GBR) values based on the configuration from QoS and Bearer Control profiles in the following GTPv2 messages during bearer creation/modification/pdn connectivity/handover procedures:

- Create Session Request
- Modify Bearer Command
- Context Response
- Forward Relocation Request

The MME applies the 4G QoS control, based on the configuration from the QoS and Bearer Control profiles, over the received the QoS parameters (QCI, ARP, APN-AMBR or MBR, GBR) from the PGW/Peer node in the following GTPv2 messages during dedicated bearer creation/pgw-initiated QoS modification for default or dedicated bearer:

- Create Session Response or Update Bearer Request or Create Bearer Request

However, if the QoS profile and Bearer Control profile configurations are not enforced in the above messages, verify the following:

- Ensure subscriber-map is configured properly, for the particular set of users and includes an associated operator policy.
- Ensure the APN profile has been created and associated with an operator policy.
- Ensure the QoS profile is created with the access type as "eps" and associated under the APN Profile.
- Ensure the Bearer Control profile is created with required QoS parameters for QCI value received from HSS/PGW and remapped QCI value, if applicable, and ensure the Bearer Control profile is associated under the QoS profile.

