**3GPP TSG-SA WG2 Meeting #162*****S2-240xxxx***

**Changsha, PRC, April 15-19, 2024 (*revision of S2-2404227*)**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.401** | **CR** | **3740** | **rev** | **10** | **Current version:** | **18.5.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |

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| ***Title:*** | Clarification on the handling of Operator defined QCIs at inter-PLMN Handover | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, UScellular, Ericsson, ZTE | | | | | | | | | |
| ***Source to TSG:*** | S2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | SAES-St2; TEI18 | | | | |  | ***Date:*** | | | 2024-03-28 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR clarifies the handling of QoS at inter-PLMN mobility  It is also needed to be clarified how a PLMN handles QCIs for inbound roamers: should a PLMN not recognize a QCI as part of an inter-PLMN agreement with the HPLMN, the PLMN can downgrade to a default QCI value based on its policy or release the EPS bearer | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | the necessary changes are introduced as per the above reasonn for change. | | | | | | | | |
| ***--*** | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Unclear specification of the EPS bearer handling at Inter-PLMN mobility | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.7.2.1, 4.7.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR’s revision history:*** | |  | | | | | | | | |

## 

## **FIRST CHANGE**

### 

#### 4.7.2.1 The EPS bearer in general

For E-UTRAN access to the EPC the PDN connectivity service is provided by an EPS bearer for GTP-based S5/S8, and if IP is in use, by an EPS bearer concatenated with IP connectivity between Serving GW and PDN GW for PMIP-based S5/S8.

In this release of the specifications, dedicated bearers are only supported for the IP and Ethernet PDN Connectivity Service.

When User Plane (S1-U) is used for data traffic, then an EPS bearer uniquely identifies traffic flows that receive a common QoS treatment between a UE and a PDN GW for GTP-based S5/S8, and between UE and Serving GW for PMIP-based S5/S8. The packet filters signalled in the NAS procedures are associated with a unique packet filter identifier on per-PDN connection basis.

NOTE 1: The EPS Bearer Identity together with the packet filter identifier is used to reference which packet filter the UE intends to modify or delete, i.e. it is used to implement the unique packet filter identifier.

An EPS bearer is the level of granularity for bearer level QoS control in the EPC/E-UTRAN. That is, all traffic mapped to the same EPS bearer receive the same bearer level packet forwarding treatment (e.g. scheduling policy, queue management policy, rate shaping policy, RLC configuration, etc.). Providing different bearer level packet forwarding treatment requires separate EPS bearers.

NOTE 2: In addition but independent to bearer level QoS control, the PCC framework allows an optional enforcement of service level QoS control on the granularity of SDFs independent of the mapping of SDFs to EPS bearers.

One EPS bearer is established when the UE connects to a PDN, and that remains established throughout the lifetime of the PDN connection to provide the UE with always-on connectivity to that PDN. That bearer is referred to as the default bearer. Any additional EPS bearer that is established for the same PDN connection is referred to as a dedicated bearer.

The EPS bearer traffic flow template (TFT) is the set of all packet filters associated with that EPS bearer. An UpLink Traffic Flow Template (UL TFT) is the set of uplink packet filters in a TFT. A DownLink Traffic Flow Template (DL TFT) is the set of downlink packet filters in a TFT. Every dedicated EPS bearer is associated with a TFT. A TFT may be also assigned to the default EPS bearer. The UE uses the UL TFT for mapping traffic to an EPS bearer in the uplink direction. The PCEF (for GTP-based S5/S8) or the BBERF (for PMIP-based S5/S8) uses the DL TFT for mapping traffic to an EPS bearer in the downlink direction. The UE may use the UL TFT and DL TFT to associate EPS Bearer Activation or Modification procedures to an application and to traffic flow aggregates of the application. Therefore the PDN GW shall, in the Create Dedicated Bearer Request and the Update Bearer Request messages, provide all available traffic flow description information (e.g. source and destination IP address and port numbers and the protocol information).

For the UE, the evaluation precedence order of the packet filters making up the UL TFTs is signalled from the P‑GW to the UE as part of any appropriate TFT operations.

NOTE 3: The evaluation precedence index of the packet filters associated with the default bearer, in relation to those associated with the dedicated bearers, is up to operator configuration. It is possible to "force" certain traffic onto the default bearer by setting the evaluation precedence index of the corresponding filters to a value that is lower than the values used for filters associated with the dedicated bearers.

Further details about the TFT and the TFT operations are described in clause 15.3 of TS 23.060 [7]. The details about the TFT packet filter(s) are described in clause 15.3.2 of TS 23.060 [7] for PDN connections of IP type and in clause 5.7.6.3 of TS 23.501 [83] for PDN connections of Ethernet type.

A TFT of an uplink unidirectional EPS bearer is only associated with UL packet filter(s) that matches the uplink unidirectional traffic flow(s) A TFT of a downlink unidirectional EPS bearer is associated with DL packet filter(s) that matches the unidirectional traffic flow(s) and a UL packet filter that effectively disallows any useful packet flows (see clause 15.3.3.4 in TS 23.060 [7] for an example of such packet filter.

The UE routes uplink packets to the different EPS bearers based on uplink packet filters in the TFTs assigned to these EPS bearers. The UE evaluates for a match, first the uplink packet filter amongst all TFTs that has the lowest evaluation precedence index and, if no match is found, proceeds with the evaluation of uplink packet filters in increasing order of their evaluation precedence index. This procedure shall be executed until a match is found or all uplink packet filters have been evaluated. If a match is found, the uplink data packet is transmitted on the EPS bearer that is associated with the TFT of the matching uplink packet filter. If no match is found, the uplink data packet shall be sent via the EPS bearer that has not been assigned any uplink packet filter. If all EPS bearers (including the default EPS bearer for that PDN) have been assigned one or more uplink packet filters, the UE shall discard the uplink data packet.

NOTE 4: The above algorithm implies that there is at most one EPS bearer without any uplink packet filter. Therefore, some UEs may expect that during the lifetime of a PDN connection (where only network has provided TFT packet filters) at most one EPS bearer exists without any uplink packet filter.

To ensure that at most one EPS bearer exists without any uplink packet filter, the PCEF (for GTP-based S5/S8) or the BBERF (for PMIP-based S5/S8) maintains a valid state for the TFT settings of the PDN connection as defined in clause 15.3.0 of TS 23.060 [7] and if necessary, adds a packet filter which effectively disallows any useful packet flows in uplink direction (see clause 15.3.3.4 in TS 23.060 [7] for an example of such a packet filter) to the TFT of a dedicated bearer.

NOTE 5: The default bearer is the only bearer that may be without any uplink packet filter and thus, a packet filter which effectively disallows any useful packet flows in uplink direction will not be added by the PCEF/BBERF.

The initial bearer level QoS parameter values of the default bearer are assigned by the network, based on subscription data (in E-UTRAN the MME sets those initial values based on subscription data retrieved from HSS).

In a non-roaming scenario, the PCEF may change the QoS parameter value received from the MME based on interaction with the PCRF or based on local configuration. When the PCEF changes those values, the MME shall use the bearer level QoS parameter values received on the S11 reference point during establishment or modification of the default bearer.

In a roaming scenario, based on local configuration, the MME may downgrade the ARP or APN-AMBR and/or remap QCI parameter values received from HSS to the value locally configured in MME (e.g. when the values received from HSS do not comply with services provided by the visited PLMN).

At inter-PLMN mobility the source MME shall provide the EPS bearer QoS parameters used in the source MME to the target MME.

The PCEF may change the QoS parameter values received from the MME based on interaction with the PCRF or based on local configuration. Alternatively, the PCEF may reject the bearer establishment.

NOTE 6: For certain APNs (e.g. the IMS APN defined by the GSMA) the QCI value is strictly defined and therefore remapping of QCI is not permitted.

NOTE 7: In roaming scenarios, the ARP/APN-AMBR/QCI values provided by the MME for a default bearer may deviate from the subscribed values depending on the roaming agreement. If the PCC/PCEF rejects the establishment of the default bearer, this implies that Attach via E-UTRAN will fail. Similarly, if the PCEF (based on interaction with the PCRF or based on local configuration) upgrades the ARP/APN-AMBR/QCI parameter values received from the MME, the default bearer establishment and attach may be rejected by the MME.

NOTE 8: Subscription data related to bearer level QoS parameter values retrieved from the HSS are not applicable for dedicated bearers.

For WB-E-UTRA, the decision to establish or modify a dedicated bearer can only be taken by the EPC, and the bearer level QoS parameter values are always assigned by the EPC.

Dedicated bearers are not supported over NB-IoT. The PDN GW uses the RAT Type to ensure that no dedicated bearers are active when the UE is accessing over NB-IoT. In the case of inter-RAT mobility from WB-EUTRA to NB-IoT, the UE and MME indicate local deactivation of non-default EPS bearers at TAU as specified in TS 24.301 [46].

The MME shall not modify the bearer level QoS parameter values received on the S11 reference point during establishment or modification of a default or dedicated bearer (except when the conditions described in NOTE 9 or NOTE 10 apply). Consequently, "QoS negotiation" between the E-UTRAN and the EPC during default or dedicated bearer establishment / modification is not supported. Based on local configuration, the MME may reject the establishment or modification of a default or dedicated bearer if the bearer level QoS parameter values sent by the PCEF over a GTP based S8 roaming interface do not comply with a roaming agreement.

NOTE 9: If the EPS QoS parameters are not compliant with the roaming agreement, the MME, based on local policies, can downgrade the ARP priority level, ARP pre-emption capability, ARP pre-emption vulnerability, APN-AMBR or MBR (for GBR bearers) parameters received over S8 and allow the bearer establishment or modification of a default or dedicated bearer. The HPLMN is expected to set EPS QoS parameters compliant with roaming agreements, therefore the HPLMN is not informed about any downgrade of EPS bearer QoS parameters. The consequences of such a downgrading APN-AMBR and MBR are that APN-AMBR and MBR enforcement at the HPLMN and at the UE will not be aligned. The consequence of downgrading the ARP is that the EPS bearer ARP at the HPLMN and at the eNodeB will not be aligned, and multiple EPS bearers created can possibly have the same EPS bearer ARP in the eNodeB.

NOTE x: In case of QCI remapping at inter-PLMN mobility is needed for certain EPS bearers, the remapping that is done is implementation specific according to an inter-PLMN agreement between the involved operators. The remapping may include QCI values in the operator-specific QCI value range. If remapping of QCI at inter-PLMN mobility is to be performed, the target PLMN chooses the QCI value based on inter-PLMN agreement among operators involved. If the source MME provides a QCI value which is not part of the inter-PLMN agreement between the target PLMN and the HPLMN, the target PLMN can choose a QCI value based on local policy. The remapping of the QCI value based on local policy can result in service degradation. The target PLMN MME informs the SGW (and the SGW updates the PGW) the selected QCI value by using the procedure in clause 5.4.2.2.

NOTE x+1: In a Home Routed roaming scenario, if the QCI value an MME receives from PGW via SGW during EPS bearer establishment or modification is not part of the inter-PLMN agreement between the serving PLMN and the HPLMN, the MME may remap QCI value. The remapping of the QCI value based on local policy can result in service degradation. The MME informs the SGW (and the SGW updates the PGW) of the selected QCI value by using the procedure in clause 5.4.2.2. Hence the same QCI value is associated with the PDN connection in the serving PLMN and HPLMN.

NOTE Y: In roaming scenarios, for IMS voice service (e.g. the IMS APN defined by the GSMA), the MME, based on local policy, can override the ARP (i.e. ARP priority level, ARP pre-emption capability, ARP pre-emption vulnerability) received over S8 if the ARP indicates lower priority than the local policy. The purpose of ARP override in the serving PLMN is to apply the same allocation and retention priority for IMS voice service for all users (i.e. roamers and non-roamers) and to apply the same allocation and retention priority for all MPS service users (clause 4.3.18) when roaming agreements are in place and where regulatory requirements apply.

At inter-RAT mobility, based on local configuration, the MME may perform a mapping of QCI values for which there is no mapping defined in Table E.3 or which are not supported in the target RAT.

NOTE z: The PCRF ensures that the EPS bearer QCI values are aligned with the QCI values mapped by the MME for the current RAT as described in clause A.4.1.2 of TS 23.203 [6].

The distinction between default and dedicated bearers should be transparent to the access network (e.g. E-UTRAN).

An EPS bearer is referred to as a GBR bearer if dedicated network resources related to a Guaranteed Bit Rate (GBR) value that is associated with the EPS bearer are permanently allocated (e.g. by an admission control function in the eNodeB) at bearer establishment/modification. Otherwise, an EPS bearer is referred to as a Non-GBR bearer.

NOTE w: Admission control can be performed at establishment / modification of a Non-GBR bearer even though a Non-GBR bearer is not associated with a GBR value.

A dedicated bearer can either be a GBR or a Non-GBR bearer. A default bearer shall be a Non-GBR bearer.

NOTE U: A default bearer provides the UE with connectivity throughout the lifetime of the PDN connection. That motivates the restriction of a default bearer to bearer type Non-GBR.

\* \* \* Next Change \* \* \*

### 4.7.3 Bearer level QoS parameters

The EPS bearer QoS profile includes the parameters QCI, ARP, GBR and MBR, described in this clause. This clause also describes QoS parameters which are applied to an aggregated set of EPS Bearers: APN‑AMBR and UE‑AMBR.

Each EPS bearer (GBR and Non-GBR) is associated with the following bearer level QoS parameters:

- QoS Class Identifier (QCI);

- Allocation and Retention Priority (ARP).

A QCI is a scalar that is used as a reference to access node-specific parameters that control bearer level packet forwarding treatment (e.g. scheduling weights, admission thresholds, queue management thresholds, link layer protocol configuration, etc.), and that have been pre-configured by the operator owning the access node (e.g. eNodeB). A one-to-one mapping of standardized QCI values to standardized characteristics is captured in TS 23.203 [6]. A QCI may have an operator-specific QCI value and the mapping of such a QCI value to the QoS characteristics is defined by the operator.

NOTE 1: On the radio interface and on S1, each PDU (e.g. RLC PDU or GTP-U PDU) is indirectly associated with one QCI via the bearer identifier carried in the PDU header. The same applies to the S5 and S8 interfaces if they are based on GTP.

NOTE 2: When required by operator policy, the eNodeB can be configured to also use the ARP priority level in addition to the QCI to control bearer level packet forwarding treatment in the eNodeB for SDFs having high priority ARPs.

The ARP shall contain information about the priority level (scalar), the pre-emption capability (flag) and the pre-emption vulnerability (flag). The primary purpose of ARP is to decide whether a bearer establishment / modification request can be accepted or needs to be rejected due to resource limitations (typically available radio capacity for GBR bearers). The priority level information of the ARP is used for this decision to ensure that the request of the bearer with the higher priority level is preferred. In addition, the ARP can be used (e.g. by the eNodeB) to decide which bearer(s) to drop during exceptional resource limitations (e.g. at handover). The pre-emption capability information of the ARP defines whether a bearer with a lower ARP priority level should be dropped to free up the required resources. The pre-emption vulnerability information of the ARP defines whether a bearer is applicable for such dropping by a pre-emption capable bearer with a higher ARP priority level.

Once a bearer has been successfully established, the packet handling (e.g. scheduling and rate control) within the eNodeB, PDN GW, and Serving GW should be solely determined by the following EPS bearer QoS parameters: QCI, GBR and MBR, and by the AMBR parameters. However, when required by operator policy, the eNodeB can be configured to also use a bearer's ARP priority level in addition to the QCI to determine the relative priority of the SDFs for packet handling (e.g. scheduling and rate control) in the eNodeB as defined in TS 23.203 [6] clause 6.1.7.2. This configuration applies only for bearers with high priority ARPs as defined in TS 23.203 [6] clause 6.1.7.3.

The ARP priority level may be used in addition to the QCI to determine the transport level packet marking, e.g. to set the DiffServ Code Point. The ARP is not included within the EPS QoS Profile sent to the UE.

NOTE 3: The ARP should be understood as "Priority of Allocation and Retention"; not as "Allocation, Retention, and Priority".

NOTE 4: Video telephony is one use case where it may be beneficial to use EPS bearers with different ARP values for the same UE. In this use case an operator could map voice to one bearer with a higher ARP, and video to another bearer with a lower ARP. In a congestion situation (e.g. cell edge) the eNodeB can then drop the "video bearer" without affecting the "voice bearer". This would improve service continuity.

NOTE 5: The ARP may also be used to free up capacity in exceptional situations, e.g. a disaster situation. In such a case the eNodeB may drop bearers with a lower ARP priority level to free up capacity if the pre-emption vulnerability information allows this.

Each GBR bearer is additionally associated with the following bearer level QoS parameters:

- Guaranteed Bit Rate (GBR);

- Maximum Bit Rate (MBR).

The GBR denotes the bit rate that can be expected to be provided by a GBR bearer. The MBR limits the bit rate that can be expected to be provided by a GBR bearer (e.g. excess traffic may get discarded by a rate shaping function). See clause 4.7.4 for further details on GBR and MBR.

GBR bearers are not supported by NB-IoT. The PDN GW uses the RAT Type to ensure that GBR bearers are not active when the UE is using NB-IoT.

Each APN access, by a UE, is associated with the following QoS parameter:

- per APN Aggregate Maximum Bit Rate (APN-AMBR).

The subscribed APN‑AMBR is a subscription parameter stored per APN in the HSS, which applies as APN-AMBR unless the APN-AMBR is modified by the MME (e.g in roaming scenarios and/or for usage of NB-IoT) or the PDN GW, based on local policy (e.g. for RAT Type = NB-IoT) or PCRF interactions. The APN-AMBR limits the aggregate bit rate that can be expected to be provided across all Non‑GBR bearers and across all PDN connections of the same APN (e.g. excess traffic may get discarded by a rate shaping function). Each of those Non‑GBR bearers could potentially utilize the entire APN‑AMBR, e.g. when the other Non‑GBR bearers do not carry any traffic. GBR bearers are outside the scope of APN‑AMBR. The P‑GW enforces the APN‑AMBR in downlink. Enforcement of APN‑AMBR in uplink is done in the UE and additionally in the P‑GW.

NOTE 6: All simultaneous active PDN connections of a UE that are associated with the same APN shall be provided by the same PDN GW (see clauses 4.3.8.1 and 5.10.1).

APN-AMBR applies to all PDN connections of an APN. For the case of multiple PDN connections of an APN, if a change of APN-AMBR occurs due to local policy or the PDN GW is provided the updated APN-AMBR for each PDN connection from the MME or PCRF, the PDN GW initiates explicit signalling for each PDN connection to update the APN-AMBR value.

Each UE in state EMM-REGISTERED is associated with the following bearer aggregate level QoS parameter:

- per UE Aggregate Maximum Bit Rate (UE-AMBR).

The UE‑AMBR is limited by a subscription parameter stored in the HSS. The MME shall set the UE‑AMBR to the sum of the APN‑AMBR of all active APNs up to the value of the subscribed UE‑AMBR. The UE‑AMBR limits the aggregate bit rate that can be expected to be provided across all Non‑GBR bearers of a UE (e.g. excess traffic may get discarded by a rate shaping function). Each of those Non‑GBR bearers could potentially utilize the entire UE‑AMBR, e.g. when the other Non‑GBR bearers do not carry any traffic. GBR bearers are outside the scope of UE AMBR. The E‑UTRAN enforces the UE‑AMBR in uplink and downlink except for PDN connections using the Control Plane CIoT EPS Optimisation.

The GBR and MBR denote bit rates of traffic per bearer while UE-AMBR/APN-AMBR denote bit rates of traffic per group of bearers. Each of those QoS parameters has an uplink and a downlink component. On S1\_MME the values of the GBR, MBR, and AMBR refer to the bit stream excluding the GTP-U/IP header overhead of the tunnel on S1\_U.

The HSS defines, for each PDN subscription context, the 'EPS subscribed QoS profile' which contains the bearer level QoS parameter values for the default bearer (QCI and ARP) and the subscribed APN-AMBR value. The subscribed ARP shall be used to set the priority level of the EPS bearer parameter ARP for the default bearer while the pre-emption capability and the pre-emption vulnerability information for the default bearer are set based on MME operator policy. In addition, the subscribed ARP shall be applied by the P-GW for setting the ARP priority level of all dedicated EPS bearers of the same PDN connection unless a different ARP priority level setting is required (due to P-GW configuration or interaction with the PCRF).

NOTE 7: The ARP parameter of the EPS bearer can be modified by the P‑GW (e.g. based on interaction with the PCRF due to e.g. MPS user initiated session) to assign the appropriate pre-emption capability and the pre-emption vulnerability setting.

The ARP pre-emption vulnerability of the default bearer should be set appropriately to minimize the risk of unnecessary release of the default bearer.

\* \* \* Next Change \* \* \*

#### 5.4.2.2 HSS Initiated Subscribed QoS Modification and MME initiated QoS modification.

The HSS Initiated Subscribed QoS Modification for a GTP-based S5/S8 is depicted in figure 5.4.2.2-1 where steps 1, 1a, are executed. The MME initiated QoS modification can happen, e.g. at Inter-PLMN mobility if there is a QoS Change upon Inter-PLMN mobility.



Figure 5.4.2.2-1: HSS Initiated Subscribed QoS Modification

NOTE 1: For a PMIP-based S5/S8, procedure steps (A) and steps (B) are defined in TS 23.402 [2]. Steps 3, 4, 5, 7 and 8 concern GTP based S5/S8.

1. The HSS sends an Insert Subscriber Data (IMSI, Subscription Data) message to the MME. The Subscription Data includes EPS subscribed QoS (QCI, ARP) and the subscribed UE-AMBR and APN‑AMBR.

1a. The MME updates the stored Subscription Data and acknowledges the Insert Subscriber Data message by returning an Insert Subscriber Data Ack (IMSI) message to the HSS (see clause 5.3.9.2).

2a If only the subscribed UE-AMBR has been modified, the MME calculates a new UE-AMBR value as described in clause 4.7.3 and may then signal a modified UE-AMBR value to the eNodeB by using S1-AP UE Context Modification Procedure. The HSS Initiated Subscribed QoS Modification Procedure ends after completion of the UE Context Modification Procedure.

2b. If the QCI and/or ARP and/or subscribed APN-AMBR has been modified and there is related active PDN connection with the modified QoS Profile the MME sends the Modify Bearer Command (EPS Bearer Identity, EPS Bearer QoS, APN‑AMBR) message to the Serving GW. The EPS Bearer Identity identifies the default bearer of the affected PDN connection. The EPS Bearer QoS contains the EPS subscribed QoS profile to be updated.

3. The Serving GW sends the Modify Bearer Command (EPS Bearer Identity, EPS Bearer QoS, APN‑AMBR) message to the PDN GW.

4. If PCC infrastructure is deployed, the PDN GW informs the PCRF about the updated EPS Bearer QoS and APN-AMBR. The PCRF sends new updated PCC decision to the PDN GW. This corresponds to the PCEF-initiated IP‑CAN Session Modification procedure as defined in TS 23.203 [6].

The PCRF may modify the APN-AMBR and the QoS parameters (QCI and ARP) associated with the default bearer in the response to the PDN GW as defined in TS 23.203 [6].

5. The PDN GW modifies the default bearer of each PDN connection corresponding to the APN for which subscribed QoS has been modified. If the subscribed ARP parameter has been changed, the PDN GW shall also modify all dedicated EPS bearers having the previously subscribed ARP value unless superseded by PCRF decision. The PDN GW then sends the Update Bearer Request (EPS Bearer Identity, EPS Bearer QoS, TFT, APN‑AMBR) message to the Serving GW.

NOTE 2: As no PTI is included the MME use protocol specific details, as described in TS 29.274 [43], to determine if the Update Bearer Request was triggered by this procedure or not.

6. If the QCI and/or ARP parameter(s) have been modified, steps 3 to 10, as described in clause 5.4.2.1, Figure 5.4.2.1-1, are invoked. If neither the QCI nor the ARP have been modified, but instead only the APN-AMBR was updated, steps 3 to 8, as described in clause 5.4.3, Figure 5.4.3-1, are invoked.

7. The Serving GW acknowledges the bearer modification to the PDN GW by sending an Update Bearer Response (EPS Bearer Identity, User Location Information (ECGI)) message. If the bearer modification fails the PDN GW deletes the concerned EPS Bearer.

8. The PDN GW indicates to the PCRF whether the requested PCC decision was enforced or not by sending a Provision Ack message.

## **END of CHANGES**