



## Operator Specific QCI

This chapter describes the addition of new standardized QCI values and Operator Specific QCI values.

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### Feature Description

In Release 20.0, MME has been enhanced to support new standardized QCIs 65, 66, 69 and 70. Also, MME also supports operator specific (non-standard) QCIs from 128 to 254. The non-standard QCIs provides Operator Specific QoS for M2M and other mission critical communications.

The **operator-defined-qci** command under the QoS profile configuration is provisioned to enable or disable Operator Specific QCI. When enabled, MME accepts Operator Specific QCI values (128-254) both from HSS and PGW. If not enabled, MME will reject the procedure on receiving any Operator Specific QCI value.

Additionally, this chapter describes the mapping of operator specific QCIs to Pre-Release8 QoS parameters during a handover to UTRAN/GERAN.

The Operator Specific QCI Support feature is license controlled. Contact your Cisco Account or Support representative for information on how to obtain a license.

The Operator Specific QCI feature provides the following functionalities:

- MME provides a CLI to enable/disable 'operator-defined-qci' under QoS-Profile.
- Operator Specific QCI value ranges from 128 to 254.
- The new standardized QCI values 65, 66, 69 and 70 is accepted for configuration under all existing CLIs that involves QCI.
- QCI validation is performed during configuration to avoid invalid values.
- Existing QoS control on all bearers is extended to the new QCIs values. A specific QCI or a range of QCIs can be associated to a Bearer Control Profile under QoS-Profile. An operator specific QCI can be re-mapped to another QCI using this Bearer Control Profile. Bearer level parameters such as ARP, MBR, GBR values can be configured independently for default/dedicated bearer along with action such as **prefer-as-cap** or **pgw-upgrade** in the Bearer Control Profile.
- MME rejects the default/dedicated bearers with QCIs that are configured to be rejected under QoS-Profile.

- MME provides CLI configuration under the Bearer Control Profile to map Operator Specific QCI to Pre-Release8 QoS parameters or a standard QCI.
- The standardized QCI mapping is defined according to the TS 23.401 3GPP specification.
- Every Standard QCI GBR/Non-GBR is associated with a priority level as shown below:

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
65	GBR	0.7
66	GBR	2
69	Non-GBR	0.5
70	Non-GBR	5.5

- Priority Level 1 has the highest priority and in case of congestion lowest priority level traffic would be the first to be discarded.
- The operator specific QCIs from 128 to 254 shall have the lowest priority. These priority values are considered while deriving resultant QoS values for the Minimum and Reject-if-exceed actions configured in prefer-as-cap or pgw-upgrade
- The **paging-map** CLI is enhanced to accommodate QCI values - 65, 66, 69 and 70.
- The **qci-reject** CLI under QoS-Profile is modified to accept Operator Specific QCI values.



**Note** MME supports standardized QCIs from 1 to 9. It accepts the new standardized QCI values 69 and 70 for default bearer creation and 65, 66, 69 and 70 for dedicated bearer creation. Any other QCI value is considered invalid.

### Controlling Process Related QCI on S6A

Standardized Non-GBR QCI values 69 and 70, and operator specific QCI values in the range 128 to 254 enabled using the **operator-defined-qci** CLI under QoS-Profile is accepted from the subscription (HSS). If the CLI is not enabled, MME will reject all Operator Specific values.

### Controlling Process Related QCI on S11

Standardized QCI values 65, 66, 69 and 70, and operator specific QCI values in the range 128 to 254 enabled using the **operator-defined-qci** CLI under QoS-Profile is accepted from the S-GW. If the CLI is not enabled, MME will reject all Operator Specific values.



#### Note

- The **qci-reject** CLI under QoS profile can be used to reject any specific QCI value or a range of QCI values.
- Standardized QCI values are accepted even if the operator-defined-qci CLI is not enabled.

### Mapping of Operator Specific QCI to 3GPP Pre-Release QoS Parameters

Mapping of Operator Specific QCIs to Pre-Release8 QoS parameters is supported for successful handover of bearers to UTRAN/GERAN during handoff

A new CLI is implemented in MME to map standard or non-standardized QCI's to PreRelease8QoS parameters so that the bearers are transferred during a handover to Gn-Gp SGSN. The mapped QoS values would be sent in GTPv1 SGSN-Context-Response or Forward-Relocation-Request messages to peer SGSN.

One of the following values can be used to map EPC QoS from non-standard QCIs to 3GPP pre-release8 QoS:

- All pre-release8 QoS parameters.
- A standard QCI value (according to the mapping defined in 3GPP TS 23.401 standards).

To support mapping, a new CLI is added in the Bearer Control Profile Configuration Mode. If this configuration is not available, MME uses background class values as default, and maps the QCIs to the background class and its associated QoS parameters.

### Standards Compliance

The Non-Standard and Operator Specific QCI feature complies with the following standards:

- LTE; General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access (3GPP TS 23.401 version 12.8.0 Release 12).
- LTE; Quality of Service (QoS) concept and architecture (3GPP TS 23.107 version 12.0.0 Release 12).
- LTE; Policy and charging control architecture (3GPP TS 23.203 version 13.1.0).

## Configuring Operator Specific QCI

This section documents the configuration procedures for the Operator Specific QCI feature.

The following CLI enables Operator Specific QCI in MME. If this CLI is enabled, MME accepts the QCI range 128 - 254 from HSS and P-GW.

```
configure
  quality-of-service-profile profile_name
    [ remove ] operator-defined-qci
  end
```




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**Note**

- By default, this command is disabled.
  - **operator-defined-qci** enables Operator Specific QCI values.
  - **remove** disables the Operator Specific QCI configuration.
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The following CLI maps non-standardized QCIs to PreRelease8QoS parameters for transferring bearers during a handover to Gn-Gp SGSN:

```
configure
  bearer-control-profile profile_name
    [ remove ] { pre-rel8-qos-mapping { { class { background |
conversational | interactive | streaming } } { thp thp_value } { sig-ind
indicator_value } { src-stat-desc value } { min-transfer-delay value } { sdu
error-ratio value } } | qci value }
  end
```

**Note**

- **pre-rel8-qos-mapping** defines (MME) mapping of EPC QoS (non-standard QCIs) to 3GPP PreRelease8 QoS parameters.
- **qci** indicates the QoS class. Its value ranges from 1 to 9. When QCI is configured, the corresponding mapping takes place based on 3GPP TS 23.401.
- **class** indicates the UMTS traffic classified into the following categories:
  - **background**
  - **conversational**
  - **interactive**
  - **streaming**
- **thp** Traffic handling priority specifies the relative importance of handling all SDUs that belong to the UMTS bearer compared to the SDUs of other bearers. The priority value ranges from 1 to 3, where the value 1 holds the highest priority. The predefined thp value is 3
- **sig-ind** toggles the state of the signal. The values are either 0 or 1.
- **src-stat-desc** toggles the state of the signal. The values are either 0 or 1.
- **sdu error-ratio** Service Data Unit (SDU) Error ratio indicates the fraction of SDUs lost or detected as error packets. SDU error ratio is defined only for conforming traffic. The range is an integer ranging from 1 to 7. The ratio ranges from  $10^{-1}$  to  $10^{-6}$ . Allowed values are  $1(10^{-2})$ ,  $2(7*10^{-3})$ ,  $3(10^{-3})$ ,  $4(10^{-4})$ ,  $5(10^{-5})$ ,  $6(10^{-6})$  and  $7(10^{-1})$ . The predefined minimum value is 1.
- **min-transfer-delay** defines the maximum delay for 95th percentile of the delay distributed for all delivered SDUs during the lifetime of a bearer service. The delay value ranges from 10 to 40,000 milliseconds. The predefined minimum value is 100.  
The delay for an SDU is defined as the time from request to transfer and SDU at one SAP to its delivery at the other SAP.

## Monitoring and Troubleshooting Operator Specific QCI

This section provides information on how to monitor and troubleshoot the Non-Standard and Operator Specific QCI Support feature.

For information on troubleshooting, please refer to the Monitoring and Troubleshooting section in the *QoS Profile Support* chapter in the *MME Administration Guide*

### Non-Standard and Operator Specific QCI Support Show Command(s) and/or Outputs

Monitor the configuration of Non-Standard and Operator Specific QCI feature, by using the following command:

```
show quality-of-service-profile full all
```

On executing the above show command, the following new field is displayed:

- Operator Defined QCI

**show bearer-control-profile full all**

This command is used to display QoS parameters configured for mapping Operator Specific QCI to 3GPP Pre-Release8 parameters

On executing the above command, the following new fields are displayed:

- pre-rel8-qos-mapping
  - Class
  - traffic handling priority
  - sdu error ratio
  - minimum transfer delay
  - source stats descriptor
  - signaling indication
  - QCI value

**show mme-service statistics esm-only verbose**

A new counter is added to monitor Operator Specific QCIs. This command is used to display the total number of bearers using Operator Specific QCIs.

On executing the above command, the following fields are displayed:

Bearer Statistics:

All Bearers: 0 Connected Bearers: 0

Idle Bearers: 0

Bearers Using Operator-Specific QCI:

All Bearers: 0 Connected Bearers: 0

Idle Bearers: 0