**3GPP TSG-SA5 Meeting #155 *S5-243044***

**Jeju, South Korea, 27 - 31 May 2024**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **32.255** | **CR** | **0537** | **rev** | **-** | **Current version:** | **18.3.0** |  |
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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:*** | Rel-18 CR 32.255 Correction of usage of FBC and QBC | | | | | | | | | |
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| ***Source to WG:*** | Ericsson LM | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI18 | | | | |  | ***Date:*** | | | 2024-05-17 |
|  |  | | | |  | |  | | |  |
| ***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)* | |
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| ***Reason for change:*** | | There is inconsistency in the usage of FBC and QBC. | | | | | | | | |
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| ***Summary of change:*** | | Moving the usage of FBC and QBC to one clause, with a more detailed description of the interaction. | | | | | | | | |
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| ***Consequences if not approved:*** | | Inconsistent may lead till interoperability issues. | | | | | | | | |
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| ***Clauses affected:*** | | 5.1.9.1, 5.2.1.6, 5.2.1.x (new), 5.2.2.12.9, 5.2.2.18.2, 5.2.2.18.3, 5.2.2.18.5, and 5.2.2.18.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 32.255 CR 0531 | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revision of S5-242790 | | | | | | | | |

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| **First change** |

5.2.1.6 QoS flow Based Charging (QBC)

QoS flow Based Charging allows the SMF to collect charging information related to data volumes per PDU session, categorized per QoS Flow. QBC doesn't support quota management.

The user can be identified by SUPI.

The SMF categorizes the volume within PDU session by QoS Flow identified by QoS Flow Identifier (QFI).

The amount of data counted for the QoS Flow shall be the user plane payload at the UPF.

Table 5.2.1.6.1 summarizes the set of default trigger conditions and their category which shall be supported by the SMF in QBC. For "immediate report" category, the table also provides the corresponding Charging Data Request [Initial, Update, Termination] message sent from SMF towards the CHF.

**Table 5.2.1.6.1: Default Chargeable events in SMF for QBC**

| **Chargeable event** | **Trigger level** | **Default category** | **CHF allowed to change category** | **CHF allowed to enable and disable** | **Message when "immediate reporting" category** |
| --- | --- | --- | --- | --- | --- |
| Start of PDU session | PDU session | Immediate | Not Applicable | Not Applicable | Charging Data Request [Initial] |
| Start of a QoS Flow | QoS Flow | Deferred | Not Applicable | Not Applicable | Charging Data Request [Update] |
| **Change of Charging conditions** | | | | |
| QoS change | QoS Flow | Deferred | Yes | Yes |
| GFBR guaranteed status change | QoS Flow | Deferred | Yes | Yes |
| User Location change | PDU session | Deferred | Yes | Yes |
| Serving Node change | PDU session | Deferred | Yes | Yes |
| Change of 3GPP PS Data off Status | PDU session | Deferred | Yes | Yes |
| Tariff time change | PDU session | Deferred | No | No |
| UE time zone change | PDU session | Immediate | Yes | Yes |
| PLMN change | PDU session | Immediate | Yes | Yes |
| RAT type change | PDU session | Immediate | Yes | Yes |
| Session-AMBR change | PDU session | Immediate | Yes | Yes |
| Addition of UPF | PDU session | Immediate | Yes | Yes |
| Removal of UPF | PDU session | Immediate | Yes | Yes |
| Handover cancel | PDU session | Immediate | Yes | Yes |
| Handover start | PDU session | Immediate | Yes | Yes |
| Handover complete | PDU session | Immediate | Yes | Yes |
| Redundant transmission change | QoS Flow | Immediate | Yes | Yes |
| Satellite backhaul category change | PDU session | Deferred | Yes | Yes |
| Satellite Backhaul QoS change | QoS Flow | Deferred | Yes | Yes |
| GEO satellite ID change | PDU session | Deferred | Yes | Yes |
| S-NSSAI replacement | PDU session | Immediate | Yes | Yes |
| **Limit per PDU session** | | | | |
| Expiry of data time limit per PDU session | PDU session | Immediate | No | Yes |
| Expiry of data volume limit per PDU session | PDU session | Immediate | No | Yes |
| Expiry of data event limit per PDU session | PDU session | Immediate | No | Yes |
| Expiry of limit of number of charging condition changes | PDU session | Immediate | No | Yes |
| **Limit per QoS Flow** | | | | |
| Expiry of data time limit per QoS Flow | QoS Flow | Deferred | Yes | Yes |
| Expiry of data volume limit per QoS Flow | QoS Flow | Deferred | Yes | Yes |
| **Others** | | | | |
| End of QoS Flow | QoS Flow | Deferred | Yes | Yes |
| Management intervention | PDU session | Immediate | No | No | Charging Data Request [Update]  Charging Data Request [Termination] |
| V-SMF change | PDU session | Immediate | Not Applicable | Not Applicable | Charging Data Request [Initial]  Charging Data Request [Termination] |
| End of PDU session | PDU session | Immediate | No | No | Charging Data Request [Termination] |
| Abort request is received from the CHF | PDU session | Immediate | No | No |
| NOTE 1: If GFBR guaranteed status change is enabled, SMF needs to ensure the request for the notification from the access network (i.e. 3GPP RAN) when the GFBR can no longer (or can again) be guaranteed for a QoS Flow during the lifetime of the QoS Flow.  NOTE 2: The columns CHF allowed to change category, and CHF allowed enable and disable are only applicable for the PDU session establishment, for other cases they are not applicable. | | | | | |

The default "Limit" trigger conditions, are trigger thresholds configured in the Charging Characteristics applied to the PDU session for QBC. It shall be possible for the CHF to override these default triggers when providing Charging Data Response [Initial], either to disable the triggers, or to enable triggers new thresholds value.

The "Limit" trigger conditions applied to the QoS Flow level of QBC is common for all QFIs, and applies the limit for each QFI in the PDU session.

For QBC the following details of chargeable events and corresponding actions in the SMF are defined in Table 5.2.1.6.2:

**Table 5.2.1.6.2: Chargeable events and their related actions in SMF for QBC**

| **Chargeable event** | **Conditions** | **SMF action** |
| --- | --- | --- |
| Start of PDU session |  | Charging Data Request [Initial]. |
| Start of a QoS Flow | Start of the QoS Flow associated with the default QoS rule | Charging Data Request [Update]. |
| Start of a QoS Flow | Start new counts with time stamps. |
| V-SMF change | If the session is moved to the V-SMF | Charging Data Request [Initial]. |
| If the session is moved from the V-SMF | Charging Data Request [Termination]  Close the counts with time stamps |
| End of a QoS Flow |  | Close the counts with time stamps for the QoS flows |
| End of PDU session |  | Charging Data Request [Termination]  Close the counts with time stamps |
| Change of charging condition in the SMF | If the corresponding trigger is enabled | Close the counts and start new counts with time stamps for all active QoS flows. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update] |
| Handover start | If the corresponding trigger is enabled | Close the counts with time stamps and start new counts with time stamps. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update]. |
| Handover cancel | If the corresponding trigger is enabled | Close the counts with time stamps and start new counts with time stamps for active QoS flows. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update]. |
| Handover complete | If the corresponding trigger is enabled | Close the counts and start new counts with time stamps for active QoS flows. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update] |
| Redundant transmission change | If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update].  Close the counts and start new counts with time stamps. |
| Addition of UPF | If the corresponding trigger is enabled | Start new counts with time stamps for the added UPF. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update]. |
| Removal of UPF | If the corresponding trigger is enabled | Close the counts with time stamps for the removed UPF |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update]. |
| Expiry of time limit per QoS Flow | If the corresponding trigger is enabled | Close the counts with time stamps. |
| If the category is set to "immediate reporting" | Charging Data Request [Update] |
| If the QoS Flow is still active | Start new counts with time stamps |
| Expiry of data volume limit per QoS Flow | If the corresponding trigger is enabled | Close the counts with time stamps |
| If the category is set to "immediate reporting" | Charging Data Request [Update] |
| If the QoS Flow is still active | Start new counts with time stamps |
| Expiry of time limit per PDU session | If the corresponding trigger is enabled | Close the counts with time stamps for all QoS flows. |
| If the category is set to "immediate reporting" | Charging Data Request [Update] |
| If the PDU session is still active | Start new counts with time stamps for all active QoS flows |
| Expiry of data volume limit per PDU session | If the corresponding trigger is enabled | Close the counts with time stamps for all QoS flows. |
| If the category is set to "immediate reporting" | Charging Data Request [Update] |
| If the PDU session is still active | Start new counts with time stamps for all active QoS flows |
| Expiry of a limit of number of charging condition changes per PDU session | If the corresponding trigger is enabled | Close the counts with time stamps for all QoS flows. |
| If the category is set to "immediate reporting" | Charging Data Request [Update] |
| If the PDU session is still active | Start new counts with time stamps for all active QoS flows |
| Management intervention | If the management intervention causes an update e.g., a reauthorization request. | Charging Data Request [Update]  Close the counts with time stamps for all QoS Flows |
| If the PDU session is still active | Start new counts with time stamps |
| If the management intervention causes a termination e.g., an abort charging request. | Charging Data Request [Termination]  Close the counts with time stamps |
| Abort |  | Charging Data Request [Termination]  Close the counts with time stamps |

The CDR generation mechanism processed by the CHF upon receiving Charging Data Request [Initial, Update, Termination] issued by the SMF for these chargeable events in QBC, is specified in clause 5.2.3.

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| **Second change** |

5.2.1.x Applicability of FBC and QBC

The default for PDU session charging is FBC. QBC is intended for interconnect charges. If both FBC and QBC are enabled, for a given PDU session, then QBC is to be performed by the SMF within the same charging session as the FBC.

**Table 5.2.1.x.1: Roaming scenario and FBC/QBC usage**

| **Roaming scenario** | **FBC Applicable** | **QBC Applicable** | **Notes** |
| --- | --- | --- | --- |
| Home routed N40 | H-SMF to H-CHF  (V-SMF to V-CHF) | V-SMF to V-CHF  (H-SMF to H-CHF) | QBC between H-SMF and H-CHF is dependent on roaming charging profile support |
| Local breakout N40 | (V-SMF to V-CHF) | V-SMF to V-CHF |  |
| Local breakout N40+N47 | V-SMF to V-CHF | V-SMF to V-CHF  (H-SMF to H-CHF) | QBC between H-SMF and H-CHF is dependent on roaming charging profile support |
| Local breakout N40+N107 | V-SMF to V-CHF  V-CHF to H-CHF | V-SMF to V-CHF  (V-CHF to H-CHF) |  |
| NOTE: Default usage is described without paratheses, and optional usage is described in paratheses. | | | |

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| **Third change** |

5.2.2.12.9 Inter-PLMN V-SMF removal

The following figure 5.2.2.12.9.1 describes the Home Routed PDU Session case in which the UE moves out of V-SMF service area in the VPLMN back to the home PLMN and H-SMF service area for the registration procedure based on clause 4.23.3 of TS 23.502 [201], with I-SMF replaced by V-SMF in I-SMF removal scenario (the CHF interaction is similar for N2 (clause 4.23.7.3 of TS 23.502 [201]) and Xn based handover (clause 4.23.11.4 of TS 23.502 [201]) procedures):

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**Figure 5.2.2.12.9.1: Roaming Home routed PDU session inter-PLMN V-SMF removal**

0ch-a: Ongoing charging session for HPLMN for UE served by H-SMF, using "Charging Identifier 1".

1. UE moves back to the HPLMN, and the new AMF selects the H-SMF based context information provided by the old-AMF. This corresponds to steps 1-16 as specified in clause 4.23.3 of TS 23.502[201].

2. Nsmf\_PDUSession\_CreatePDUSessionContext\_Request is sent from the new-AMF to the H-SMF as specified in Step 17 of clause 4.23.3 of TS 23.502[201].

3. The H-SMF determines that the UE has returned to HPLMN and that the V-SMF is no longer required

4. Nsmf\_PDUSession\_CreatePDUSessionContext\_Response is sent from the H-SMF to the new AMF.

4ch-a. A Charging Data Request [Update, Roaming Charging Profile] is sent to the H-CHF, with trigger indicating SMF change.

4ch-b. Based on the trigger, the H-CHF updates the CDR

4ch-c, The H-CHF acknowledges by sending Charging Data Response [Update] to the H-SMF.

5. Registration Procedure continues as captured in clause 4.23.3 of TS 23.502 [201].

6. After timer expires in the Old AMF, the Old AMF deletes the context in the V-SMF by sending a Nsmf\_PDUSession\_ReleasePDUSessionContext\_Request message.

7. Nsmf\_PDUSession\_ReleasePDUSessionContext\_Response is sent from the V-SMF to the old AMF

7ch-a. A Charging Data Request [Terminate] is sent to the V-CHF, with trigger indicating removal of I-SMF.

7ch-b. Based on the I-SMF removal trigger, the V-CHF closes the CDR

7ch-c. The V-CHF acknowledges by sending Charging Data Response [Terminate] to the V-SMF.

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| **Fourth change** |

5.2.2.18.2 PDU session establishment, SMF to H-CHF and V-CHF

The following figure 5.2.2.18.2-1 describes a PDU session establishment charging, based on figure 4.3.2.2.1-1 UE-requested PDU Session Establishment for non-roaming and roaming with local breakout TS 23.502 [201], where the V-SMF interacts with H-CHF and V-CHF.

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**Figure 5.2.2.18.2-1: PDU session establishment, SMF to H-CHF and V-CHF**

9ch-a. The UE is identified as a roamer (e.g., PLMN ID of the received SUPI is different from VPLMN PLMN ID), the V-CHF and optionally H-CHF are selected accordingly.

9ch-b1. The Charging Data Request [Initial] is sent to V-CHF, for the subscriber triggered by start of PDU session charging event.

9ch-c1. The V-CHF opens a CDR.

9ch-d1. The V-CHF acknowledges by sending Charging Data Response [Initial] to the V-SMF and optionally supplies a "Roaming charging profile" to the V-SMF (which overrides the default one).

9ch-b2. If a H-CHF was selected a Charging Data Request [Initial] is sent to H-CHF, triggered by, e.g. "start of PDU session",with Charging Identifier, and with or without quota management and optionally including the "Roaming charging profile".

9ch-c2. The H-CHF opens a CDR.

9ch-d2. The H-CHF acknowledges by sending Charging Data Response [Initial] to the V-SMF and optionally supplies a "Roaming charging profile" to the V-SMF.

10ch-a1. The Charging Data Request [Update] is sent to V-CHF, when enabled triggers are met and optionally including the "Roaming charging profile".

10ch-b1. The V-CHF update the CDR.

10ch-c1. The V-CHF acknowledges by sending Charging Data Response [Update] to the V-SMF.

10ch-a2. If a H-CHF was selected a Charging Data Request [Update] is sent to H-CHF, when enabled triggers are met and optionally include a request for quota.

10ch-b2. The H-CHF update the CDR.

10ch-c2. The H-CHF acknowledges by sending Charging Data Response [Update] to the V-SMF.

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| **Fifth change** |

5.2.2.18.3 PDU Session Modification, SMF to H-CHF and V-CHF

The following figure 5.2.2.18.3-1 describes the PDU session modification charging, based on figure 4.3.3.2-1 UE or network requested PDU Session Modification (for non-roaming and roaming with local breakout) TS 23.502 [201], where the V-SMF interacts with H-CHF and V-CHF.

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**Figure 5.2.2.18.3-1: PDU Session Modification, SMF to H-CHF and V-CHF**

2ch-a1. The Charging Data Request [Update] is sent to V-CHF for reporting the QBC and/or FBC information when enabled triggers are met.

2ch-b1. The V-CHF update the CDR.

2ch-c1. The V-CHF acknowledges by sending Charging Data Response [Update] to the V-SMF.

2ch-a2. If a H-CHF was selected a Charging Data Request [Update] is sent to H-CHF, when the enabled triggers are met and optionally include a request for quota.

2ch-b2. The H-CHF update a CDR.

2ch-c2. The H-CHF acknowledges by sending Charging Data Response [Update] to the V-SMF.

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| **Sixth change** |

5.2.2.18.5 PDU session establishment, V-SMF to V-CHF

The following figure 5.2.2.18.5-1 describes a PDU session establishment charging, based on figure 4.3.2.2.1-1 UE-requested PDU Session Establishment for non-roaming and roaming with local breakout TS 23.502 [201], where the V-SMF interacts with V-CHF and V-CHF interacts with H-CHF.

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**Figure 5.2.2.18.5-1: PDU session establishment, V-SMF to V-CHF**

9ch-a. The UE is identified as a roamer (e.g., PLMN ID of the received SUPI is different from VPLMN PLMN ID), the V-CHF is selected.

9ch-b. The Charging Data Request [Initial] is sent to V-CHF, for the subscriber triggered by start of PDU session charging event, with or without quota management, and optionally including the "Roaming charging profile".

9ch-c. The V-CHF opens a CDR, and optionally H-CHF is selected.

9ch-d. If a H-CHF was selected a Charging Data Request [Initial] is sent to H-CHF, with or without quota management, and optionally including the "Roaming charging profile".

9ch-e. The H-CHF opens a CDR.

9ch-f. The H-CHF acknowledges by sending Charging Data Response [Initial] to the V-CHF and optionally includes a "Roaming charging profile".

9ch-f. The V-CHF forwards the acknowledgement by sending Charging Data Response [Initial] to the V-SMF and optionally includes a "Roaming charging profile" (which overrides the default one).

10ch-a. The Charging Data Request [Update] is sent to V-CHF, when enabled triggers are met, optionally including the new "Roaming charging profile", and optionally include a request for quota.

10ch-b. The V-CHF update the CDR.

10ch-c. If a H-CHF was selected a Charging Data Request [Update] is sent to H-CHF, when enabled triggers are met and optionally include a request for quota.

10ch-d. The H-CHF update the CDR.

10ch-e. The H-CHF acknowledges by sending Charging Data Response [Update] to the V-CHF.

10ch-f. The V-CHF forwards the acknowledgement by sending Charging Data Response [Update] to the V-SMF.

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| **Seventh change** |

5.2.2.18.6 PDU Session Modification, SMF to V-CHF

The following figure 5.2.2.18.6-1 describes the PDU session modification charging, based on figure 4.3.3.2-1 UE or network requested PDU Session Modification (for non-roaming and roaming with local breakout), where the V-SMF interacts with V-CHF and V-CHF interacts with H-CHF.

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**Figure 5.2.2.18.6-1: PDU Session Modification, SMF to V-CHF**

2ch-a. The Charging Data Request [Update] is sent to V-CHF for reporting the QBC and/or FBC information when enabled triggers are met, and for FBC it may include a request for quota.

2ch-b. The V-CHF update the CDR.

2ch-c. If a H-CHF was selected a Charging Data Request [Update] is sent to H-CHF, when the enabled triggers are met and optionally include a request for quota.

2ch-d. The H-CHF update a CDR.

2ch-e. The H-CHF acknowledges by sending Charging Data Response [Update] to the V-CHF.

2ch-f. The V-CHF forwards the acknowledgement by sending Charging Data Response [Update] to the V-SMF.

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| **End of changes** |