

# Extended QCI Options

This chapter describes extended QCI functionality.


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# Per QCI Packet Drop Counters and ARP Granularity for QCI Level Counters

This section describes the Per QCI Packet Drop Counters and ARP Granularity for QCI Level Counters feature.

## Feature Description

This section describes the Per QCI Packet Drop Counters and ARP Granularity for QCI Level Counters feature.

### Support for QCI and ARP Visibility

As of StarOS release 20.2, the software has been enhanced to support the viewing of QoS statistics on a Quality of Service Class Index (QCI) and Allocation and Retention Priority (ARP) basis.

ARP is a 3GPP mechanism for dropping or downgrading lower-priority bearers in situations where the network becomes congested. The network looks at the ARP when determining if new dedicated bearers can be established through the radio base station. QCI is an operator provisioned value that controls bearer level packet forwarding treatments.

This enhancement enables operators to monitor QoS statistics that identify multiple services running with the same QCI value. In addition, packet drop counters have been introduced to provide the specific reason the Enhanced Charging Service (ECS) dropped a packet. The packet drop counters provide output on a per ARP basis. This provides additional information that operators can use to troubleshoot and identify network issues that may be affecting service.

**Important** For the ARP value only the priority level value in the Allocation/Retention Priority (ARP) Information Element (IE) is considered. Pre-emption Vulnerability (PVI) and Pre-emption Capability (PCI) flags in the ARP IE are not considered.

The existing **show apn statistics name** *apn-name* and **show apn statistics** *Exec Mode* CLI commands have been enhanced. The output of these commands now provides visibility for QoS statistics on a QCI/ARP basis.

### Licensing

**Important** ARP Granularity for QCI Level Counters is a license-controlled feature. Per QCI Packet Drop Counters functionality does not require a license. Contact your Cisco account or support representative for licensing details.

# Configuring ARP Granularity for QCI Level Counters

This section describes how to configure the ARP Granularity for QCI Level Counters feature.

**Important** ARP Granularity for QCI Level Counters is a license-controlled feature. Per QCI Packet Drop Counters functionality does not require a license. Contact your Cisco account or support representative for licensing details.

Configuring the feature consists of the following tasks:

1. Create a Stats Profile.
2. Enable the Collection of Per QCI Packet Drop Counters.
3. Enable the Collection of QCI/ARP Level Statistics.
4. Associate a Stats Profile with an APN.
5. Verify the Configuration.

## Create a Stats Profile

Use the following example to access *Global Configuration Mode* and create a Stats Profile:

```
configure
  stats-profile stats_profile_name
  end
```

Notes:

- *stats_profile_name* must be an alphanumeric string from 1 to 63 characters in length.

## Enable the Collection of Packet Drop Statistics

Use the following example to access *Stats Profile Configuration Mode* and create a Stats Profile and enable the collection of packet drop statistics:

```
configure
  stats-profile stats_profile_name
    packet-drop
    end
```

To disable the collection of packet drop statistics

```
configure
  stats-profile stats_profile_name
    no packet-drop
    end
```

Notes:

- *stats_profile_name* must be the name of an existing Stats Profile. The name must be an alphanumeric string from 1 to 63 characters in length.
- **packet-drop**: enables the collection of packet drop statistics for the specified Stats Profile.
- **no packet-drop**: disables the collection of packet drop statistics for the specified Stats Profile.

## Enable the Collection of QCI/ARP Level Statistics

Use the following example to access *Stats Profile Configuration Mode* and enable the collection of QCI/ARP level statistics for a Stats Profile:

```
configure
  stats-profile stats_profile_name
    qci { all | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | [ non-std { non-gbr
 | gbr } ] } { arp { all | [ 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11
 |12 | 13 | 14 | 15 ] + } }
    end
```

To disable the collection of QCI/ARP statistics:

```
configure
  stats-profile stats_profile_name
  no qci { all | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | [ non-std { non-gbr
 | gbr } ] } { arp { all | [ 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11
 |12 | 13 | 14 | 15 ] + } }
  end
```

Notes:

- *stats_proflle_name* must be the name of an existing Stats Profile. The name must be an alphanumeric string from 1 to 64 characters in length.
- **qci**: configures the collection of ARP priority level statistics for the specified QCI(s).
- **non-std**: configures the collection of ARP priority level statistics for non-standard QCIs.
- **non-gbr**: configures the collection of ARP priority level statistics for non-standard non-guaranteed bit rate (GBR) QCIs.

- **gbr**: configures the collection of ARP priority level statistics for non-standard GBR QCIs.
- **arp**: configures the collection of ARP priority level statistics for the specified ARP values.
- **no**: disables the collection of ARP priority level statistics for the specified **qci** and **arp** settings.

## Associate a Stats Profile with an APN

Use the following example to access *APN Configuration Mode* and associate a Stats Profile with an APN:

```
configure
  apn apn_name
    stats-profile stats_profile_name
    end
```

To disassociate a Stats Profile from a specified APN:

```
configure
  apn apn_name
    no stats-profile
    end
```

Notes:

- *stats_profile_name*: must be the name of an existing Stats Profile. The name must be an alphanumeric string from 1 to 63 characters in length.
- A maximum of 64 Stats Profiles can be configured per P-GW/SAEGW/GGSN service.
- **no stats-profile**: disassociates the Stats Profile from the APN.



**Important** If a Stats Profile is associated with more than 12 APNs, the following memory and performance impact warning is provided:

```
[WARNING] Configuring QCI/ ARP level statistics for more then 12 APNs will have
memory and performance impact. Do you want to continue [Y/N]
```

## Verify the Configuration

Use the following procedure to verify the configuration:

First, verify that the Stats Profile is associated with the correct APN. In *Exec Mode*, enter the following command:

```
show apn name apn_name
```

Notes:

- In the command output, look for the **stats profile** field. It should contain the name of the Stats Profile which is associated with this APN.

Next, verify that the Stats Profile configuration settings are correct. In *Exec Mode*, enter the following command:

```
show stats-profile name stats_profile_name
```

Notes:

- Where *stats_profile_name* is the name of the Stats Profile for which you want to view settings.
- The command output includes the following information:
  - Stats Profile name
  - Packet-drop configuration settings for both QCI and ARP
  - QCI ARP combinations for which the StarOS will collect granular ARP statistics

If any of the above settings are incorrect, perform the configuration procedure again to reconfigure the Stats Profile with the proper settings.

# Monitoring Per QCI Packet Drop Counters and ARP Granularity for QCI Level Counters

This section describes how to monitor the Per QCI Packet Drop Counters and ARP Granularity for QCI Level Counters feature.

## Bulk Statistics

This section provides the bulk statistics that have been added to support the ARP Granularity and per QCI Packet Drop Counters feature.

### APN Schema

The following bulk statistics have been added to the APN Schema to support the New Standard QCIs feature.

```
qci65-actbear
qci65-setupbear
qci65-relbear
qci65-uplinkpkt-fwd
qci65-dwlinkpkt-fwd
qci65-uplinkbyte-fwd
qci65-dwlinkbyte-fwd
qci65-uplinkpkt-drop
qci65-dwlinkpkt-drop
qci65-uplinkbyte-drop
qci65-dwlinkbyte-drop
qci65-uplinkpkt-drop-mbrexcd
qci65-dwlinkpkt-drop-mbrexcd
qci65-uplinkbyte-drop-mbrexcd
qci65-dwlinkbyte-drop-mbrexcd
qci65-rejbearer
qci66-actbear
qci66-setupbear
qci66-relbear
qci66-uplinkpkt-fwd
qci66-dwlinkpkt-fwd
qci66-uplinkbyte-fwd
qci66-dwlinkbyte-fwd
qci66-uplinkpkt-drop
qci66-dwlinkpkt-drop
qci66-uplinkbyte-drop
qci66-dwlinkbyte-drop
qci66-uplinkpkt-drop-mbrexcd
qci66-dwlinkpkt-drop-mbrexcd
qci66-uplinkbyte-drop-mbrexcd
```

```
qci66-dwlinkbyte-drop-mbrexcd
qci66-rejbearer
qci69-actbear
qci69-setupbear
qci69-relbear
qci69-uplinkpkt-fwd
qci69-dwlinkpkt-fwd
qci69-uplinkbyte-fwd
qci69-dwlinkbyte-fwd
qci69-uplinkpkt-drop
qci69-dwlinkpkt-drop
qci69-uplinkbyte-drop
qci69-dwlinkbyte-drop
qci69-uplinkpkt-drop-mbrexcd
qci69-dwlinkpkt-drop-mbrexcd
qci69-uplinkbyte-drop-mbrexcd
qci69-dwlinkbyte-drop-mbrexcd
qci69-rejbearer
qci70-actbear
qci70-setupbear
qci70-relbear
qci70-uplinkpkt-fwd
qci70-dwlinkpkt-fwd
qci70-uplinkbyte-fwd
qci70-dwlinkbyte-fwd
qci70-uplinkpkt-drop
qci70-dwlinkpkt-drop
qci70-uplinkbyte-drop
qci70-dwlinkbyte-drop
qci70-uplinkpkt-drop-mbrexcd
qci70-dwlinkpkt-drop-mbrexcd
qci70-uplinkbyte-drop-mbrexcd
qci70-dwlinkbyte-drop-mbrexcd
qci70-rejbearer
sessstat-bearrel-ded-admin-clear-qci65
sessstat-bearrel-ded-admin-clear-qci66
sessstat-bearrel-ded-admin-clear-qci69
sessstat-bearrel-ded-admin-clear-qci70
```

## Show Commands

This section provides the Exec Mode show commands that are available to support the Per Packet QCI Drop Counters and ARP Granularity for QCI Level Counters feature.

### show apn statistics

The **qci** and **arp** keywords have been added to this command. The new keywords enable operators to view output for four basic scenarios that apply to the Per QCI Packet Drop Counters and ARP Granularity for QCI Level Counters feature.

**Scenario 1**

View packet drop counters with granularity at the QCI/ARP level for a single APN. The output of this command is useful for isolating network issues that may be affecting packet drops.

**show apn statistics name** *apn_name* **qci { all | 1-9 | non-std { gbr | non-gbr } } arp { all | 1-15 }**

Notes:

- *apn_name*: must be the name of a configured APN created in *APN Configuration Mode*.

- **qci**: displays packet drop statistics for the specified QCI(s).
- **all**: displays packet drop statistics for all QCI(s).
- **1-9**: displays packet drop statistics for QCI <n>. Must be a QCI number from 1 to 9.
- **non-std**: displays packet drop statistics for non-standard QCIs.
- **non-gbr**: displays packet drop statistics for non-standard non-gbr QCIs
- **gbr**: displays packet drop statistics for non-standard GBR QCIs.
- **arp**: displays statistics for the specified ARP priority level(s)
- **all**: displays packet drop statistics for all ARP priority levels.
- **1-15**: displays statistics for the specified ARP priority level.

**Scenario 2**

View packet drop counters with granularity at the QCI/ARP level for all APNs.

```
show apn statistics qci { all | 1-9 | non-std { gbr | non-gbr } } arp {
all | 1-15 }
```

Notes:

- *apn_name*: must be the name of a configured APN created in *APN Configuration Mode*.
- **qci**: displays packet drop statistics for the specified QCI(s).
- **all**: displays packet drop statistics for all QCI(s).
- **1-9**: displays packet drop statistics for QCI <n>. Must be a QCI number from 1 to 9.
- **non-std**: displays packet drop statistics for non-standard QCIs.
- **non-gbr**: displays packet drop statistics for non-standard non-gbr QCIs
- **gbr**: displays packet drop statistics for non-standard GBR QCIs.
- **arp**: displays statistics for the specified ARP priority level(s)
- **all**: displays packet drop statistics for all ARP priority levels.
- **1-15**: displays statistics for the specified ARP priority level.

**Scenario 3**

View the new packet drop counters at granularity of QCI level, and pre-existing QCI level counters for the specified APN.

```
show apn statistics name apn_name qci { all | 1-9 | non-std { gbr | non-gbr
 } }
```

Notes:

- *apn_name*: must be the name of a configured APN created in *APN Configuration Mode*.
- **qci**: displays packet drop statistics for the specified QCI(s).
- **all**: displays packet drop statistics for all QCI(s).

- **1-9**: displays packet drop statistics for QCI <n>. Must be a QCI number from 1 to 9.
- **non-std**: displays packet drop statistics for non-standard QCIs.
- **non-gbr**: displays packet drop statistics for non-standard non-gbr QCIs
- **gbr**: displays packet drop statistics for non-standard GBR QCIs.
- **arp**: displays statistics for the specified ARP priority level(s)
- **all**: displays packet drop statistics for all ARP priority levels.
- **1-15**: displays statistics for the specified ARP priority level.

**Scenario 4**

View the packet drop counters at the granularity of the QCI level, and view pre-existing QCI counters consolidated for all APNs.

**show apn statistics qci { all | 1-9 | non-std { gbr | non-gbr } }**

Notes:

- *apn_name*: must be the name of a configured APN created in *APN Configuration Mode*.
- **qci**: displays packet drop statistics for the specified QCI(s).
- **all**: displays packet drop statistics for all QCI(s).
- **1-9**: displays packet drop statistics for QCI <n>. Must be a QCI number from 1 to 9.
- **non-std**: displays packet drop statistics for non-standard QCIs.
- **non-gbr**: displays packet drop statistics for non-standard non-gbr QCIs
- **gbr**: displays packet drop statistics for non-standard GBR QCIs.
- **arp**: displays statistics for the specified ARP priority level(s)
- **all**: displays packet drop statistics for all ARP priority levels.
- **1-15**: displays statistics for the specified ARP priority level.

The output of the **show apn statistics name** *apn_name* **qci all arp all** command has been enhanced to display the following new statistics:

```
Data Statistics:

    Uplink Bytes:                0   Downlink Bytes:                          0
    Uplink Pkts:                 0   Downlink Pkts:                           0
    Uplink Bytes dropped:        0   Downlink Bytes dropped:                  0
    Uplink Pkts dropped:         0   Downnlink Pkts dropped:                  0

  Uplink Dropped:                          Downlink Dropped:
    MBR Exceeded(Bytes):                 0  MBR Exceeded(Bytes):                  0
    MBR Exceeded(Pkts):                  0  MBR Exceeded(Pkts):                   0
    AMBR Exceeded(Bytes):                0  AMBR Exceeded(Bytes):                 0
    AMBR Exceeded(Pkts):                 0  AMBR Exceeded(Pkts):                  0
    Miscellaneous(Bytes):                0  Miscellaneous(Bytes):                 0
    Miscellaneous(Pkts):                 0  Miscellaneous(Pkts):                  0
    Overcharge Prtctn(Bytes)             0  Overcharge Prtctn(Bytes):             0
    Overcharge Prtctn(Pkts):             0  Overcharge Prtctn(Pkts):              0
    SGW Restoration(Bytes):              0  SGW Restoration(Bytes):               0
```

```
    SGW Restoration(Pkts):                0  SGW Restoration(Pkts):                0
    SDF Gate(Bytes):                      0  SDF Gate(Bytes):                      0
    SDF Gate(Pkts):                       0  SDF Gate(Pkts):                       0
    ITC Gate(Bytes):                      0  ITC Gate(Bytes):                      0
    ITC Gate(Pkts):                       0  ITC Gate(Pkts):                       0
    Flow Terminated(Bytes):               0  Flow Terminated(Bytes):               0
    Flow Terminated(Pkts):                0  Flow Terminated(Pkts):                0
    Subsession Terminated(Bytes):         0  Subsession Terminated(Bytes):         0
    Subsession Terminated(Pkts):          0  Subsession Terminated(Pkts):          0
    Call Terminated(Bytes):               0  Call Terminated(Bytes):               0
    Call Terminated(Pkts):                0  Call Terminated(Pkts):                0
    DCCA Discard(Bytes):                  0  DCCA Discard(Bytes):                  0
    DCCA Discard(Pkts):                   0  DCCA Discard(Pkts):                   0
    No Rule Match(Bytes):                 0  No Rule Match(Bytes):                 0
    No Rule Match(Pkts):                  0  No Rule Match(Pkts):                  0
    ICAP(Bytes):                          0  ICAP(Bytes):                        N/A
    ICAP(Pkts):                           0  ICAP(Pkts):                         N/A
    SFW(Bytes):                           0  SFW(Bytes):                           0
    SFW(Pkts):                            0  SFW(Pkts):                            0
    Hierarchical ENF(Bytes):              0  Hierarchical ENF(Bytes):              0
    Hierarchical ENF(Pkts):               0  Hierarchical ENF(Pkts):               0
    Dynamic CA Gate(Bytes):               0  Dynamic CA Gate(Bytes):    :          0
    Dynamic CA Gate(Pkts):                0  Dynamic CA Gate(Pkts):                0
    NAT64 Cancel(Bytes):                  0  NAT64 Cancel(Bytes):                  0
    NAT64 Cancel(Pkts):                   0  NAT64 Cancel(Pkts):                   0
    Bearer Not Found(Bytes):              0  Bearer Not Found(Bytes):              0
    Bearer Not Found(Pkts):               0  Bearer Not Found(Pkts):               0


4G Bearers Released By Reasons:
                 QCI1  QCI2  QCI3  QCI4  QCI5  QCI6  QCI7  QCI8  QCI9

Admin disconnect: 0      0    0      0    0      0     0     0    0


  ARP level distribution of 4G Bearer Released By Reasons:

    Admin disconnect:
    QCI 1:
       ARP  1:            0
       ARP  2:            0
       ARP  3:            0
       ARP  4:            0
       ARP  5:            0
       ARP  6:            0
       ARP  7:            0
       ARP  8:            0
       ARP  9:            0
       ARP 10:            0
       ARP 11:            0
       ARP 12:            0
       ARP 13:            0
       ARP 14:            0
       ARP 15:            0
.
.
.

    QCI 9:
       ARP  1:            0
       ARP  2:            0
       ARP  3:            0
       ARP  4:            0
```

```
       ARP  5:            0
       ARP  6:            0
       ARP  7:            0
       ARP  8:            0
       ARP  9:            0
       ARP 10:            0
       ARP 11:            0
       ARP 12:            0
       ARP 13:            0
       ARP 14:            0
       ARP 15:            0


Subscriber QoS Statistics:


4G Bearers Released By Reasons:
                QCI1  QCI2  QCI3  QCI4  QCI5  QCI6  QCI7  QCI8  QCI9

Admin disconnect: 0      0    0      0    0      0     0     0    0


  ARP level distribution of 4G Bearer Released By Reasons:

    Admin disconnect:
    QCI 1:
       ARP  1:            0
       ARP  2:            0
       ARP  3:            0
       ARP  4:            0
       ARP  5:            0
       ARP  6:            0
       ARP  7:            0
       ARP  8:            0
       ARP  9:            0
       ARP 10:            0
       ARP 11:            0
       ARP 12:            0
       ARP 13:            0
       ARP 14:            0
       ARP 15:            0
.
.
.

    QCI 9:
       ARP  1:            0
       ARP  2:            0
       ARP  3:            0
       ARP  4:            0
       ARP  5:            0
       ARP  6:            0
       ARP  7:            0
       ARP  8:            0
       ARP  9:            0
       ARP 10:            0
       ARP 11:            0
       ARP 12:            0
       ARP 13:            0
       ARP 14:            0
       ARP 15:            0

  QCI 1:
```

```
 ARP 1:
  Bearer Active:                0   Bearer setup:                                2
  Bearer Released:              2   Bearer Rejected:                             0

  Uplink Bytes forwarded:       0   Downlink Bytes forwarded:                    0
  Uplink Pkts forwarded:        0   Downlink Pkts forwarded:                     0
  Uplink Bytes dropped:         0   Downlink Bytes dropped:                      0
  Uplink Pkts dropped:          0   Downlink Pkts dropped:                       0
 Uplink Dropped:                          Downlink Dropped:
  MBR Exceeded(Bytes):                 0  MBR Exceeded(Bytes):                  0
  MBR Exceeded(Pkts):                  0  MBR Exceeded(Pkts):                   0
  AMBR Exceeded(Bytes):                0  AMBR Exceeded(Bytes):                 0
  AMBR Exceeded(Pkts):                 0  AMBR Exceeded(Pkts):                  0
  Miscellaneous(Bytes):                0  Miscellaneous(Bytes):                 0
  Miscellaneous(Pkts):                 0  Miscellaneous(Pkts):                  0
  Overcharge Prtctn(Bytes)             0  Overcharge Prtctn(Bytes):             0
  Overcharge Prtctn(Pkts):             0  Overcharge Prtctn(Pkts):              0
  SGW Restoration(Bytes):              0  SGW Restoration(Bytes):               0
  SGW Restoration(Pkts):               0  SGW Restoration(Pkts):                0
  SDF Gate(Bytes):                     0  SDF Gate(Bytes):                      0
  SDF Gate(Pkts):                      0  SDF Gate(Pkts):                       0
  ITC Gate(Bytes):                     0  ITC Gate(Bytes):                      0
  ITC Gate(Pkts):                      0  ITC Gate(Pkts):                       0
  Flow Terminated(Bytes):              0  Flow Terminated(Bytes):               0
  Flow Terminated(Pkts):               0  Flow Terminated(Pkts):                0
  Subsession Terminated(Bytes):        0  Subsession Terminated(Bytes):         0
  Subsession Terminated(Pkts):         0  Subsession Terminated(Pkts):          0
  Call Terminated(Bytes):              0  Call Terminated(Bytes):               0
  Call Terminated(Pkts):               0  Call Terminated(Pkts):                0
  DCCA Discard(Bytes):                 0  DCCA Discard(Bytes):                  0
  DCCA Discard(Pkts):                  0  DCCA Discard(Pkts):                   0
  No Rule Match(Bytes):                0  No Rule Match(Bytes):                0
  No Rule Match(Pkts):                 0  No Rule Match(Pkts):                 0
  ICAP(Bytes):                         0  ICAP(Bytes):                        N/A
  ICAP(Pkts):                          0  ICAP(Pkts):                         N/A
  SFW(Bytes):                          0  SFW(Bytes):                           0
  SFW(Pkts):                           0  SFW(Pkts):                            0
  Hierarchical ENF(Bytes):             0  Hierarchical ENF(Bytes):              0
  Hierarchical ENF(Pkts):              0  Hierarchical ENF(Pkts):               0
  Dynamic CA Gate(Bytes):              0  Dynamic CA Gate(Bytes):    :          0
  Dynamic CA Gate(Pkts):               0  Dynamic CA Gate(Pkts):                0
  NAT64 Cancel(Bytes):                 0  NAT64 Cancel(Bytes):                  0
  NAT64 Cancel(Pkts):                  0  NAT64 Cancel(Pkts):                   0
  Bearer Not Found(Bytes):             0  Bearer Not Found(Bytes):              0
  Bearer Not Found(Pkts):              0  Bearer Not Found(Pkts):               0
QCI 1:
 ARP 2:
  Bearer Active:                0   Bearer setup:                                2
  Bearer Released:              2   Bearer Rejected:                             0

  Uplink Bytes forwarded:       0   Downlink Bytes forwarded:                    0
  Uplink Pkts forwarded:        0   Downlink Pkts forwarded:                     0
  Uplink Bytes dropped:         0   Downlink Bytes dropped:                      0
  Uplink Pkts dropped:          0   Downlink Pkts dropped:                       0
 Uplink Dropped:                          Downlink Dropped:
  MBR Exceeded(Bytes):          0  MBR Exceeded(Bytes):                  0
  MBR Exceeded(Pkts):           0  MBR Exceeded(Pkts):                   0
  AMBR Exceeded(Bytes):         0  AMBR Exceeded(Bytes):                 0
  AMBR Exceeded(Pkts):          0  AMBR Exceeded(Pkts):                  0
  Miscellaneous(Bytes):         0  Miscellaneous(Bytes):                 0
  Miscellaneous(Pkts):          0  Miscellaneous(Pkts):                  0
  Overcharge Prtctn(Bytes)      0  Overcharge Prtctn(Bytes):             0
  Overcharge Prtctn(Pkts):      0  Overcharge Prtctn(Pkts):              0
  SGW Restoration(Bytes):       0  SGW Restoration(Bytes):               0
```

```
    SGW Restoration(Pkts):          0  SGW Restoration(Pkts):                0
    SDF Gate(Bytes):                0  SDF Gate(Bytes):                      0
    SDF Gate(Pkts):                 0  SDF Gate(Pkts):                       0
    ITC Gate(Bytes):                0  ITC Gate(Bytes):                      0
    ITC Gate(Pkts):                 0  ITC Gate(Pkts):                       0
    Flow Terminated(Bytes):         0  Flow Terminated(Bytes):               0
    Flow Terminated(Pkts):          0  Flow Terminated(Pkts):                0
    Subsession Terminated(Bytes):   0  Subsession Terminated(Bytes):          0
    Subsession Terminated(Pkts):    0  Subsession Terminated(Pkts):           0
    Call Terminated(Bytes):         0  Call Terminated(Bytes):               0
    Call Terminated(Pkts):          0  Call Terminated(Pkts):                0
    DCCA Discard(Bytes):            0  DCCA Discard(Bytes):                  0
    DCCA Discard(Pkts):             0  DCCA Discard(Pkts):                   0
    No Rule Match(Bytes):           0  No Rule Match(Bytes):                 0
    No Rule Match(Pkts):            0  No Rule Match(Pkts):                  0
    ICAP(Bytes):                    0  ICAP(Bytes):                        N/A
    ICAP(Pkts):                     0  ICAP(Pkts):                         N/A
    SFW(Bytes):                     0  SFW(Bytes):                           0
    SFW(Pkts):                      0  SFW(Pkts):                            0
    Hierarchical ENF(Bytes):        0  Hierarchical ENF(Bytes):              0
    Hierarchical ENF(Pkts):         0  Hierarchical ENF(Pkts):               0
    Dynamic CA Gate(Bytes):         0  Dynamic CA Gate(Bytes):    :          0
    Dynamic CA Gate(Pkts):          0  Dynamic CA Gate(Pkts):                0
    NAT64 Cancel(Bytes):            0  NAT64 Cancel(Bytes):                  0
    NAT64 Cancel(Pkts):             0  NAT64 Cancel(Pkts):                   0
    Bearer Not Found(Bytes):        0  Bearer Not Found(Bytes):              0
    Bearer Not Found(Pkts):         0  Bearer Not Found(Pkts):               0
```

The output of the **show apn statistics name** *apn_name* **qci all** command has been enhanced to display the following new statistics:

```
Data Statistics:

    Uplink Bytes:                   0   Downlink Bytes:                       0
    Uplink Pkts:                    0   Downlink Pkts:                        0
    Uplink Bytes dropped:           0   Downlink Bytes dropped:               0
    Uplink Pkts dropped:            0   Downnlink Pkts dropped:               0

  Uplink Dropped:                         Downlink Dropped:
    MBR Exceeded(Bytes):              0   MBR Exceeded(Bytes):                0
    MBR Exceeded(Pkts):               0   MBR Exceeded(Pkts):                 0
    AMBR Exceeded(Bytes):             0   AMBR Exceeded(Bytes):               0
    AMBR Exceeded(Pkts):              0   AMBR Exceeded(Pkts):                0
    Miscellaneous(Bytes):             0   Miscellaneous(Bytes):               0
    Miscellaneous(Pkts):              0   Miscellaneous(Pkts):                0
    Overcharge Prtctn(Bytes)          0   Overcharge Prtctn(Bytes):           0
    Overcharge Prtctn(Pkts):          0   Overcharge Prtctn(Pkts):            0
    SGW Restoration(Bytes):           0   SGW Restoration(Bytes):             0
    SGW Restoration(Pkts):            0   SGW Restoration(Pkts):              0
    SDF Gate(Bytes):                  0   SDF Gate(Bytes):                    0
    SDF Gate(Pkts):                   0   SDF Gate(Pkts):                     0
    ITC Gate(Bytes):                  0   ITC Gate(Bytes):                    0
    ITC Gate(Pkts):                   0   ITC Gate(Pkts):                     0
    Flow Terminated(Bytes):           0   Flow Terminated(Bytes):             0
    Flow Terminated(Pkts):            0   Flow Terminated(Pkts):              0
    Subsession Terminated(Bytes):     0   Subsession Terminated(Bytes):       0
    Subsession Terminated(Pkts):      0   Subsession Terminated(Pkts):        0
    Call Terminated(Bytes):           0   Call Terminated(Bytes):             0
    Call Terminated(Pkts):            0   Call Terminated(Pkts):              0
    DCCA Discard(Bytes):              0   DCCA Discard(Bytes):                0
    DCCA Discard(Pkts):               0   DCCA Discard(Pkts):                 0
    No Rule Match(Bytes):             0   No Rule Match(Bytes):               0
    No Rule Match(Pkts):              0   No Rule Match(Pkts):                0
    ICAP(Bytes):                      0   ICAP(Bytes):                      N/A
    ICAP(Pkts):                       0   ICAP(Pkts):                       N/A
```

```
    SFW(Bytes):                          0  SFW(Bytes):                          0
    SFW(Pkts):                           0  SFW(Pkts):                           0
    Hierarchical ENF(Bytes):             0  Hierarchical ENF(Bytes):             0
    Hierarchical ENF(Pkts):              0  Hierarchical ENF(Pkts):              0
    Dynamic CA Gate(Bytes):              0  Dynamic CA Gate(Bytes):    :          0
    Dynamic CA Gate(Pkts):               0  Dynamic CA Gate(Pkts):              0
    NAT64 Cancel(Bytes):                 0  NAT64 Cancel(Bytes):                 0
    NAT64 Cancel(Pkts):                  0  NAT64 Cancel(Pkts):                  0
    Bearer Not Found(Bytes):             0  Bearer Not Found(Bytes):             0
    Bearer Not Found(Pkts):              0  Bearer Not Found(Pkts):              0

4G Bearers Released By Reasons:

                      QCI1  QCI2  QCI3  QCI4  QCI5  QCI6  QCI7  QCI8    QCI9
   Admin disconnect:     0     0     0     0     0     0     0     0       0


Subscriber QoS Statistics:

  QCI 1:
    Bearer Active:                   0   Bearer setup:                          0
    Bearer Released:                 0   Bearer Rejected:                       0

    Uplink Bytes forwarded:          0   Downlink Bytes forwarded:              0
    Uplink Pkts forwarded:           0   Downlink Pkts forwarded:               0
    Uplink Bytes dropped:            0   Downlink Bytes dropped:                0
    Uplink Pkts dropped:             0   Downlink Pkts dropped:                 0
  Uplink Dropped:                          Downlink Dropped:
    MBR Exceeded(Bytes):                 0  MBR Exceeded(Bytes):                0
    MBR Exceeded(Pkts):                  0  MBR Exceeded(Pkts):                 0
    AMBR Exceeded(Bytes):                0  AMBR Exceeded(Bytes):               0
    AMBR Exceeded(Pkts):                 0  AMBR Exceeded(Pkts):                0
    Miscellaneous(Bytes):                0  Miscellaneous(Bytes):               0
    Miscellaneous(Pkts):                 0  Miscellaneous(Pkts):                0
    Overcharge Prtctn(Bytes)             0  Overcharge Prtctn(Bytes):           0
    Overcharge Prtctn(Pkts):             0  Overcharge Prtctn(Pkts):            0
    SGW Restoration(Bytes):              0  SGW Restoration(Bytes):             0
    SGW Restoration(Pkts):               0  SGW Restoration(Pkts):              0
    SDF Gate(Bytes):                     0  SDF Gate(Bytes):                    0
    SDF Gate(Pkts):                      0  SDF Gate(Pkts):                     0
    ITC Gate(Bytes):                     0  ITC Gate(Bytes):                    0
    ITC Gate(Pkts):                      0  ITC Gate(Pkts):                     0
    Flow Terminated(Bytes):              0  Flow Terminated(Bytes):             0
    Flow Terminated(Pkts):               0  Flow Terminated(Pkts):              0
    Subsession Terminated(Bytes):        0  Subsession Terminated(Bytes):       0
    Subsession Terminated(Pkts):         0  Subsession Terminated(Pkts):        0
    Call Terminated(Bytes):              0  Call Terminated(Bytes):             0
    Call Terminated(Pkts):               0  Call Terminated(Pkts):              0
    DCCA Discard(Bytes):                 0  DCCA Discard(Bytes):                0
    DCCA Discard(Pkts):                  0  DCCA Discard(Pkts):                 0
    No Rule Match(Bytes):                0  No Rule Match(Bytes):               0
    No Rule Match(Pkts):                 0  No Rule Match(Pkts):                0
    ICAP(Bytes):                         0  ICAP(Bytes):                      N/A
    ICAP(Pkts):                          0  ICAP(Pkts):                       N/A
    SFW(Bytes):                          0  SFW(Bytes):                         0
    SFW(Pkts):                           0  SFW(Pkts):                          0
    Hierarchical ENF(Bytes):             0  Hierarchical ENF(Bytes):            0
    Hierarchical ENF(Pkts):              0  Hierarchical ENF(Pkts):             0
    Dynamic CA Gate(Bytes):              0  Dynamic CA Gate(Bytes):    :        0
    Dynamic CA Gate(Pkts):               0  Dynamic CA Gate(Pkts):              0
    NAT64 Cancel(Bytes):                 0  NAT64 Cancel(Bytes):                0
    NAT64 Cancel(Pkts):                  0  NAT64 Cancel(Pkts):                 0
    Bearer Not Found(Bytes):             0  Bearer Not Found(Bytes):            0
```

```
    Bearer Not Found(Pkts):                0  Bearer Not Found(Pkts):                0

.
.
.
QCI 9:
    Bearer Active:                 0   Bearer setup:                          0
    Bearer Released:               0   Bearer Rejected:                       0

    Uplink Bytes forwarded:        0   Downlink Bytes forwarded:              0
    Uplink Pkts forwarded:         0   Downlink Pkts forwarded:               0
    Uplink Bytes dropped:          0   Downlink Bytes dropped:                0
    Uplink Pkts dropped:           0   Downlink Pkts dropped:
```

### show configuration

The output of this command has been enhanced to show the Stats Profile configuration settings.

- stats-profile <*stats_profile_name*>
- qci <*qci number*> arp <*arp number*>
- packet-drop (*if packet-drop is enabled*)

### show stats-profile name

This new command in *Exec Mode* shows the configuration settings for the specified Stats Profile.

- Stats Profile Name: <*stats_profile_name*>
- qci <*qci number*> arp <*arp_number(s)*>
- packet-drop <*if packet drop is enabled*>

# DSCP Marking Based on Both QCI and ARP Values

## Feature Description

P-GW allows users to perform DSCP marking based on QoS Class Identifier (QCI) values. This functionality has been expanded to include the Priority Level (PL) values 1-15 of Allocation and Retention Priority (ARP), which allows users to assign different DSCP values for bearers with the same QCI but different ARP priority values. For example, the ability to assign DSCP values based on QCI+ARP could be used to meet compliance on priority and emergency calling via VoLTE.

Applies to the P-GW for the following interfaces:

- S5
- S8
- SGi
- S2b

Applies to the S-GW for the following interfaces:

- S1-U
- S5
- S8
- S11
- S4

## Relationships to Other Features

ECS populates the DSCP values in inner IP header. These values are fetched from the DSCP table by means of a sessmanager API. Since DSCP values are now available for QCI-ARP combination, the API is replaced by a wrapper API that will accept both QCI and ARP and provide the DSCP values to ECS in a new data structure.

The API will return correct values in the following scenarios:

1. QCI-DSCP table is not configured, or it is not associated for this session.

   API will return an indication to ECS that table was not found.

2. Table is configured, but entry for the given QCI value is not present in the table.

   API will not populate the structure and keep the same unaltered.

3. Entry for given QCI is present, but it is not available for the given QCI-ARP pair.

   The default DSCP values for that particular QCI will be populated in the return structure.

4. Entry for given QCI-ARP combination is present.

   The DSCP values for given QCI-ARP combination will be populated in the return structure.

Once values are received from SM, ECS caches these values and uses the cached values for marking the further packets. Another lookup into the table is done only when there is a mismatch between the currently cached QCI-ARP value and the current packet's QCI-ARP value. Therefore, any change in the QCI-ARP table would be affected for inner DSCP marking on existing flows only in case of QCI or ARP change.

## Licensing

DSCP marking capability requires that a valid license key be installed. Contact your Cisco Account or Support representative for information on how to obtain a license.

# How It Works

The expansion of functionality to allow assigning different DSCP values for bearers with the same QCI, but different APR values, works as follows.

- DSCP marking of packets based on QCI+ARP combination allowed
- QCI + ARP configuration will override any DSCP entry for that QCI+ARP combination
- QCI only DSCP entry will override all existing QCI+ARP configuration
- Applying associated DSCP marking for QCI+ARP for Uplink and Downlink functionality is also allowed

# Configuring DSCP Marking Based on Both QCI and ARP Values

This section describes how to configure DSCP marking based on both QCI and ARP values.

## Configuring QCI-QoS Mapping

Use the following example to create and map QCI and ARP values to enforceable Quality of Service (QoS) parameters:

```
configure
   qci-qos-mapping name
      qci num [ arp-priority-level arp_value ] [ downlink [ encaps-header { copy-inner | dscp-marking dscp-marking-value } ] [ internal-qos priority priority ] [ user-datagram dscp-marking dscp-marking-value  ] ] [ uplink [ downlink] [ encaps-header { copy-inner | dscp-marking dscp-marking-value } ]  [ internal-qos priority priority ]  [ user-datagram dscp-marking dscp-marking-value  ] ]
      end
```

Notes:

- The P-GW does not support non-standard QCI values unless a valid license key is installed.

  QCI values 1 through 9 are standard values defined in 3GPP TS 23.203; the P-GW supports these standard values. In addition, QCI values 65, 66, 69, and 70 can be used in StarOS release 21.0 and later.

  From 3GPP Release 8 onwards, operator-specific/non-standard QCIs are supported and carriers can define QCI 128- 254.

- **arp-priority-level** *arp_value*: Specifies the address retention priority (ARP) priority level.

  *arp_value* must be an integer from 1 through 15.

- The above configuration only shows one keyword example. Refer to the *QCI - QOS Mapping Configuration Mode Commands* chapter in the *Command Line Interface Reference* for more information on the **qci** command and other supported keywords.

Use the following example to disable QCI and ARP values:

```
configure
   qci-qos-mapping name
      no qci num [ arp-priority-level arp_value ]
      end
```

## Associating QCI-QoS Mapping Configuration

Use the following example to specify that the P-GW service is to be associated with an existing QCI-QoS mapping configuration:

```
configure
   contextcontext_name
      pgw-service pgw_service_name
         associate qci-qos-mapping name
         end
```

Notes:

- QCI-QoS mapping configurations are created in the AAA context.

Use the following example to specify that the S-GW service is to be associated with an existing QCI-QoS mapping configuration:

```
configure
  context context_name
    sgw-service sgw_service_name
      associate qci-qos-mapping name
      end
```

Notes:

- QCI-QoS mapping configurations are created in the AAA context.

## Configuring CS5 Marking for GTP-C

Use the following example to mark DSCP precedence CS5 on control packets:

```
configure
  context context_name
    ggsn-service ggsn_service_name
      ip qos-dscp gtpc cs5
      end
```

Notes:

- Designates Class Selector 5 DSCP precedence for GTP-C packets.

## Verifying the Configuration

Use the following command in Exec mode to display/verify the configuration.

```
show configuration
```

# Monitoring DSCP Marking Based on Both QCI and ARP Values

## Output of Show Commands

This section provides information regarding show commands and/or their outputs in support of DSCP marking based on both QCI and ARP values.

### show qci-qos-mapping table all

The output of this command has been enhanced to show the ARP value:

- arp-priority-level

# New Standard QCI Support

CDETS: CSCuy20910 - Support of new standard QCIs (65, 66, 69, 70)

**Applicable Products**: P-GW, SAEGW, S-GW

# Feature Description

The P-GW/SAEGW/S-GW support additional new 3GPP-defined standard QCIs. QCIs 65, 66, 69, and 70 are now supported for Mission Critical and Push-to-Talk (MCPTT) applications. These new standard QCIs are supported in addition to the previously supported QCIs of 1 through 9, and operator-defined QCIs 128 through 254.

The StarOS will continue to reject QCIs 10 through 127 sent by the PCRF.

## Licensing



**Important** New Standard QCI Support is a licensed feature. Contact your Cisco account or support representative for licensing details.

# How it Works

Although the 3GPP specification mentions that only QCIs 65 and 69 can co-exist, there is no hard restriction on the QCIs in the StarOS implementation of this feature, as that is applicable to the PCRF. The P-GW acts as a pass-through node and allows QCIs 65 and 69 if a different QCI combination is requested from PCRF.

With support for standard QCIs 65, 66, 69, and 70 present, the implementation has also added support across the following StarOS interfaces:

- **Gx**: Gx processes Default Bearer QoS and Rule Validation allowing the new Mission Critical (MC)/Push to Talk (PTT) QCIs. When the MC/PTT bit is not negotiated with the PCRF, the PCEF will reject the creation of a bearer or reject call setup.
- **sessmgr**: The P-GW sessmgr now processes the updating and modification of QoS. The P-GW rejects all UE initiated BRC creation for the new standard QCIs.
- **ECS**: ECS accepts the new standard QCIs when received from the PCRF and will reject them when either the license is not configured or the same is received in 3G. The ECS is able to update a Default bearer with this QoS change or create a Dedicated Bearer for the new standard QCIs.

### Handoff Behavior

For Gn/Gp handoffs, local mapping via the CLI is supported so that the P-GW/SAEGW/S-GW is in sync with the MME-to-SGSN context transfer. The following scenarios are supported:

**No Local QoS Mapping Present**: When no local mapping is present for the new QCIs, a call handoff from 4G to 3G will be rejected.

**Local QoS Mapping Present**: Three scenarios are supported when local mapping is present:

- **Local Mapping present for MME-SGSN and PCRF Out of Synchronization**: When local mapping is present it is assumed that the QoS mapping in the P-GW is in sync with the mapping from the MME to SGSN. Even if the QoS mapping for one of the transferred PDPs during a Gn/Gp handoff is not in sync with MME-SGSN mapping, the P-GW/SAEGW/S-GW still continues with the handoff with the local mapping present. However, the CDR generated while waiting for the PCRF response during the handoff would be out of sync with the CDR's received after the handoff.

- **Mapping present for MME-SGSN and PCRF in Synchronization**: When local mapping is in sync with the MME-SGSN there is no difference in the CDR generated after the handoff.
- **Partial Mapping Present**: Partial mapping occurs when some MC/PTT QCI(s) have mapping and the remainder of the MC/PTT QCI(s) do not have mapping. In this case the call is dropped.

## Expected Call Flow Output

This section provides detailed information on the expected call flow output for various scenarios with the New Standard QCI support feature:

- New Call Procedure
- Handoff Procedures
- UE Initiated Bearer Creation
- Bearer Creation
- Bearer Update

These sections describe new behaviors and provide behavior clarification for this feature. Behavior not described is similar to that for Standard QCIs.

### New Call Procedure

This section provides detailed information on the expected call flow output for various new call procedure scenarios with the New Standard QCI Support feature.

*Table 1: Expected Call Flow Output: New Call Procedure*

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| Setup 3G (GGSN) | N/A | N/A | Create PDP Req | Std QCI | Enabled | MC/PTT-Std QCI | N/A | N/A | Call rejected by application |
| Setup eHRPD | N/A | N/A | PBU | Std QCI | Enabled | MC/PTT-Std QCI | N/A | N/A | Call accepted and created with this rule |
| Setup 4G (RAT: S4-SGSN) | N/A | N/A | Create Session Req | Std QCI | Enabled | MC/PTT-Std QCI | N/A | N/A | Call accepted and created with this rule |

### Handoff Procedures

This section provides detailed information on expected call flow output for various handoff procedure scenarios with the New Standard QCI Support feature.

*Table 2: Expected Call Flow Output: Handoff Procedures*

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| Default bearer existing for WiFi | Call existing with MC/PTT-QCI requested to handoff to MC/PTT-QCI | Create Session Req | MC/PTT - QCI | Enabled | N/A | MC/PTT-Std QCI received for default bearer | N/A | Handoff accepted and dowlnadd MC/PTT Std QCI applied | |

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| GnGp Handoff (4G (LTE) to 3G (GGSN)) | Update PDP request received for primary PDP and pending response (Local mapping present) | Call existing with MC/PTT-QCI requested to Std-QCI where mapping not received for few MC/PTT-QCI bearers | Update PDP Req | Partial mapping received from PCRF for MC/PTT- QCI to Std-QCI | Enabled | N/A | Partial mapped Std QCI for MC/PTT-QCIs received. Here mapping is not Received for some PDP bearers . | N/A | Handoff rejected and call drop Initiated |
| | Update PDP Request received for primary PDP and pending response (Local mapping present) | Call existing with MC/PTT-QCI requested to Std-QCI where no mapping received for few MC/PTT-QCI bearers | Update PDP Req | No mapping Received from PCRF for MC/PTT- QCI to Std-QCI | Enabled | N/A | No mapping received | N/A | Handoff rejected and call drop initiated |
| | Update PDP request received for primary PDP and pending response (No-Local Mapping Present) | Call existing with Std primary PDP & MC/PTT-QCI requested to Std-QCI | Update PDP Req | N/A | Enabled | N/A | MC/PTT update rules received for Std QCI dedicated bearers | N/A | MC/PTT QCI mapped rule associated dedicated bearer purged and handoff accepted |
| | | Call existing with MC/PTT primary PDP | Update PDP Req | N/A | Enabled | N/A | N/A | N/A | |

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| | Update PDP Request received for primary PDP and pending response<br>(No-local mapping present) | | | | | | | | Handoff rejected and call drop Initiated (dropped before Initiating CCA-U for handoff) |
| | Update PDP Request received for primary PDP and pending response<br>(Local mapping present) | Call existing with MC/PTT-QCI requested to Std-QCI | Update PDP Req | PCRF Timeout No Response received | Enabled | N/A | No response from PCRF / CCA-U timeout | N/A | Handoff rejected and call drop initiated |
| | Update PDP Request received for primary PDP and pending response. BCM mode is mixed.<br>(Local mapping present and same as what QCI values comes in UPC during HO) | Call existing with MC/PTT-QCI requested to Std-QCI | Update PDP Req | Mapping received from PCRF for MC/PTT- QCI to Std-QCI | Enabled | N/A | All mapping received from PCRF | N/A | Handoff accepted |
| | | | Update PDP Req | N/A | Enabled | N/A | N/A | N/A | Handoff rejected and call drop initiated |

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| | Update PDP Request received for primary PDP and pending response. BCM mode is mixed.<br>(Local mapping present and not same as what QCI values comes in UPC during HO). | Call existing with MC/PTT-QCI requested to Std-QCI | | | | | | | |
| | Update PDP Request received for primary PDP and pending response. BCM mode is UE Only.<br>(Local mapping present and same as what QCI values come in UPC during HO) | Call existing with MC/PTT-QCI requested to Std-QCI | Update PDP Req | Mapping received from PCRF for MC/PTT- QCI to Std-QCI | Enabled | N/A | All mapping received from PCRF | N/A | Handoff accepted |
| | | Call existing with MC/PTT-QCI requested to Std-QCI | Update PDP Req | Mapping received from PCRF for MC/PTT- QCI to Std-QCI | Enabled | N/A | All mapping received from PCRF | N/A | Handoff accepted |

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| | Update PDP Request received for primary PDP and pending response. BCM mode is UE Only.<br>(Local mapping present and not same as what QCI values come in UPC during HO.) | | | | | | | | |
| | Update PDP Request received for primary PDP and pending response<br>(Local mapping present/not present) | Call existing with MC/PTT-QCI requested to Std-QCI. Also suppress-NRUPC UPC is configured at the GGSN service level. | Update PDP Req | N/A | Enabled | N/A | N/A | N/A | Handoff rejected and call drop initiated |
| | Update PDP Request received for primary PDP and response sent<br>(Local mapping present) | Call existing with MC/PTT-QCI requested to Std-QCI mapping received for All MC/PTT-QCI bearers | Update PDP Req | Complete mapping Received from PCRF for MC/PTT- QCI to Std-QCI (as per Local MC/PTT to Std QCI mapping) | Enabled | N/A | All mapped Std QCI for MC/PTT-QCI | N/A | Handoff accepted |

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| | Update PDP Request received for primary PDP and response sent<br>(Local mapping present) | Call existing with MC/PTT-QCI requested to Std-QCI mapping received for All MC/PTT-QCI bearers | Update PDP Req | Complete mapping received from PCRF for MC/PTT- QCI to Std-QCI (different from local MC/PTT to Std QCI mapping) | Enabled | N/A | All mapped Std QCI for MC/PTT-QCI | N/A | Handoff accepted and Update PDP Response sent for all bearers |
| eHRPD -> LTE | Create Session Req received with ho_ind = 1 | Only one bearer existing with the call | Create Session Req | MC/PTT - QCI | Enabled | N/A | MC/PTT-Std QCI received with rules | N/A | Handoff accepted and dedicated bearer are created with the MC/PTT-Std QCI received. |
| LTE -> eHRPD | Default + dedicated bearer existing for LTE | Call existing with MC/PTT-QCI | PBU | N/A | Enabled | N/A | N/A | N/A | Handoff accepted and PBA is sent and dedicated bearer rules are added under single bearer |

### UE Initiated Bearer Creation

This section provides detailed information on the expected call flow output for various UE initiated bearer creation scenarios with the New Standard QCI Support feature.

*Table 3: Expected Call Flow Output: UE Initiated Bearer Creation*

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| LTE UE Initiated Bearer | Default bearer existing for LTE | N/A | Bearer Resource Command | MC/PTT- Std QCI | N/A | N/A | N/A | N/A | BRC rejected by application |
| | Default bearer existing for LTE | N/A | Bearer Resource Command | Std QCI | Disabled | N/A | MC/PTT-Std dedicated QCI | N/A | BRC rejected / rule rejected with resource allocation failure |
| | Default bearer existing for LTE | N/A | Bearer Resource Command | Std QCI | Enabled | N/A | MC/PTT-Std dedicated QCI | N/A | BRC rejected /CBReq initiated with MC/PTT- Std QCI |

## Bearer Creation

This section provides detailed information on the expected call flow output for Bearer Creation scenarios with the New Standard QCI Support feature.

*Table 4: Expected Call Flow Output: Bearer Creation*

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| GGSN secondary PDP creation | Primary PDP existing for GGSN | New secondary PDP requested with MC/PTT-Std-QCI | RAR Procedure | N/A | Enabled | N/A | N/A | Rules received with MC/PTT-Std QCI | CCR-I resource allocation failure for secondary PDP sent to PCRF |

## Bearer Update

This section provides detailed information on the expected call flow output for Bearer Update scenarios with the New Standard QCI Support feature.

*Table 5: Expected Call Flow Output: Bearer Update*

| Procedure (3G/4G/ S2b/S2a) | Pre-Condition | Call QCI Modification | Message Type | Request with Type Of QCI | PGW License | Gx Interface (Type of Re-mapped QCI received) | | | Expected Behavior |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CCA-I | CCA-U | RAR | |
| GGSN Primary PDP QoS modification | Primary PDP existing for GGSN | Call existing with Std-QCI requested to MC/PTT-Std QCI modification | RAR Procedure | MC/PTT- Std QCI | Enabled | N/A | N/A | MC/PTT-Std QCI for primary PDP received | CCR-I QoS modification failure for primary PDP QoS modification rejected |
| GGSN Secondary PDP Qos Modification | Primary PDP & secondary PDP existing for GGSN | Call existing with Std-QCI requested to MC/PTT-Std QCI modification for secondary PDP | RAR Procedure | MC/PTT- Std QCI | Enabled | N/A | N/A | MC/PTT-Std QCI for secondary PDP with rules received | CCR-I resource allocation failure for secondary PDP QoS modification sent |

# Configuring New Standard QCIs

Configuring New Standard QCIs consists of the following tasks:

- Configuring QCI-QoS Mapping
- Configuring Local Mapping for Gn/Gp Support
- Configuring Transaction Rate Network Initiated Setup/Teardown Events
- Enable Mission Critical QCIs

## Configuring QCI-QoS Mapping

Standard QCI options **65**, **66**, **69**, and **70** have been added to the **qci** command in *QCI-QoS Mapping Configuration Mode*.

To configure QCI-QoS Mapping for new standard QCIs:

```
configure
  qci-qos-mapping qci_qos_map_name
    qci { 1-9 | 65 | 66 | 69 | 70 }
    end
```

To disable new QCI-QoS mapping for new standard QCIs:

```
configure
  qci-qos-mapping qci_qos_map_name
```

```
no qci { 1-9 | 65 | 66 | 69 | 70 }
end
```

Notes:

- **qci** options 65 and 66 are available for guaranteed bit rate (GBR) network initiated QCI values only.

  **qci** options 69 and 70 are available for non-GBR network initiated QCI values only.

- **no** disables the specified standard **qci** value.

## Configuring Local QCI Mapping for Gn/Gp QoS Support

Use the following example to configure local QCI mapping for Gn/Gp support:

```
configure
  qci-qos-mapping mapping_name
    qci  { 1-9 | 65 | 66 | 69 | 70 } pre-rel8-qos-mapping qci_value
    end
```

Notes:

- **qci**: When the MPS license is disabled, this value must be a Standard QoS Class Identifier (QCI) from 1 to 9. When the MPS license is enabled, this value must be a Standard QCI from 1 to 9, or 65, 66, 69, 70.
- **qci** 65 and 66 are Mission Critical/Push to Talk (MC/PTT) GBR values and values 69 and 70 are MC/PTT Non-GBR values.
- **qci** values 65 and 66 can only be mapped to QCI values 1 through 4, and QCI values 69 and 70 can only be mapped to QCI values 5 through 9.

## Configuring Transaction Rate Network Initiated Setup/Teardown Events

To configure transaction rate network initiated setup/teardown events for new standard QCI values:

```
configure
  transaction-rate nw-initiated-setup-teardown-events qci { 1-9 | 65 |
66 | 69 | 70 | 128-254 }
  end
```

To disable transaction rate network initiated setup/teardown events for new standard QCI values:

```
configure
  no transaction-rate nw-initiated-setup-teardown-events qci qci_value
  end
```

Notes:

- **65** and **66** are available options for GBR network-initiated QCI values.
- **69** and **70** are available options for non-GBR network-initiated QCI values.
- **no** disables transaction rate network initiated setup/teardown events for the specified new standard QCI value.

## Enable Mission Critical QCIs

The **mission-critical-qcis** keyword in the **diameter encode-supported-features** command is required for support between the PCEF and PCRF for new standard QCI support. Use the following example to enable mission critical QCIs in *Policy Control Configuration Mode*:

```
configure
  context context_name
    ims-auth-service ims-ggsn-auth
      policy-control
        diameter encode-supported-features mission-critical-qcis
        end
```

To disable this feature, enter the following commands:

```
configure
  context context_name
    ims-auth-service ims-ggsn-auth
      policy-control
        no diameter encode-supported-features
        end
```

Notes:



**Important** The LTE Wireless Priority Feature Set must be enabled to configure the **mission-critical-qcis** option. The LTE Wireless Priority Feature Set is a license-controlled feature. Contact your Cisco account or support representative for licensing details.

## Verifying the Configuration

Use the following example to verify the new standard QCI configuration:

```
show qci-qos-mapping table name qci_qos_mapping_table_name
```

Notes:

- The command output provides all qci-qos mapping attributes, including the new standard qci number. If any of the attributes are incorrect, repeat the configuration procedure in this chapter to correct the settings.

# Monitoring the Feature

This section describes how to monitor the New Standard QCI Support feature.

## Bulk Statistics

This section lists the bulk statistics that have been added to support the New Standard QCIs feature.

### APN Schema

The following bulk statistics have been added to the APN Schema to support the New Standard QCIs feature.

```
qci65-actbear
qci65-setupbear
qci65-relbear
qci65-uplinkpkt-fwd
qci65-dwlinkpkt-fwd
qci65-uplinkbyte-fwd
qci65-dwlinkbyte-fwd
qci65-uplinkpkt-drop
qci65-dwlinkpkt-drop
qci65-uplinkbyte-drop
qci65-dwlinkbyte-drop
qci65-uplinkpkt-drop-mbrexcd
qci65-dwlinkpkt-drop-mbrexcd
qci65-uplinkbyte-drop-mbrexcd
qci65-dwlinkbyte-drop-mbrexcd
qci65-rejbearer
qci66-actbear
qci66-setupbear
qci66-relbear
qci66-uplinkpkt-fwd
qci66-dwlinkpkt-fwd
qci66-uplinkbyte-fwd
qci66-dwlinkbyte-fwd
qci66-uplinkpkt-drop
qci66-dwlinkpkt-drop
qci66-uplinkbyte-drop
qci66-dwlinkbyte-drop
qci66-uplinkpkt-drop-mbrexcd
qci66-dwlinkpkt-drop-mbrexcd
qci66-uplinkbyte-drop-mbrexcd
qci66-dwlinkbyte-drop-mbrexcd
qci66-rejbearer
qci69-actbear
qci69-setupbear
qci69-relbear
qci69-uplinkpkt-fwd
qci69-dwlinkpkt-fwd
qci69-uplinkbyte-fwd
qci69-dwlinkbyte-fwd
qci69-uplinkpkt-drop
qci69-dwlinkpkt-drop
qci69-uplinkbyte-drop
qci69-dwlinkbyte-drop
qci69-uplinkpkt-drop-mbrexcd
qci69-dwlinkpkt-drop-mbrexcd
qci69-uplinkbyte-drop-mbrexcd
qci69-dwlinkbyte-drop-mbrexcd
qci69-rejbearer
qci70-actbear
qci70-setupbear
qci70-relbear
qci70-uplinkpkt-fwd
qci70-dwlinkpkt-fwd
qci70-uplinkbyte-fwd
qci70-dwlinkbyte-fwd
qci70-uplinkpkt-drop
qci70-dwlinkpkt-drop
qci70-uplinkbyte-drop
qci70-dwlinkbyte-drop
qci70-uplinkpkt-drop-mbrexcd
qci70-dwlinkpkt-drop-mbrexcd
qci70-uplinkbyte-drop-mbrexcd
qci70-dwlinkbyte-drop-mbrexcd
qci70-rejbearer
```

```
sessstat-bearrel-ded-admin-clear-qci65
sessstat-bearrel-ded-admin-clear-qci66
sessstat-bearrel-ded-admin-clear-qci69
sessstat-bearrel-ded-admin-clear-qci70
```

## GTPU Schema

The following bulk statistics have been added to the GTPU Schema to support the New Standard QCIs feature.

```
qci65-uplink-pkts
qci65-uplink-bytes
qci65-dwlink-pkts
qci65-dwlink-byte
qci65-pkts-discard
qci65-bytes-discard
qci66-uplink-pkts
qci66-uplink-bytes
qci66-dwlink-pkts
qci66-dwlink-byte
qci66-pkts-discard
qci66-bytes-discard
qci69-uplink-pkts
qci69-uplink-bytes
qci69-dwlink-pkts
qci69-dwlink-byte
qci69-pkts-discard
qci69-bytes-discard
qci70-uplink-pkts
qci70-uplink-bytes
qci70-dwlink-pkts
qci70-dwlink-byte
qci70-pkts-discard
qci70-bytes-discard
```

## P-GW Schema

The following bulk statistics have been added to the P-GW schema to support the New Standard QCIs feature.

```
subqosstat-bearact-qci65
subqosstat-bearact-qci66
subqosstat-bearact-qci69
subqosstat-bearact-qci70
subqosstat-bearsetup-qci65
subqosstat-bearsetup-qci66
subqosstat-bearsetup-qci69
subqosstat-bearsetup-qci70
subqosstat-bearrel-qci65
subqosstat-bearrel-qci66
subqosstat-bearrel-qci69
subqosstat-bearrel-qci70
subdatastat-uppktfwd-qci65
subdatastat-uppktfwd-qci66
subdatastat-uppktfwd-qci69
subdatastat-uppktfwd-qci70
subdatastat-upbytefwd-qci65
subdatastat-upbytefwd-qci66
subdatastat-upbytefwd-qci69
subdatastat-upbytefwd-qci70
subdatastat-downpktfwd-qci65
subdatastat-downpktfwd-qci66
subdatastat-downpktfwd-qci69
subdatastat-downpktfwd-qci70
subdatastat-downbytefwd-qci65
subdatastat-downbytefwd-qci66
```

```
subdatastat-downbytefwd-qci69
subdatastat-downbytefwd-qci70
subdatastat-uppktdrop-qci65
subdatastat-uppktdrop-qci66
subdatastat-uppktdrop-qci69
subdatastat-uppktdrop-qci70
subdatastat-upbytedrop-qci65
subdatastat-upbytedrop-qci66
subdatastat-upbytedrop-qci69
subdatastat-upbytedrop-qci70
subdatastat-downpktdrop-qci65
subdatastat-downpktdrop-qci66
subdatastat-downpktdrop-qci69
subdatastat-downpktdrop-qci70
subdatastat-downbytedrop-qci65
subdatastat-downbytedrop-qci66
subdatastat-downbytedrop-qci69
subdatastat-downbytedrop-qci70
subdatastat-uppktdropmbrexc-qci65
subdatastat-uppktdropmbrexc-qci66
subdatastat-uppktdropmbrexc-qci69
subdatastat-uppktdropmbrexc-qci70
subdatastat-upbytedropmbrexc-qci65
subdatastat-upbytedropmbrexc-qci66
subdatastat-upbytedropmbrexc-qci69
subdatastat-upbytedropmbrexc-qci70
subdatastat-downpktdropmbrexc-qci65
subdatastat-downpktdropmbrexc-qci66
subdatastat-downpktdropmbrexc-qci69
subdatastat-downpktdropmbrexc-qci70
subdatastat-downbytedropmbrexc-qci65
subdatastat-downbytedropmbrexc-qci66
subdatastat-downbytedropmbrexc-qci69
subdatastat-downbytedropmbrexc-qci70
```

## SAEGW Schema

The following bulk statistics have been added to the SAEGW Schema to support the New Standard QCIs feature.

```
sgw-totepsbearact-qci65
sgw-totepsbearact-qci66
sgw-totepsbearact-qci69
sgw-totepsbearact-qci70
sgw-totepsbearset-qci65
sgw-totepsbearset-qci66
sgw-totepsbearset-qci69
sgw-totepsbearset-qci70
sgw-totepsbearrel-qci65
sgw-totepsbearrel-qci66
sgw-totepsbearrel-qci69
sgw-totepsbearrel-qci70
sgw-totepsbearmod-qci65
sgw-totepsbearmod-qci66
sgw-totepsbearmod-qci69
sgw-totepsbearmod-qci70
sgw-totepsbearrel-dedrsn-pgw-qci65
sgw-totepsbearrel-dedrsn-pgw-qci66
sgw-totepsbearrel-dedrsn-pgw-qci69
sgw-totepsbearrel-dedrsn-pgw-qci70
sgw-totepsbearrel-dedrsn-s1err-qci65
sgw-totepsbearrel-dedrsn-s1err-qci66
sgw-totepsbearrel-dedrsn-s1err-qci69
sgw-totepsbearrel-dedrsn-s1err-qci70
```

```
sgw-totepsbearrel-dedrsn-s5err-qci65
sgw-totepsbearrel-dedrsn-s5err-qci66
sgw-totepsbearrel-dedrsn-s5err-qci69
sgw-totepsbearrel-dedrsn-s5err-qci70
sgw-totepsbearrel-dedrsn-s4err-qci65
sgw-totepsbearrel-dedrsn-s4err-qci66
sgw-totepsbearrel-dedrsn-s4err-qci69
sgw-totepsbearrel-dedrsn-s4err-qci70
sgw-totepsbearrel-dedrsn-s12err-qci65
sgw-totepsbearrel-dedrsn-s12err-qci66
sgw-totepsbearrel-dedrsn-s12err-qci69
sgw-totepsbearrel-dedrsn-s12err-qci70
sgw-totepsbearrel-dedrsn-local-qci65
sgw-totepsbearrel-dedrsn-local-qci66
sgw-totepsbearrel-dedrsn-local-qci69
sgw-totepsbearrel-dedrsn-local-qci70
sgw-totepsbearrel-dedrsn-pdn-qci65
sgw-totepsbearrel-dedrsn-pdn-qci66
sgw-totepsbearrel-dedrsn-pdn-qci69
sgw-totepsbearrel-dedrsn-pdn-qci70
sgw-totepsbearrel-dedrsn-pathfail-s1-u-qci65
sgw-totepsbearrel-dedrsn-pathfail-s1-u-qci66
sgw-totepsbearrel-dedrsn-pathfail-s1-u-qci69
sgw-totepsbearrel-dedrsn-pathfail-s1-u-qci70
sgw-totepsbearrel-dedrsn-pathfail-s5-u-qci65
sgw-totepsbearrel-dedrsn-pathfail-s5-u-qci66
sgw-totepsbearrel-dedrsn-pathfail-s5-u-qci69
sgw-totepsbearrel-dedrsn-pathfail-s5-u-qci70
sgw-totepsbearrel-dedrsn-pathfail-s5-qci65
sgw-totepsbearrel-dedrsn-pathfail-s5-qci66
sgw-totepsbearrel-dedrsn-pathfail-s5-qci69
sgw-totepsbearrel-dedrsn-pathfail-s5-qci70
sgw-totepsbearrel-dedrsn-pathfail-s11-qci65
sgw-totepsbearrel-dedrsn-pathfail-s11-qci66
sgw-totepsbearrel-dedrsn-pathfail-s11-qci69
sgw-totepsbearrel-dedrsn-pathfail-s11-qci70
sgw-totepsbearrel-dedrsn-pathfail-s12-qci65
sgw-totepsbearrel-dedrsn-pathfail-s12-qci66
sgw-totepsbearrel-dedrsn-pathfail-s12-qci69
sgw-totepsbearrel-dedrsn-pathfail-s12-qci70
sgw-totepsbearrel-dedrsn-pathfail-s4-u-qci65
sgw-totepsbearrel-dedrsn-pathfail-s4-u-qci66
sgw-totepsbearrel-dedrsn-pathfail-s4-u-qci69
sgw-totepsbearrel-dedrsn-pathfail-s4-u-qci70
sgw-totepsbearrel-dedrsn-inactivity-timeout-qci65
sgw-totepsbearrel-dedrsn-inactivity-timeout-qci66
sgw-totepsbearrel-dedrsn-inactivity-timeout-qci69
sgw-totepsbearrel-dedrsn-inactivity-timeout-qci70
sgw-totepsbearrel-dedrsn-other-qci65
sgw-totepsbearrel-dedrsn-other-qci66
sgw-totepsbearrel-dedrsn-other-qci69
sgw-totepsbearrel-dedrsn-other-qci70
sgw-datastat-ul-qci65totbyte
sgw-datastat-ul-qci65totpkt
sgw-datastat-ul-qci66totbyte
sgw-datastat-ul-qci66totpkt
sgw-datastat-ul-qci69totbyte
sgw-datastat-ul-qci69totpkt
sgw-datastat-ul-qci70totbyte
sgw-datastat-ul-qci70totpkt
sgw-datastat-ul-dropstat-qci65totbyte
sgw-datastat-ul-dropstat-qci65totpkt
sgw-datastat-ul-dropstat-qci66totbyte
sgw-datastat-ul-dropstat-qci66totpkt
```

sgw-datastat-ul-dropstat-qci69totbyte
sgw-datastat-ul-dropstat-qci69totpkt
sgw-datastat-ul-dropstat-qci70totbyte
sgw-datastat-ul-dropstat-qci70totpkt
sgw-datastat-dl-qci65totbyte
sgw-datastat-dl-qci65totpkt
sgw-datastat-dl-qci66totbyte
sgw-datastat-dl-qci66totpkt
sgw-datastat-dl-qci69totbyte
sgw-datastat-dl-qci69totpkt
sgw-datastat-dl-qci70totbyte
sgw-datastat-dl-qci70totpkt
sgw-datastat-dl-dropstat-qci65totbyte
sgw-datastat-dl-dropstat-qci65totpkt
sgw-datastat-dl-dropstat-qci66totbyte
sgw-datastat-dl-dropstat-qci66totpkt
sgw-datastat-dl-dropstat-qci69totbyte
sgw-datastat-dl-dropstat-qci69totpkt
sgw-datastat-dl-dropstat-qci70totbyte
sgw-datastat-dl-dropstat-qci70totpkt
sgw-s1u-ul-qci65totbyte
sgw-s1u-ul-qci65totpkt
sgw-s1u-ul-qci66totbyte
sgw-s1u-ul-qci66totpkt
sgw-s1u-ul-qci69totbyte
sgw-s1u-ul-qci69totpkt
sgw-s1u-ul-qci70totbyte
sgw-s1u-ul-qci70totpkt
sgw-s1u-ul-drop-qci65totbyte
sgw-s1u-ul-drop-qci65totpkt
sgw-s1u-ul-drop-qci66totbyte
sgw-s1u-ul-drop-qci66totpkt
sgw-s1u-ul-drop-qci69totbyte
sgw-s1u-ul-drop-qci69totpkt
sgw-s1u-ul-drop-qci70totbyte
sgw-s1u-ul-drop-qci70totpkt
sgw-s1u-dl-qci65totbyte
sgw-s1u-dl-qci65totpkt
sgw-s1u-dl-qci66totbyte
sgw-s1u-dl-qci66totpkt
sgw-s1u-dl-qci69totbyte
sgw-s1u-dl-qci69totpkt
sgw-s1u-dl-qci70totbyte
sgw-s1u-dl-qci70totpkt
sgw-s1u-dl-drop-qci65totbyte
sgw-s1u-dl-drop-qci65totpkt
sgw-s1u-dl-drop-qci66totbyte
sgw-s1u-dl-drop-qci66totpkt
sgw-s1u-dl-drop-qci69totbyte
sgw-s1u-dl-drop-qci69totpkt
sgw-s1u-dl-drop-qci70totbyte
sgw-s1u-dl-drop-qci70totpkt
sgw-s4u-ul-qci65totbyte
sgw-s4u-ul-qci65totpkt
sgw-s4u-ul-qci66totbyte
sgw-s4u-ul-qci66totpkt
sgw-s4u-ul-qci69totbyte
sgw-s4u-ul-qci69totpkt
sgw-s4u-ul-qci70totbyte
sgw-s4u-ul-qci70totpkt
sgw-s4u-ul-drop-qci65totbyte
sgw-s4u-ul-drop-qci65totpkt
sgw-s4u-ul-drop-qci66totbyte
sgw-s4u-ul-drop-qci66totpkt

```
sgw-s4u-ul-drop-qci69totbyte
sgw-s4u-ul-drop-qci69totpkt
sgw-s4u-ul-drop-qci70totbyte
sgw-s4u-ul-drop-qci70totpkt
sgw-s4u-dl-qci65totbyte
sgw-s4u-dl-qci65totpkt
sgw-s4u-dl-qci66totbyte
sgw-s4u-dl-qci66totpkt
sgw-s4u-dl-qci69totbyte
sgw-s4u-dl-qci69totpkt
sgw-s4u-dl-qci70totbyte
sgw-s4u-dl-qci70totpkt
sgw-s4u-dl-drop-qci65totbyte
sgw-s4u-dl-drop-qci65totpkt
sgw-s4u-dl-drop-qci66totbyte
sgw-s4u-dl-drop-qci66totpkt
sgw-s4u-dl-drop-qci69totbyte
sgw-s4u-dl-drop-qci69totpkt
sgw-s4u-dl-drop-qci70totbyte
sgw-s4u-dl-drop-qci70totpkt
sgw-s12-ul-qci65totbyte
sgw-s12-ul-qci65totpkt
sgw-s12-ul-qci66totbyte
sgw-s12-ul-qci66totpkt
sgw-s12-ul-qci69totbyte
sgw-s12-ul-qci69totpkt
sgw-s12-ul-qci70totbyte
sgw-s12-ul-qci70totpkt
sgw-s12-ul-drop-qci65totbyte
sgw-s12-ul-drop-qci65totpkt
sgw-s12-ul-drop-qci66totbyte
sgw-s12-ul-drop-qci66totpkt
sgw-s12-ul-drop-qci69totbyte
sgw-s12-ul-drop-qci69totpkt
sgw-s12-ul-drop-qci70totbyte
sgw-s12-ul-drop-qci70totpkt
sgw-s12-dl-qci65totbyte
sgw-s12-dl-qci65totpkt
sgw-s12-dl-qci66totbyte
sgw-s12-dl-qci66totpkt
sgw-s12-dl-qci69totbyte
sgw-s12-dl-qci69totpkt
sgw-s12-dl-qci70totbyte
sgw-s12-dl-qci70totpkt
sgw-s12-dl-drop-qci65totbyte
sgw-s12-dl-drop-qci65totpkt
sgw-s12-dl-drop-qci66totbyte
sgw-s12-dl-drop-qci66totpkt
sgw-s12-dl-drop-qci69totbyte
sgw-s12-dl-drop-qci69totpkt
sgw-s12-dl-drop-qci70totbyte
sgw-s12-dl-drop-qci70totpkt
sgw-s5-ul-qci65totbyte
sgw-s5-ul-qci65totpkt
sgw-s5-ul-qci66totbyte
sgw-s5-ul-qci66totpkt
sgw-s5-ul-qci69totbyte
sgw-s5-ul-qci69totpkt
sgw-s5-ul-qci70totbyte
sgw-s5-ul-qci70totpkt
sgw-s5-ul-drop-qci65totbyte
sgw-s5-ul-drop-qci65totpkt
sgw-s5-ul-drop-qci66totbyte
sgw-s5-ul-drop-qci66totpkt
```

sgw-s5-ul-drop-qci69totbyte
sgw-s5-ul-drop-qci69totpkt
sgw-s5-ul-drop-qci70totbyte
sgw-s5-ul-drop-qci70totpkt
sgw-s5-dl-qci65totbyte
sgw-s5-dl-qci65totpkt
sgw-s5-dl-qci66totbyte
sgw-s5-dl-qci66totpkt
sgw-s5-dl-qci69totbyte
sgw-s5-dl-qci69totpkt
sgw-s5-dl-qci70totbyte
sgw-s5-dl-qci70totpkt
sgw-s5-dl-drop-qci65totbyte
sgw-s5-dl-drop-qci65totpkt
sgw-s5-dl-drop-qci66totbyte
sgw-s5-dl-drop-qci66totpkt
sgw-s5-dl-drop-qci69totbyte
sgw-s5-dl-drop-qci69totpkt
sgw-s5-dl-drop-qci70totbyte
sgw-s5-dl-drop-qci70totpkt
sgw-s8-ul-qci65totbyte
sgw-s8-ul-qci65totpkt
sgw-s8-ul-qci66totbyte
sgw-s8-ul-qci66totpkt
sgw-s8-ul-qci69totbyte
sgw-s8-ul-qci69totpkt
sgw-s8-ul-qci70totbyte
sgw-s8-ul-qci70totpkt
sgw-s8-ul-drop-qci65totbyte
sgw-s8-ul-drop-qci65totpkt
sgw-s8-ul-drop-qci66totbyte
sgw-s8-ul-drop-qci66totpkt
sgw-s8-ul-drop-qci69totbyte
sgw-s8-ul-drop-qci69totpkt
sgw-s8-ul-drop-qci70totbyte
sgw-s8-ul-drop-qci70totpkt
sgw-s8-dl-qci65totbyte
sgw-s8-dl-qci65totpkt
sgw-s8-dl-qci66totbyte
sgw-s8-dl-qci66totpkt
sgw-s8-dl-qci69totbyte
sgw-s8-dl-qci69totpkt
sgw-s8-dl-qci70totbyte
sgw-s8-dl-qci70totpkt
sgw-s8-dl-drop-qci65totbyte
sgw-s8-dl-drop-qci65totpkt
sgw-s8-dl-drop-qci66totbyte
sgw-s8-dl-drop-qci66totpkt
sgw-s8-dl-drop-qci69totbyte
sgw-s8-dl-drop-qci69totpkt
sgw-s8-dl-drop-qci70totbyte
sgw-s8-dl-drop-qci70totpkt
sgw-s5s8-ul-qci65totbyte
sgw-s5s8-ul-qci65totpkt
sgw-s5s8-ul-qci66totbyte
sgw-s5s8-ul-qci66totpkt
sgw-s5s8-ul-qci69totbyte
sgw-s5s8-ul-qci69totpkt
sgw-s5s8-ul-qci70totbyte
sgw-s5s8-ul-qci70totpkt
sgw-s5s8-ul-drop-qci65totbyte
sgw-s5s8-ul-drop-qci65totpkt
sgw-s5s8-ul-drop-qci66totbyte
sgw-s5s8-ul-drop-qci66totpkt

```
sgw-s5s8-ul-drop-qci69totbyte
sgw-s5s8-ul-drop-qci69totpkt
sgw-s5s8-ul-drop-qci70totbyte
sgw-s5s8-ul-drop-qci70totpkt
sgw-s5s8-dl-qci65totbyte
sgw-s5s8-dl-qci65totpkt
sgw-s5s8-dl-qci66totbyte
sgw-s5s8-dl-qci66totpkt
sgw-s5s8-dl-qci69totbyte
sgw-s5s8-dl-qci69totpkt
sgw-s5s8-dl-qci70totbyte
sgw-s5s8-dl-qci70totpkt
sgw-s5s8-dl-drop-qci65totbyte
sgw-s5s8-dl-drop-qci65totpkt
sgw-s5s8-dl-drop-qci66totbyte
sgw-s5s8-dl-drop-qci66totpkt
sgw-s5s8-dl-drop-qci69totbyte
sgw-s5s8-dl-drop-qci69totpkt
sgw-s5s8-dl-drop-qci70totbyte
sgw-s5s8-dl-drop-qci70totpkt
pgw-subqosstat-bearact-qci65
pgw-subqosstat-bearact-qci66
pgw-subqosstat-bearact-qci69
pgw-subqosstat-bearact-qci70
pgw-subqosstat-bearset-qci65
pgw-subqosstat-bearset-qci66
pgw-subqosstat-bearset-qci69
pgw-subqosstat-bearset-qci70
pgw-subqosstat-bearrel-qci65
pgw-subqosstat-bearrel-qci66
pgw-subqosstat-bearrel-qci69
pgw-subqosstat-bearrel-qci70
pgw-subdatastat-ulpktfwd-qci65
pgw-subdatastat-ulpktfwd-qci66
pgw-subdatastat-ulpktfwd-qci69
pgw-subdatastat-ulpktfwd-qci70
pgw-subdatastat-ulbytefwd-qci65
pgw-subdatastat-ulbytefwd-qci66
pgw-subdatastat-ulbytefwd-qci69
pgw-subdatastat-ulbytefwd-qci70
pgw-subdatastat-dlpktfwd-qci65
pgw-subdatastat-dlpktfwd-qci66
pgw-subdatastat-dlpktfwd-qci69
pgw-subdatastat-dlpktfwd-qci70
pgw-subdatastat-dlbytefwd-qci65
pgw-subdatastat-dlbytefwd-qci66
pgw-subdatastat-dlbytefwd-qci69
pgw-subdatastat-dlbytefwd-qci70
pgw-subdatastat-ulpktdrop-qci65
pgw-subdatastat-ulpktdrop-qci66
pgw-subdatastat-ulpktdrop-qci69
pgw-subdatastat-ulpktdrop-qci70
pgw-subdatastat-ulbytedrop-qci65
pgw-subdatastat-ulbytedrop-qci66
pgw-subdatastat-ulbytedrop-qci69
pgw-subdatastat-ulbytedrop-qci70
pgw-subdatastat-dlpktdrop-qci65
pgw-subdatastat-dlpktdrop-qci66
pgw-subdatastat-dlpktdrop-qci69
pgw-subdatastat-dlpktdrop-qci70
pgw-subdatastat-dlbytedrop-qci65
pgw-subdatastat-dlbytedrop-qci66
pgw-subdatastat-dlbytedrop-qci69
pgw-subdatastat-dlbytedrop-qci70
```

pgw-subdatastat-ulpktdropmbrexc-qci65
pgw-subdatastat-ulpktdropmbrexc-qci66
pgw-subdatastat-ulpktdropmbrexc-qci69
pgw-subdatastat-ulpktdropmbrexc-qci70
pgw-subdatastat-ulbytedropmbrexc-qci65
pgw-subdatastat-ulbytedropmbrexc-qci66
pgw-subdatastat-ulbytedropmbrexc-qci69
pgw-subdatastat-ulbytedropmbrexc-qci70
pgw-subdatastat-dlpktdropmbrexc-qci65
pgw-subdatastat-dlpktdropmbrexc-qci66
pgw-subdatastat-dlpktdropmbrexc-qci69
pgw-subdatastat-dlpktdropmbrexc-qci70
pgw-subdatastat-dlbytedropmbrexc-qci65
pgw-subdatastat-dlbytedropmbrexc-qci66
pgw-subdatastat-dlbytedropmbrexc-qci69
pgw-subdatastat-dlbytedropmbrexc-qci70
collapsed-subdatastat-ulpktfwd-qci65
collapsed-subdatastat-ulpktfwd-qci66
collapsed-subdatastat-ulpktfwd-qci69
collapsed-subdatastat-ulpktfwd-qci70
collapsed-subdatastat-ulbytefwd-qci65
collapsed-subdatastat-ulbytefwd-qci66
collapsed-subdatastat-ulbytefwd-qci69
collapsed-subdatastat-ulbytefwd-qci70
collapsed-subdatastat-dlpktfwd-qci65
collapsed-subdatastat-dlpktfwd-qci66
collapsed-subdatastat-dlpktfwd-qci69
collapsed-subdatastat-dlpktfwd-qci70
collapsed-subdatastat-dlbytefwd-qci65
collapsed-subdatastat-dlbytefwd-qci66
collapsed-subdatastat-dlbytefwd-qci69
collapsed-subdatastat-dlbytefwd-qci70
collapsed-subdatastat-ulpktdrop-qci65
collapsed-subdatastat-ulpktdrop-qci66
collapsed-subdatastat-ulpktdrop-qci69
collapsed-subdatastat-ulpktdrop-qci70
collapsed-subdatastat-ulbytedrop-qci65
collapsed-subdatastat-ulbytedrop-qci66
collapsed-subdatastat-ulbytedrop-qci69
collapsed-subdatastat-ulbytedrop-qci70
collapsed-subdatastat-dlpktdrop-qci65
collapsed-subdatastat-dlpktdrop-qci66
collapsed-subdatastat-dlpktdrop-qci69
collapsed-subdatastat-dlpktdrop-qci70
collapsed-subdatastat-dlbytedrop-qci65
collapsed-subdatastat-dlbytedrop-qci66
collapsed-subdatastat-dlbytedrop-qci69
collapsed-subdatastat-dlbytedrop-qci70
collapsed-subqosstat-bearact-qci65
collapsed-subqosstat-bearact-qci66
collapsed-subqosstat-bearact-qci69
collapsed-subqosstat-bearact-qci70
collapsed-subqosstat-bearset-qci65
collapsed-subqosstat-bearset-qci66
collapsed-subqosstat-bearset-qci69
collapsed-subqosstat-bearset-qci70
collapsed-subqosstat-bearrel-qci65
collapsed-subqosstat-bearrel-qci66
collapsed-subqosstat-bearrel-qci69
collapsed-subqosstat-bearrel-qci70
saegw-ggsn-subqosstat-bearact-qci65
saegw-ggsn-subqosstat-bearact-qci66
saegw-ggsn-subqosstat-bearact-qci69
saegw-ggsn-subqosstat-bearact-qci70

```
saegw-ggsn-subqosstat-bearset-qci65
saegw-ggsn-subqosstat-bearset-qci66
saegw-ggsn-subqosstat-bearset-qci69
saegw-ggsn-subqosstat-bearset-qci70
saegw-ggsn-subqosstat-bearrel-qci65
saegw-ggsn-subqosstat-bearrel-qci66
saegw-ggsn-subqosstat-bearrel-qci69
saegw-ggsn-subqosstat-bearrel-qci70
saegw-ggsn-subdatastat-ulpktfwd-qci65
saegw-ggsn-subdatastat-ulpktfwd-qci66
saegw-ggsn-subdatastat-ulpktfwd-qci69
saegw-ggsn-subdatastat-ulpktfwd-qci70
saegw-ggsn-subdatastat-ulbytefwd-qci65
saegw-ggsn-subdatastat-ulbytefwd-qci66
saegw-ggsn-subdatastat-ulbytefwd-qci69
saegw-ggsn-subdatastat-ulbytefwd-qci70
saegw-ggsn-subdatastat-dlpktfwd-qci65
saegw-ggsn-subdatastat-dlpktfwd-qci66
saegw-ggsn-subdatastat-dlpktfwd-qci69
saegw-ggsn-subdatastat-dlpktfwd-qci70
saegw-ggsn-subdatastat-dlbytefwd-qci65
saegw-ggsn-subdatastat-dlbytefwd-qci66
saegw-ggsn-subdatastat-dlbytefwd-qci69
saegw-ggsn-subdatastat-dlbytefwd-qci70
saegw-ggsn-subdatastat-ulpktdrop-qci65
saegw-ggsn-subdatastat-ulpktdrop-qci66
saegw-ggsn-subdatastat-ulpktdrop-qci69
saegw-ggsn-subdatastat-ulpktdrop-qci70
saegw-ggsn-subdatastat-ulbytedrop-qci65
saegw-ggsn-subdatastat-ulbytedrop-qci66
saegw-ggsn-subdatastat-ulbytedrop-qci69
saegw-ggsn-subdatastat-ulbytedrop-qci70
saegw-ggsn-subdatastat-dlpktdrop-qci65
saegw-ggsn-subdatastat-dlpktdrop-qci66
saegw-ggsn-subdatastat-dlpktdrop-qci69
saegw-ggsn-subdatastat-dlpktdrop-qci70
saegw-ggsn-subdatastat-dlbytedrop-qci65
saegw-ggsn-subdatastat-dlbytedrop-qci66
saegw-ggsn-subdatastat-dlbytedrop-qci69
saegw-ggsn-subdatastat-dlbytedrop-qci70
saegw-ggsn-subdatastat-ulpktdropmbrexc-qci65
saegw-ggsn-subdatastat-ulpktdropmbrexc-qci66
saegw-ggsn-subdatastat-ulpktdropmbrexc-qci69
saegw-ggsn-subdatastat-ulpktdropmbrexc-qci70
saegw-ggsn-subdatastat-ulbytedropmbrexc-qci65
saegw-ggsn-subdatastat-ulbytedropmbrexc-qci66
saegw-ggsn-subdatastat-ulbytedropmbrexc-qci69
saegw-ggsn-subdatastat-ulbytedropmbrexc-qci70
saegw-ggsn-subdatastat-dlpktdropmbrexc-qci65
saegw-ggsn-subdatastat-dlpktdropmbrexc-qci66
saegw-ggsn-subdatastat-dlpktdropmbrexc-qci69
saegw-ggsn-subdatastat-dlpktdropmbrexc-qci70
saegw-ggsn-subdatastat-dlbytedropmbrexc-qci65
saegw-ggsn-subdatastat-dlbytedropmbrexc-qci66
saegw-ggsn-subdatastat-dlbytedropmbrexc-qci69
saegw-ggsn-subdatastat-dlbytedropmbrexc-qci70
```

## S-GW Schema

The following bulk statistics have been added to the S-GW schema to support the New Standard QCIs feature.

```
totepsbearactive-qci65
totepsbearactive-qci66
totepsbearactive-qci69
```

```
totepsbearactive-qci70
totepsbearsetup-qci65
totepsbearsetup-qci66
totepsbearsetup-qci69
totepsbearsetup-qci70
totepsbearrel-qci65
totepsbearrel-qci66
totepsbearrel-qci69
totepsbearrel-qci70
totepsbearmod-qci65
totepsbearmod-qci66
totepsbearmod-qci69
totepsbearmod-qci70
totepsbearrel-dedrsn-pgw-qci65
totepsbearrel-dedrsn-pgw-qci66
totepsbearrel-dedrsn-pgw-qci69
totepsbearrel-dedrsn-pgw-qci70
totepsbearrel-dedrsn-s1err-qci65
totepsbearrel-dedrsn-s1err-qci66
totepsbearrel-dedrsn-s1err-qci69
totepsbearrel-dedrsn-s1err-qci70
totepsbearrel-dedrsn-s5err-qci65
totepsbearrel-dedrsn-s5err-qci66
totepsbearrel-dedrsn-s5err-qci69
totepsbearrel-dedrsn-s5err-qci70
totepsbearrel-dedrsn-s4err-qci65
totepsbearrel-dedrsn-s4err-qci66
totepsbearrel-dedrsn-s4err-qci69
totepsbearrel-dedrsn-s4err-qci70
totepsbearrel-dedrsn-s12err-qci65
totepsbearrel-dedrsn-s12err-qci66
totepsbearrel-dedrsn-s12err-qci69
totepsbearrel-dedrsn-s12err-qci70
totepsbearrel-dedrsn-local-qci65
totepsbearrel-dedrsn-local-qci66
totepsbearrel-dedrsn-local-qci69
totepsbearrel-dedrsn-local-qci70
totepsbearrel-dedrsn-pdn-qci65
totepsbearrel-dedrsn-pdn-qci66
totepsbearrel-dedrsn-pdn-qci69
totepsbearrel-dedrsn-pdn-qci70
totepsbearrel-dedrsn-pathfail-s1-u-qci65
totepsbearrel-dedrsn-pathfail-s1-u-qci66
totepsbearrel-dedrsn-pathfail-s1-u-qci69
totepsbearrel-dedrsn-pathfail-s1-u-qci70
totepsbearrel-dedrsn-pathfail-s5-u-qci65
totepsbearrel-dedrsn-pathfail-s5-u-qci66
totepsbearrel-dedrsn-pathfail-s5-u-qci69
totepsbearrel-dedrsn-pathfail-s5-u-qci70
totepsbearrel-dedrsn-pathfail-s5-qci65
totepsbearrel-dedrsn-pathfail-s5-qci66
totepsbearrel-dedrsn-pathfail-s5-qci69
totepsbearrel-dedrsn-pathfail-s5-qci70
totepsbearrel-dedrsn-pathfail-s11-qci65
totepsbearrel-dedrsn-pathfail-s11-qci66
totepsbearrel-dedrsn-pathfail-s11-qci69
totepsbearrel-dedrsn-pathfail-s11-qci70
totepsbearrel-dedrsn-pathfail-s12-qci65
totepsbearrel-dedrsn-pathfail-s12-qci66
totepsbearrel-dedrsn-pathfail-s12-qci69
totepsbearrel-dedrsn-pathfail-s12-qci70
totepsbearrel-dedrsn-pathfail-s4-u-qci65
totepsbearrel-dedrsn-pathfail-s4-u-qci66
totepsbearrel-dedrsn-pathfail-s4-u-qci69
```

```
totepsbearrel-dedrsn-pathfail-s4-u-qci70
totepsbearrel-dedrsn-inactivity-timeout-qci65
totepsbearrel-dedrsn-inactivity-timeout-qci66
totepsbearrel-dedrsn-inactivity-timeout-qci69
totepsbearrel-dedrsn-inactivity-timeout-qci70
totepsbearrel-dedrsn-other-qci65
totepsbearrel-dedrsn-other-qci66
totepsbearrel-dedrsn-other-qci69
totepsbearrel-dedrsn-other-qci70
datastat-uplink-qci65totbyte
datastat-uplink-qci65totpkt
datastat-uplink-qci66totbyte
datastat-uplink-qci66totpkt
datastat-uplink-qci69totbyte
datastat-uplink-qci69totpkt
datastat-uplink-qci70totbyte
datastat-uplink-qci70totpkt
datastat-uplink-dropstat-qci65totbyte
datastat-uplink-dropstat-qci65totpkt
datastat-uplink-dropstat-qci66totbyte
datastat-uplink-dropstat-qci66totpkt
datastat-uplink-dropstat-qci69totbyte
datastat-uplink-dropstat-qci69totpkt
datastat-uplink-dropstat-qci70totbyte
datastat-uplink-dropstat-qci70totpkt
datastat-downlink-qci65totbyte
datastat-downlink-qci65totpkt
datastat-downlink-qci66totbyte
datastat-downlink-qci66totpkt
datastat-downlink-qci69totbyte
datastat-downlink-qci69totpkt
datastat-downlink-qci70totbyte
datastat-downlink-qci70totpkt
datastat-downlink-dropstat-qci65totbyte
datastat-downlink-dropstat-qci65totpkt
datastat-downlink-dropstat-qci66totbyte
datastat-downlink-dropstat-qci66totpkt
datastat-downlink-dropstat-qci69totbyte
datastat-downlink-dropstat-qci69totpkt
datastat-downlink-dropstat-qci70totbyte
datastat-downlink-dropstat-qci70totpkt
s1u-uplnk-qci65totbyte
s1u-uplnk-qci65totpkt
s1u-uplnk-qci66totbyte
s1u-uplnk-qci66totpkt
s1u-uplnk-qci69totbyte
s1u-uplnk-qci69totpkt
s1u-uplnk-qci70totbyte
s1u-uplnk-qci70totpkt
s1u-uplnk-drop-qci65totbyte
s1u-uplnk-drop-qci65totpkt
s1u-uplnk-drop-qci66totbyte
s1u-uplnk-drop-qci66totpkt
s1u-uplnk-drop-qci69totbyte
s1u-uplnk-drop-qci69totpkt
s1u-uplnk-drop-qci70totbyte
s1u-uplnk-drop-qci70totpkt
s1u-downlnk-qci65totbyte
s1u-downlnk-qci65totpkt
s1u-downlnk-qci66totbyte
s1u-downlnk-qci66totpkt
s1u-downlnk-qci69totbyte
s1u-downlnk-qci69totpkt
s1u-downlnk-qci70totbyte
```

```
s1u-downlnk-qci70totpkt
s1u-downlnk-drop-qci65totbyte
s1u-downlnk-drop-qci65totpkt
s1u-downlnk-drop-qci66totbyte
s1u-downlnk-drop-qci66totpkt
s1u-downlnk-drop-qci69totbyte
s1u-downlnk-drop-qci69totpkt
s1u-downlnk-drop-qci70totbyte
s1u-downlnk-drop-qci70totpkt
s4u-uplnk-qci65totbyte
s4u-uplnk-qci65totpkt
s4u-uplnk-qci66totbyte
s4u-uplnk-qci66totpkt
s4u-uplnk-qci69totbyte
s4u-uplnk-qci69totpkt
s4u-uplnk-qci70totbyte
s4u-uplnk-qci70totpkt
s4u-uplnk-drop-qci65totbyte
s4u-uplnk-drop-qci65totpkt
s4u-uplnk-drop-qci66totbyte
s4u-uplnk-drop-qci66totpkt
s4u-uplnk-drop-qci69totbyte
s4u-uplnk-drop-qci69totpkt
s4u-uplnk-drop-qci70totbyte
s4u-uplnk-drop-qci70totpkt
s4u-downlnk-qci65totbyte
s4u-downlnk-qci65totpkt
s4u-downlnk-qci66totbyte
s4u-downlnk-qci66totpkt
s4u-downlnk-qci69totbyte
s4u-downlnk-qci69totpkt
s4u-downlnk-qci70totbyte
s4u-downlnk-qci70totpkt
s4u-downlnk-drop-qci65totbyte
s4u-downlnk-drop-qci65totpkt
s4u-downlnk-drop-qci66totbyte
s4u-downlnk-drop-qci66totpkt
s4u-downlnk-drop-qci69totbyte
s4u-downlnk-drop-qci69totpkt
s4u-downlnk-drop-qci70totbyte
s4u-downlnk-drop-qci70totpkt
s12-uplnk-qci65totbyte
s12-uplnk-qci65totpkt
s12-uplnk-qci66totbyte
s12-uplnk-qci66totpkt
s12-uplnk-qci69totbyte
s12-uplnk-qci69totpkt
s12-uplnk-qci70totbyte
s12-uplnk-qci70totpkt
s12-uplnk-drop-qci65totbyte
s12-uplnk-drop-qci65totpkt
s12-uplnk-drop-qci66totbyte
s12-uplnk-drop-qci66totpkt
s12-uplnk-drop-qci69totbyte
s12-uplnk-drop-qci69totpkt
s12-uplnk-drop-qci70totbyte
s12-uplnk-drop-qci70totpkt
s12-downlnk-qci65totbyte
s12-downlnk-qci65totpkt
s12-downlnk-qci66totbyte
s12-downlnk-qci66totpkt
s12-downlnk-qci69totbyte
s12-downlnk-qci69totpkt
s12-downlnk-qci70totbyte
```

```
s12-downlnk-qci70totpkt
s12-downlnk-drop-qci65totbyte
s12-downlnk-drop-qci65totpkt
s12-downlnk-drop-qci66totbyte
s12-downlnk-drop-qci66totpkt
s12-downlnk-drop-qci69totbyte
s12-downlnk-drop-qci69totpkt
s12-downlnk-drop-qci70totbyte
s12-downlnk-drop-qci70totpkt
s5-uplnk-qci65totbyte
s5-uplnk-qci65totpkt
s5-uplnk-qci66totbyte
s5-uplnk-qci66totpkt
s5-uplnk-qci69totbyte
s5-uplnk-qci69totpkt
s5-uplnk-qci70totbyte
s5-uplnk-qci70totpkt
s5-uplnk-drop-qci65totbyte
s5-uplnk-drop-qci65totpkt
s5-uplnk-drop-qci66totbyte
s5-uplnk-drop-qci66totpkt
s5-uplnk-drop-qci69totbyte
s5-uplnk-drop-qci69totpkt
s5-uplnk-drop-qci70totbyte
s5-uplnk-drop-qci70totpkt
s5-downlnk-qci65totbyte
s5-downlnk-qci65totpkt
s5-downlnk-qci66totbyte
s5-downlnk-qci66totpkt
s5-downlnk-qci69totbyte
s5-downlnk-qci69totpkt
s5-downlnk-qci70totbyte
s5-downlnk-qci70totpkt
s5-downlnk-drop-qci65totbyte
s5-downlnk-drop-qci65totpkt
s5-downlnk-drop-qci66totbyte
s5-downlnk-drop-qci66totpkt
s5-downlnk-drop-qci69totbyte
s5-downlnk-drop-qci69totpkt
s5-downlnk-drop-qci70totbyte
s5-downlnk-drop-qci70totpkt
s8-uplnk-qci65totbyte
s8-uplnk-qci65totpkt
s8-uplnk-qci66totbyte
s8-uplnk-qci66totpkt
s8-uplnk-qci69totbyte
s8-uplnk-qci69totpkt
s8-uplnk-qci70totbyte
s8-uplnk-qci70totpkt
s8-uplnk-drop-qci65totbyte
s8-uplnk-drop-qci65totpkt
s8-uplnk-drop-qci66totbyte
s8-uplnk-drop-qci66totpkt
s8-uplnk-drop-qci69totbyte
s8-uplnk-drop-qci69totpkt
s8-uplnk-drop-qci70totbyte
s8-uplnk-drop-qci70totpkt
s8-downlnk-qci65totbyte
s8-downlnk-qci65totpkt
s8-downlnk-qci66totbyte
s8-downlnk-qci66totpkt
s8-downlnk-qci69totbyte
s8-downlnk-qci69totpkt
s8-downlnk-qci70totbyte
```

```
s8-downlnk-qci70totpkt
s8-downlnk-drop-qci65totbyte
s8-downlnk-drop-qci65totpkt
s8-downlnk-drop-qci66totbyte
s8-downlnk-drop-qci66totpkt
s8-downlnk-drop-qci69totbyte
s8-downlnk-drop-qci69totpkt
s8-downlnk-drop-qci70totbyte
s8-downlnk-drop-qci70totpkt
s5s8-uplnk-qci65totbyte
s5s8-uplnk-qci65totpkt
s5s8-uplnk-qci66totbyte
s5s8-uplnk-qci66totpkt
s5s8-uplnk-qci69totbyte
s5s8-uplnk-qci69totpkt
s5s8-uplnk-qci70totbyte
s5s8-uplnk-qci70totpkt
s5s8-uplnk-drop-qci65totbyte
s5s8-uplnk-drop-qci65totpkt
s5s8-uplnk-drop-qci66totbyte
s5s8-uplnk-drop-qci66totpkt
s5s8-uplnk-drop-qci69totbyte
s5s8-uplnk-drop-qci69totpkt
s5s8-uplnk-drop-qci70totbyte
s5s8-uplnk-drop-qci70totpkt
s5s8-downlnk-qci65totbyte
s5s8-downlnk-qci65totpkt
s5s8-downlnk-qci66totbyte
s5s8-downlnk-qci66totpkt
s5s8-downlnk-qci69totbyte
s5s8-downlnk-qci69totpkt
s5s8-downlnk-qci70totbyte
s5s8-downlnk-qci70totpkt
s5s8-downlnk-drop-qci65totbyte
s5s8-downlnk-drop-qci65totpkt
s5s8-downlnk-drop-qci66totbyte
s5s8-downlnk-drop-qci66totpkt
s5s8-downlnk-drop-qci69totbyte
s5s8-downlnk-drop-qci69totpkt
s5s8-downlnk-drop-qci70totbyte
s5s8-downlnk-drop-qci70totpkt
```

## System Schema

The following bulk statistics have been added to the System Schema to support the New Standard QCIs feature.

```
sess-bearerdur-5sec-qci65
sess-bearerdur-10sec-qci65
sess-bearerdur-30sec-qci65
sess-bearerdur-1min-qci65
sess-bearerdur-2min-qci65
sess-bearerdur-5min-qci65
sess-bearerdur-15min-qci65
sess-bearerdur-30min-qci65
sess-bearerdur-1hr-qci65
sess-bearerdur-4hr-qci65
sess-bearerdur-12hr-qci65
sess-bearerdur-24hr-qci65
sess-bearerdur-over24hr-qci65
sess-bearerdur-2day-qci65
sess-bearerdur-4day-qci65
sess-bearerdur-5day-qci65
sess-bearerdur-5sec-qci66
```

```
sess-bearerdur-10sec-qci66
sess-bearerdur-30sec-qci66
sess-bearerdur-1min-qci66
sess-bearerdur-2min-qci66
sess-bearerdur-5min-qci66
sess-bearerdur-15min-qci66
sess-bearerdur-30min-qci66
sess-bearerdur-1hr-qci66
sess-bearerdur-4hr-qci66
sess-bearerdur-12hr-qci66
sess-bearerdur-24hr-qci66
sess-bearerdur-over24hr-qci66
sess-bearerdur-2day-qci66
sess-bearerdur-4day-qci66
sess-bearerdur-5day-qci66
sess-bearerdur-5sec-qci69
sess-bearerdur-10sec-qci69
sess-bearerdur-30sec-qci69
sess-bearerdur-1min-qci69
sess-bearerdur-2min-qci69
sess-bearerdur-5min-qci69
sess-bearerdur-15min-qci69
sess-bearerdur-30min-qci69
sess-bearerdur-1hr-qci69
sess-bearerdur-4hr-qci69
sess-bearerdur-12hr-qci69
sess-bearerdur-24hr-qci69
sess-bearerdur-over24hr-qci69
sess-bearerdur-2day-qci69
sess-bearerdur-4day-qci69
sess-bearerdur-5day-qci69
sess-bearerdur-5sec-qci70
sess-bearerdur-10sec-qci70
sess-bearerdur-30sec-qci70
sess-bearerdur-1min-qci70
sess-bearerdur-2min-qci70
sess-bearerdur-5min-qci70
sess-bearerdur-15min-qci70
sess-bearerdur-30min-qci70
sess-bearerdur-1hr-qci70
sess-bearerdur-4hr-qci70
sess-bearerdur-12hr-qci70
sess-bearerdur-24hr-qci70
sess-bearerdur-over24hr-qci70
sess-bearerdur-2day-qci70
sess-bearerdur-4day-qci70
sess-bearerdur-5day-qci70
```

## Show Commands

This section describes the show commands available to monitor the New Standard QCIs feature.

### show apn statistics all

The output of this command has been enhanced to show administrative disconnects and bearer statistics for the new standard QCIs 65, 66, 69, and 70. New statistics are highlighted in *italics*.

```
...

4G Bearers Released By Reasons:

                     QCI1   QCI2   QCI3   QCI4   QCI5   QCI6   QCI7   QCI8   QCI9
   Admin disconnect:  0          0          0      0      0      0      0      0
```

```
                     QCI65      QCI66      QCI69      QCI70
   Admin disconnect:         0          0          0          0
...

  QCI 65:
    Bearer Active:                  0   Bearer setup:                              0
    Bearer Released:                0   Bearer Rejected:                           0

    Uplink Bytes forwarded:         0   Downlink Bytes forwarded:                  0
    Uplink pkts forwarded:          0   Downlink pkts forwarded:                   0
    Uplink Bytes dropped:           0   Downlink Bytes dropped:                    0
    Uplink pkts dropped:            0   Downlink pkts dropped:                     0
    Uplink Bytes dropped(MBR Excd): 0   Downlink Bytes dropped(MBR Excd):          0
    Uplink pkts dropped(MBR Excd):  0   Downlink pkts dropped(MBR Excd):           0

  QCI 66:
    Bearer Active:                  0   Bearer setup:                              0
    Bearer Released:                0   Bearer Rejected:                           0

    Uplink Bytes forwarded:         0   Downlink Bytes forwarded:                  0
    Uplink pkts forwarded:          0   Downlink pkts forwarded:                   0
    Uplink Bytes dropped:           0   Downlink Bytes dropped:                    0
    Uplink pkts dropped:            0   Downlink pkts dropped:                     0
    Uplink Bytes dropped(MBR Excd): 0   Downlink Bytes dropped(MBR Excd):          0
    Uplink pkts dropped(MBR Excd):  0   Downlink pkts dropped(MBR Excd):           0

  QCI 69:
    Bearer Active:                  0   Bearer setup:                              0
    Bearer Released:                0   Bearer Rejected:                           0

    Uplink Bytes forwarded:         0   Downlink Bytes forwarded:                  0
    Uplink pkts forwarded:          0   Downlink pkts forwarded:                   0
    Uplink Bytes dropped:           0   Downlink Bytes dropped:                    0
    Uplink pkts dropped:            0   Downlink pkts dropped:                     0
    Uplink Bytes dropped(MBR Excd): 0   Downlink Bytes dropped(MBR Excd):          0
    Uplink pkts dropped(MBR Excd):  0   Downlink pkts dropped(MBR Excd):           0

  QCI 70:
    Bearer Active:                  0   Bearer setup:                              0
    Bearer Released:                0   Bearer Rejected:                           0

    Uplink Bytes forwarded:         0   Downlink Bytes forwarded:                  0
    Uplink pkts forwarded:          0   Downlink pkts forwarded:                   0
    Uplink Bytes dropped:           0   Downlink Bytes dropped:                    0
    Uplink pkts dropped:            0   Downlink pkts dropped:                     0
    Uplink Bytes dropped(MBR Excd): 0   Downlink Bytes dropped(MBR Excd):          0
    Uplink pkts dropped(MBR Excd):  0   Downlink pkts dropped(MBR Excd):         0
                      0
...
```

## show gtpu statistics

The output of this command has been enhanced to provide packet and byte information for QCI values 65, 66, 69, and 70. New statistics are in *italics*.

```
...
    QCI 9:
         Uplink Packets:              0  Uplink Bytes:                0
         Downlink Packets:            0  Downlink Bytes:              0
         Packets Discarded:           0  Bytes Discarded:             0

    QCI 65:
         Uplink Packets:              0  Uplink Bytes:                0
```

```
         Downlink Packets:            0  Downlink Bytes:              0
         Packets Discarded:           0  Bytes Discarded:             0

    QCI 66:
         Uplink Packets:              0  Uplink Bytes:                0
         Downlink Packets:            0  Downlink Bytes:              0
         Packets Discarded:           0  Bytes Discarded:             0


    QCI 69:
         Uplink Packets:              0  Uplink Bytes:                0
         Downlink Packets:            0  Downlink Bytes:              0
         Packets Discarded:           0  Bytes Discarded:             0

    QCI 70:
         Uplink Packets:              0  Uplink Bytes:                0
         Downlink Packets:            0  Downlink Bytes:              0
         Packets Discarded:           0  Bytes Discarded:             0

    Non-Std QCI(Non-GBR):
         Uplink Packets:              0  Uplink Bytes:                0
         Downlink Packets:            0  Downlink Bytes:              0
         Packets Discarded:           0  Bytes Discarded:             0
...
```

## show pgw-service statistics all verbose

The output of this command has been enhanced to provide new standard QCI information by QoS characteristics and IPv4v6 PDN Data statistics. New statistics are in *italics*.

```
Bearers By QoS characteristics:
  Active:                                    Setup:
    QCI 1:                              0      QCI 1:                            0
...
    QCI 65:                          0       QCI 65:                          0
    QCI 66:                             0      QCI 66:                           0
    QCI 69:                             0      QCI 69:                           0
    QCI 70:                             0      QCI 70:                           0
...

  Released:
    QCI 1:                              0
...
    QCI 65:                             0
    QCI 66:                             0
    QCI 69:                             0
    QCI 70:                             0
...

  IPv4v6 PDN Data Statistics:
    Uplink :                                 Downlink :
...
      Packets:                                 Packets:
        QCI 1:                          0        QCI 1:                            0
...
        QCI 65:                      0           QCI 65:                          0
        QCI 66:                         0           QCI 66:                           0
        QCI 69:                         0           QCI 69:                           0
        QCI 70:                         0           QCI 70:                           0
```

## show saegw-service statistics all verbose

The output of this command has been enhanced to provide information related to the new standard QCIs. New statistics are in *italics*.

```
...

Bearers By QoS characteristics:
  Active:                                  Setup:
    QCI  1:                          0      QCI  1:                          0
    ...
    QCI  9:                          0      QCI  9:                          0
    QCI 65:                          0      QCI 65:                          0
    QCI 66:                          0      QCI 66:                          0
    QCI 69:                          0      QCI 69:                          0
    QCI 70:                          0      QCI 70:                          0
    Non-Std QCI:                     0      Non-Std QCI:                     0
  Released:
    QCI  1:                          0
   ...
    QCI  9:                          0
    QCI 65:                          0
    QCI 66:                          0
    QCI 69:                          0
    QCI 70:                          0
    Non-Std QCI:                     0

…
      Std QCI(Non-GBR):              0      Std QCI(Non-GBR):              0
      Std QCI(GBR):                  0      Std QCI(GBR):                  0

    Uplink :                                 Downlink :
      Packets:                                 Packets:
        QCI 1:                       0          QCI 1:                       0
...
        QCI 65:                      0          QCI 65:                      0
        QCI 66:                      0          QCI 66:                      0
        QCI 69:                      0          QCI 69:                      0
        QCI 70:                      0          QCI 70:                      0
        Non-Std QCI:                 0          Non-Std QCI:                 0

      Bytes:                                   Bytes:
        QCI 1:                       0          QCI 1:                       0
...
        QCI 65:                      0          QCI 65:                      0
        QCI 66:                      0          QCI 66:                      0
        QCI 69:                      0          QCI 69:                      0
        QCI 70:                      0          QCI 70:                      0
        Non-Std QCI:                 0          Non-Std QCI:                 0

      Dropped Packets:                         Dropped Packets:
        QCI 1:                       0          QCI 1:                       0\
...
        QCI 65:                      0          QCI 65:                      0
        QCI 66:                      0          QCI 66:                      0
        QCI 69:                      0          QCI 69:                      0
        QCI 70:                      0          QCI 70:                      0
        Non-Std QCI:                 0          Non-Std QCI:                 0

      Dropped Bytes:                           Dropped Bytes:
        QCI 1:                       0          QCI 1:                       0
...
        QCI 65:                      0          QCI 65:                      0
        QCI 66:                      0          QCI 66:                      0
```

```
        QCI 69:                         0        QCI 69:                         0
        QCI 70:                         0        QCI 70:                         0
        Non-Std QCI:                    0        Non-Std QCI:                    0
Setup Guard Timer Expired:        0
```

## show sgw-service statistics all verbose

The output of this command has been enhanced to provide new standard QCI information. New statistics are highlighted in *italics*.

```
...

Bearers By QoS characteristics:
  Active:                                 Setup:
    QCI 1:                          0       QCI 1:                          0
...
    QCI 65:                     0       QCI 65:                         0
    QCI 66:                         0       QCI 66:                         0
    QCI 69:                         0       QCI 69:                         0
    QCI 70:                         0       QCI 70:                         0
...

  Released:                               Modified:
    QCI 1:                          0       QCI 1:                          0
...
    QCI 65:                     0       QCI 65:                         0
    QCI 66:                         0       QCI 66:                         0
    QCI 69:                         0       QCI 69:                         0
    QCI 70:                         0       QCI 70:                         0
...

Dedicated Bearers Released By Reason:
  PGW Ini:                          0     PCRF Ini:                         0
    QCI 1:                          0
...
    QCI 65:                     0
    QCI 66:                         0
    QCI 69:                         0
    QCI 70:                         0
    Non-Std QCI:                    0
...
  S1 Error Ini:                     0     S5 Error Ini:                     0
    QCI 1:                          0       QCI 1:                          0
...
    QCI 65:                     0       QCI 65:                         0
    QCI 66:                         0       QCI 66:                         0
    QCI 69:                         0       QCI 69:                         0
    QCI 70:                         0       QCI 70:                         0
    Non-Std QCI:                    0       Non-Std QCI:                    0

  S4 Error Ini:                     0     S12 Error Ini:                    0
    QCI 1:                          0       QCI 1:                          0
...
    QCI 65:                     0       QCI 65:                         0
    QCI 66:                         0       QCI 66:                         0
    QCI 69:                         0       QCI 69:                         0
    QCI 70:                         0       QCI 70:                         0
    Non-Std QCI:                    0       Non-Std QCI:                    0

  Local:                            0     PDN Down:                         0
    QCI 1:                          0       QCI 1:                          0
...
    QCI 65:                     0       QCI 65:                         0
    QCI 66:                         0       QCI 66:                         0
```

```
    QCI 69:                          0      QCI 69:                          0
    QCI 70:                          0      QCI 70:                          0
    Non-Std QCI:                     0      Non-Std QCI:                     0

  Path Failure S1-U:                 0    Path Failure S5-U:                 0
    QCI 1:                           0      QCI 1:                           0
    ...
    QCI 65:                    0      QCI 65:                          0
    QCI 66:                          0      QCI 66:                          0
    QCI 69:                          0      QCI 69:                          0
    QCI 70:                          0      QCI 70:                          0
    Non-Std QCI:                     0      Non-Std QCI:                     0

  Path Failure S5:                   0    Path Failure S11:                  0
    QCI 1:                           0      QCI 1:                           0
...
    QCI 65:                    0      QCI 65:                          0
    QCI 66:                          0      QCI 66:                          0
    QCI 69:                          0      QCI 69:                          0
    QCI 70:                          0      QCI 70:                          0
    Non-Std QCI:                     0      Non-Std QCI:                     0

  Path Failure S4-U:                 0    Path Failure S12:                  0
    QCI 1:                           0      QCI 1:                           0
...
    QCI 65:                    0      QCI 65:                          0
    QCI 66:                          0      QCI 66:                          0
    QCI 69:                          0      QCI 69:                          0
    QCI 70:                          0      QCI 70:                          0
    Non-Std QCI:                     0      Non-Std QCI:                     0

  Inactivity Timeout:                0    Other:                             0
    QCI 1:                           0      QCI 1:                           0
...
    QCI 65:                    0      QCI 65:                          0
    QCI 66:                          0      QCI 66:                          0
    QCI 69:                          0      QCI 69:                          0
    QCI 70:                          0      QCI 70:                          0
    Non-Std QCI:                     0      Non-Std QCI:                     0

 ...
 Data Statistics Per Interface:
  S1-U Total Data Statistics:
    Uplink :                           Downlink :
...
      Packets:                           Packets:
        QCI 1:                     0       QCI 1:                           0
...
        QCI 65:                    0       QCI 65:                          0
        QCI 66:                          0       QCI 66:                          0
        QCI 69:                          0       QCI 69:                          0
        QCI 70:                          0       QCI 70:                          0
        Non-Std QCI:                     0       Non-Std QCI:                     0

      Bytes:                             Bytes:
        QCI 1:                     0       QCI 1:                           0
...
        QCI 65:                    0       QCI 65:                          0
        QCI 66:                          0       QCI 66:                          0
        QCI 69:                          0       QCI 69:                          0
        QCI 70:                          0       QCI 70:                          0
        Non-Std QCI:                     0       Non-Std QCI:                     0

      Dropped Packets:                   Dropped Packets:
```

```
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                     0        QCI 65:                         0
        QCI 66:                         0        QCI 66:                         0
        QCI 69:                         0        QCI 69:                         0
        QCI 70:                         0        QCI 70:                         0
        Non-Std QCI:                    0        Non-Std QCI:                    0

      Dropped Bytes:                          Dropped Bytes:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                     0        QCI 65:                         0
        QCI 66:                         0        QCI 66:                         0
        QCI 69:                         0        QCI 69:                         0
        QCI 70:                         0        QCI 70:                         0
        Non-Std QCI:                    0        Non-Std QCI:                    0

  S4-U Total Data Statistics:
    Uplink :                              Downlink :
      Total Pkts:                     0      Total Pkts:                     0
      Total Bytes:                    0      Total Bytes:                    0
      Dropped Pkts:                   0      Dropped Pkts:                   0
      Dropped Bytes:                  0      Dropped Bytes:                  0

      Packets:                                Packets:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                     0        QCI 65:                         0
        QCI 66:                         0        QCI 66:                         0
        QCI 69:                         0        QCI 69:                         0
        QCI 70:                         0        QCI 70:                         0
        Non-Std QCI:                    0        Non-Std QCI:                    0

      Bytes:                                  Bytes:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                     0        QCI 65:                         0
        QCI 66:                         0        QCI 66:                         0
        QCI 69:                         0        QCI 69:                         0
        QCI 70:                         0        QCI 70:                         0
        Non-Std QCI:                    0        Non-Std QCI:                    0

      Dropped Packets:                        Dropped Packets:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                     0        QCI 65:                         0
        QCI 66:                         0        QCI 66:                         0
        QCI 69:                         0        QCI 69:                         0
        QCI 70:                         0        QCI 70:                         0
        Non-Std QCI:                    0        Non-Std QCI:                    0

      Dropped Bytes:                          Dropped Bytes:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                     0        QCI 65:                         0
        QCI 66:                         0        QCI 66:                         0
        QCI 69:                         0        QCI 69:                         0
        QCI 70:                         0        QCI 70:                         0
        Non-Std QCI:                    0        Non-Std QCI:                    0

  S12 Total Data Statistics:
    Uplink :                              Downlink :
      Total Pkts:                     0      Total Pkts:                     0
      Total Bytes:                    0      Total Bytes:                    0
```

```
      Dropped Pkts:                     0      Dropped Pkts:                     0
      Dropped Bytes:                    0      Dropped Bytes:                    0

      Packets:                                 Packets:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                   0            QCI 65:                   0
        QCI 66:                         0          QCI 66:                         0
        QCI 69:                         0          QCI 69:                         0
        QCI 70:                         0          QCI 70:                         0
        Non-Std QCI:                    0          Non-Std QCI:                    0

      Bytes:                                   Bytes:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                   0            QCI 65:                   0
        QCI 66:                         0          QCI 66:                         0
        QCI 69:                         0          QCI 69:                         0
        QCI 70:                         0          QCI 70:                         0
        Non-Std QCI:                    0          Non-Std QCI:                    0

      Dropped Packets:                         Dropped Packets:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                   0            QCI 65:                   0
        QCI 66:                         0          QCI 66:                         0
        QCI 69:                         0          QCI 69:                         0
        QCI 70:                         0          QCI 70:                         0
        Non-Std QCI:                    0          Non-Std QCI:                    0

      Dropped Bytes:                           Dropped Bytes:
        QCI 1:                          0        QCI 1:                          0
...
        QCI 65:                   0            QCI 65:                   0
        QCI 66:                         0          QCI 66:                         0
        QCI 69:                         0          QCI 69:                         0
        QCI 70:                         0          QCI 70:                         0
        Non-Std QCI:                    0          Non-Std QCI:                    0

    S5-U Total Data Statistics:
      Uplink :                                 Downlink :
        Total Pkts:                     0        Total Pkts:                     0
        Total Bytes:                    0        Total Bytes:                    0
        Dropped Pkts:                   0        Dropped Pkts:                   0
        Dropped Bytes:                  0        Dropped Bytes:                  0

        Packets:                                 Packets:
          QCI 1:                        0          QCI 1:                        0
...
          QCI 65:                 0              QCI 65:                 0
          QCI 66:                       0            QCI 66:                       0
          QCI 69:                       0            QCI 69:                       0
          QCI 70:                       0            QCI 70:                       0
          Non-Std QCI:                  0            Non-Std QCI:                  0

        Bytes:                                   Bytes:
          QCI 1:                        0          QCI 1:                        0
...
          QCI 65:                 0              QCI 65:                 0
          QCI 66:                       0            QCI 66:                       0
          QCI 69:                       0            QCI 69:                       0
          QCI 70:                       0            QCI 70:                       0
          Non-Std QCI:                  0            Non-Std QCI:                  0
```

```
      Dropped Packets:                          Dropped Packets:
        QCI 1:                          0         QCI 1:                          0
...
        QCI 65:                     0         QCI 65:                         0
        QCI 66:                         0         QCI 66:                         0
        QCI 69:                         0         QCI 69:                         0
        QCI 70:                         0         QCI 70:                         0
        Non-Std QCI:                    0         Non-Std QCI:                    0

      Dropped Bytes:                            Dropped Bytes:
        QCI 1:                          0         QCI 1:                          0
...
        QCI 65:                     0         QCI 65:                         0
        QCI 66:                         0         QCI 66:                         0
        QCI 69:                         0         QCI 69:                         0
        QCI 70:                         0         QCI 70:                         0
        Non-Std QCI:                    0         Non-Std QCI:                    0

  S8-U Total Data Statistics:
    Uplink :                                  Downlink :
      Total Pkts:                     0       Total Pkts:                     0
      Total Bytes:                    0       Total Bytes:                    0
      Dropped Pkts:                   0       Dropped Pkts:                   0
      Dropped Bytes:                  0       Dropped Bytes:                  0

      Packets:                                  Packets:
        QCI 1:                          0         QCI 1:                          0
...
        QCI 65:                     0         QCI 65:                         0
        QCI 66:                         0         QCI 66:                         0
        QCI 69:                         0         QCI 69:                         0
        QCI 70:                         0         QCI 70:                         0
        Non-Std QCI:                    0         Non-Std QCI:                    0

      Bytes:                                    Bytes:
        QCI 1:                          0         QCI 1:                          0
...
        QCI 65:                     0         QCI 65:                         0
        QCI 66:                         0         QCI 66:                         0
        QCI 69:                         0         QCI 69:                         0
        QCI 70:                         0         QCI 70:                         0
        Non-Std QCI:                    0         Non-Std QCI:                    0

      Dropped Packets:                          Dropped Packets:
        QCI 1:                          0         QCI 1:                          0
...
        QCI 65:                     0         QCI 65:                         0
        QCI 66:                         0         QCI 66:                         0
        QCI 69:                         0         QCI 69:                         0
        QCI 70:                         0         QCI 70:                         0
        Non-Std QCI:                    0         Non-Std QCI:                    0

      Dropped Bytes:                            Dropped Bytes:
        QCI 1:                          0         QCI 1:                          0
...
        QCI 65:                     0         QCI 65:                         0
        QCI 66:                         0         QCI 66:                         0
        QCI 69:                         0         QCI 69:                         0
        QCI 70:                         0         QCI 70:                         0
        Non-Std QCI:                    0         Non-Std QCI:                    0
```

# Non-standard QCI Support

This section describes the Non-standard QCI Support feature.

## Feature Description

Usually, only standards-based QCI values of 1 through 9 are supported on GGSN/P-GW/SAEGW/S-GW/ePDG. A license, however, allows non-standard QCIs (128-254) to be used on P-GW/GGSN (not standalone GGSN).

### Licensing

Use of non-standard QCIs require that a valid license key be installed. Contact your Cisco Account or Support representative for information on how to obtain a license.

## How It Works

From 3GPP Release 8 onwards, operator-specific/non-standard QCIs can be supported and carriers can define QCI 128-254. QCI values 0 and 10 to 255 are defined as follows:

- 0: Reserved
- 10-127: Reserved
- 128-254: Operator-specific/Non-standard QCI
- 255: Reserved

Unique operator-specific QCIs (128-254) can be used to differentiate between various services/applications carriers provide to the end users in their network.

### Limitations

- Non-standard QCIs can only be supported with S5/S8/S2a/S2b interfaces.
- The Gn interface is not supported.

### Standards Compliance

- 3GPP Specification TS 23.203: Policy and charging control architecture
- 3GPP Specification TS 29.212: Policy and Charging Control over Gx reference point

## Configuring Non-standard QCI Support

The **operator-defined-qci** command in the QCI-QoS Mapping Configuration Mode configures the non-standard QCIs in P-GW so that calls can be accepted when non-standard QCI values are received from UE or PCRF. Unique DSCP parameters (uplink and downlink) and GBR or Non-GBR can also be configured.

As non-standard QCIs are not supported in GGSN, **pre-rel8-qos-mapping** is used as a reference for mapping the non-standard QCI values to pre-rel8 QoS values during 3G calls or GnGp handovers.

## Configuring Non-standard QCI Support in P-GW

Use the following command to configure non-standard QCI support in P-GW so that calls can be accepted when non-standard QCI values are received from UE or PCRF.

```
configure
    qci-qos-mapping name
         operator-defined-qci num { gbr | non-gbr } [ { downlink |
uplink } [ encaps-header { copy-inner | copy-outer | dscp-marking
dscp-marking-value } [ internal-qos priority priority ] | internal-qos priority
 priority | user-datagram dscp-marking dscp-marking-value [ encaps-header {
copy-inner | copy-outer | dscp-marking dscp-marking-value } [ internal-qos
priority priority ] ] | pre-rel8-qos-mapping num ]
         no operator-defined-qci num
         end
```

Notes:

- This command is only visible if the license key supporting non-standard QCIs is installed. Contact your Cisco Account or Support representative for information on how to obtain a license.
- **operator-defined-qci** *num*: Specifies the operator-defined QCI value to be enabled.

  *num* must be an integer from 128 through 254.

  Standards-based QCI values 1 through 9 are configured through the **qci** command.
- **pre-rel8-qos-mapping** *num*: Maps non-standard QCI to a standard QCI that has the characteristics (TC, THP, SI, TD, SSD) similar to desired pre-rel8 standard QoS values during 3G call or GnGp handover.

  *num* must be an integer from 1 through 4 for GBR and 5 through 9 for non-GBR. QCI values 1 through 9 are defined in *3GPP Specification TS 23.203 "Policy and charging control architecture"*.

  **3G GGSN Call**

  If the **pre-rel8-qos-mapping** field is not configured for the non-standard QCI under P-GW which is associated with a GGSN, then the 3G call would be rejected.

  **GnGp Handoff**

  1. If the **pre-rel8-qos-mapping** field is not configured for the non-standard QCI for default bearer, then the handoff would be rejected.
  2. If the **pre-rel8-qos-mapping** field is not configured for the non-standard QCI for dedicated bearer, then only that bearer would be rejected during handoff.
  3. In the following scenario:
     - default bearer with standard QCI or non-standard QCI (with **pre-rel8-qos-mapping** configured)
     - more than one dedicated bearer (some with standard QCI, some with non-standard QCI with **pre-rel8-qos-mapping** configured, and some with non-standard QCI with no mapping)

     During LTE-to-GnGp handoff:

     - UPC Request for all the dedicated bearers with non-standard QCI with no mapping would be rejected
     - handoff will be successful for the remaining bearers

# Monitoring Non-standard QCI Support

## Bulk Statistics

This section provides information regarding bulk statistics in support of non-standard QCI support.

### APN Schema

The following counters have been added in support of non-standard QCIs (GBR and Non-GBR):

- nonstdqci-nongbr-uplinkpkt-drop-mbrexcd
- nonstdqci-nongbr-dwlinkpkt-drop-mbrexcd
- nonstdqci-nongbr-uplinkbyte-drop-mbrexcd
- nonstdqci-nongbr-dwlinkbyte-drop-mbrexcd
- nonstdqci-nongbr-rejbearer
- nonstdqci-gbr-uplinkpkt-drop-mbrexcd
- nonstdqci-gbr-dwlinkpkt-drop-mbrexcd
- nonstdqci-gbr-uplinkbyte-drop-mbrexcd
- nonstdqci-gbr-dwlinkbyte-drop-mbrexcd
- nonstdqci-gbr-rejbearer

## Output of Show Commands

This section provides information regarding show commands and/or their outputs in support of non-standard QCI support.

### show apn statistics

The output of this command has been enhanced to show the following non-standard QCI counters (GBR and Non-GBR):

- Non-Std QCI(Non-GBR)
  - Bearer Rejected
  - Uplink Bytes dropped(MBR Excd)
  - Downlink Bytes dropped(MBR Excd)
  - Uplink pkts dropped(MBR Excd)
  - Downlink pkts dropped(MBR Excd)
- Non-Std QCI(GBR)
  - Bearer Rejected
  - Uplink Bytes dropped(MBR Excd)
  - Downlink Bytes dropped(MBR Excd)
  - Uplink pkts dropped(MBR Excd)
  - Downlink pkts dropped(MBR Excd)

### show qci-qos-mapping table all

The output of this command has been enhanced to show when non-standard QCI are configured:

- Operator-defined-qci
- pre-rel8-qos-mapping