**3GPP TSG-SA5 Meeting #139-e *S5-215232***

**e-meeting, 11 - 20 October 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **32.255** | **CR** | **0335** | **rev** | **-** | **Current version:** | **17.3.0** |  |
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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:***  | Correcting unit count inactivity timer enablement |
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| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | S5 |
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| ***Work item code:*** | TEI17 |  | ***Date:*** | 2021-10-01 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *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 canbe 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:*** | The statement about how trigger and value of unit inactivity timer should work is inconsistent the table 5.2.1.4.1 states that CHF can disable the trigger but in table 6.2.1.2.1 it cannot be disabled only set to zero if it shouldn’t be used. The text is also a bit vague if the CHF only can send a value if one is received from the SMF. |
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| ***Summary of change:*** | Clarifying that the CHF can only send a new value for the unit count inactivity timer if it has received one. |
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| ***Consequences if not approved:*** | The use of the unit inactivity timer may cause interoperability issues. |
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| ***Clauses affected:*** | 5.2.1.1, 5.2.1.4 |
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|  | **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:*** |  |

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| **First change** |

#### 5.2.1.1 General

Converged charging may be performed by the SMF interacting with CHF using Nchf specified in TS 32.290 [57] and TS 32.291 [58]. In order to provide the data required for the management activities outlined in TS 32.240 [1] (Credit-Control, accounting, billing, statistics etc.), the SMF shall be able to perform converged charging for each of the following:

- Charging data related to PDU session;

- Charging data related to service data flows within the PDU session.

Converged charging includes quota management and usage reporting.

The SMF shall be able to report charging events to CDF for CDR generation.

The SMF shall be able to perform convergent charging by interacting with CHF, for charging data related to PDU sessions. The Charging Data Request and Charging Data Response are exchanged between the SMF and the CHF, based on SCUR scenarios specified in TS 32.290 [57]. The Charging Data Request is issued by the SMF towards the CHF when certain conditions (chargeable events) are met.

The quota management is always per rating group, reporting level can be either per rating group or per combination of the rating group and service id, which is defined per PCC rule.

Converged charging uses centralized or decentralized unit determination and centralized rating scenarios for session based convergent charging specified in TS 32.290 [57].

The charging information collected per PDU session includes the network slice instance the PDU session belongs to.

The contents and purpose of each charging event that triggers interaction with CHF, as well as the chargeable events that trigger them, are described in the following sub-clauses.

The SMF initiates a charging session with Charging Data Request/Response [Initial], updates the charging session with Charging Data Request/Response [Update], and terminates the charging session with Charging Data Request/Response [Termination].

A detailed formal description of the converged charging parameters defined in the present document is to be found in TS 32.291 [58].

A detailed formal description of the CDR parameters defined in the present document is to be found in TS 32.298 [51].

In order to avoid a charging session remaining inactive for a long period of time, upon expiry of the Unit Count Inactivity Timer, the charging session may be terminated by the SMF sending Charging Data Request [Termination], indicating the PDU session shall continue and the CHF can expect a later Charging Data Request [Initial] request for the same PDU session with the original Charging ID and new session identifier. The SMF may send its locally configured value of the Unit Count Inactivity Timer to the CHF. The CHF may respond with a new Unit Count Inactivity Timer for use in the SMF. The inclusion of the Unit Inactivity Timer in the response by the CHF may be dependent or independent on first receiving the Unit Inactivity Timer from the SMF.

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| **Second change** |

#### 5.2.1.4 Flow Based Charging (FBC)

For FBC charging, the SMF categorizes the service data flows within PDU session data traffic by rating group and / or combination of the rating group and service id. The level of the reporting and charging method is defined per PCC rule. Details of this functionality are specified in TS 23.503 [202] and TS 32.240 [1].

The SMF can include the QoS Information per rating group or per combination of rating group/service id. If the QoS Information cannot be unambiguously determined per rating group or per combination of rating group/service id, it should be omitted.

NOTE: The SMF can only include one QoS Information occurrence per combination of rating group/service id. This implies if an operator wishes to be able to separate usage according to 5QI and ARP for the same charging method, they will need to ensure that service data flows having different 5QI and ARP do not have the same:

- rating group in cases where rating reporting is used;

- rating group/service id where rating group/service id reporting is used.

When a service data flow is governed by a PCC Rule indicated with "Online" charging method, quota management is required for the service data flow. It may also indicate if authorization for the service data flow is needed or not before service delivery, i.e. blocking or non-blocking mode.

When a service data flow is governed by a PCC Rule indicated with "Offline" charging method, quota management is not required for this service data flow. Usage reporting is required for this service data flow without affecting the delivery.

According to TS 23.503 [202], FBC shall support different charging models per PCC rule. These charging models may be based on volume and/or time and on number of events matching a specific service data flow template in PCC rule. When a chargeable event occurs for which quota needs to be requested by the SMF to the CHF, the type of requested quota may depend on measurement method configured for the PCC rule.

In general, the charging of a service data flow shall be linked to the PDU session under which the service data flow has been activated.

The amount of data counted shall be the user plane payload at the UPF separated between UL and DL.

For PDU session specific charging, time metering shall start when PDU session is activated.

Table 5.2.1.4.1 summarizes the set of default trigger conditions and their category which shall be supported by the SMF. For "immediate report" category, the table also provides the corresponding Charging Data Request [Initial, Update, Termination] message sent from SMF towards the CHF.

Table 5.2.1.4.1: Default Trigger conditions in SMF

| Trigger Conditions | Trigger level | Converged Charging default category | Offline only charging 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 | Immediate | Not Applicable | Not Applicable | Charging Data Request [Initial] |
| Start of the Service data flow and no charging session exists. | RG | Immediate | Immediate | No | No |
| **Change of Charging conditions** | Charging Data Request [Update] |
| QoS change | PDU session/ RG | Deferred | Deferred | Yes | Yes |
| GFBR guaranteed status change | RG | Deferred | Deferred | Yes | Yes |
| User Location change | PDU session/ RG | Deferred | Deferred | Yes | Yes |
| Serving Node change | PDU session/ RG | Deferred | Deferred | Yes | Yes |
| Change of UE presence in Presence Reporting Area(s) | PDU session/ RG | Deferred | Deferred | Yes | Yes |
| Change of 3GPP PS Data off Status | PDU session/ RG | Deferred | Deferred | Yes | Yes |
| Tariff time change | PDU session/ RG | Deferred | Deferred | No | No |
| UE time zone change | PDU session/ RG | Immediate | Deferred | Yes | Yes |
| PLMN change | PDU session/ RG | Immediate | Deferred | Yes | Yes |
| RAT type change | PDU session/ RG | Immediate | Deferred | Yes | Yes |
| Session-AMBR change | PDU session | Immediate | Deferred | Yes | Yes |
| Addition of UPF | PDU Session/RG | Immediate | Deferred | Yes | Yes |
| Removal of UPF  | PDU session/RG | Immediate | Deferred | Yes | Yes |
| Insertion of I-SMF | PDU Session | Deferred | Deferred | Yes | Yes |
| Change of I-SMF | PDU Session | Deferred | Deferred | Yes | Yes |
| Removal of I-SMF | PDU Session | Deferred | Deferred | Yes | Yes |
| Handover cancel | PDU session | Immediate | Deferred | Yes | Yes |
| Handover start | PDU session | Immediate | Deferred | Yes | Yes |
| Handover complete | PDU session | Immediate | Deferred | Yes | Yes |
| Addition of access | PDU session/ RG | Immediate | Deferred | Yes | Yes |
| Removal of access | PDU session/ RG | Immediate | Deferred | Yes | Yes |
| Redundant transmission change | RG | Immediate | Deferred | Yes | Yes |
| **Limit per PDU session** |
| Expiry of data time limit per PDU session | PDU session | Immediate | Immediate | No | Yes |
| Expiry of data volume limit per PDU session | PDU session | Immediate | Immediate | No | Yes |
| Expiry of data event limit per PDU session | PDU session | Immediate | Immediate | No | Yes |
| Expiry of limit of number of charging condition changes | PDU session | Immediate | Immediate | No | Yes |
| **Limit per Rating group** |
| Expiry of data time limit per rating group | RG | Deferred | Deferred | Yes | Yes |
| Expiry of data volume limit per rating group | RG | Deferred | Deferred | Yes | Yes |
| Expiry of data event limit per rating group | RG | Deferred | Deferred | Yes | Yes |
| **Quota management** |
| Time threshold reached | RG | Immediate | Not applicable | No | Yes |
| Volume threshold reached | RG | Immediate | Not applicable | No | Yes |
| Unit threshold reached | RG | Immediate | Not applicable | No | Yes |
| Time quota exhausted | RG | Immediate | Not applicable | No | Yes |
| Volume quota exhausted | RG | Immediate | Not applicable | No | Yes |
| Unit quota exhausted | RG | Immediate | Not applicable | No | Yes |
| Expiry of quota validity time | RG | Immediate | Not applicable | No | Yes |
| Expiry of quota holding time | RG | Immediate | Not applicable | No | Yes |
| Re-authorization request by CHF | RG | Immediate | Not applicable | No | No |
| Start of service data flow, in case no valid quota for this rating group  | RG | Immediate | Not applicable | No | No |
| Start of SDF additional access, in case no valid quota for this access rating group  | RG | Immediate | Not applicable | No | No |
| **Others**  |
| Termination of service data flow - last service data flow under a given Rating Group. | RG | Immediate | Immediate | No | No |
| Management intervention | PDU session | Immediate | Immediate | No | No |
| Expiry of Unit Count Inactivity Timer | PDU session | Immediate | Not applicable | No | No | Charging Data Request [Termination] |
| End of PDU session | PDU session | Immediate | Immediate | No | No |
| CHF response with session termination  | PDU session | Immediate | Not applicable | No | No |
| Abort request is received from the CHF | PDU session | Immediate | 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. |

The default "Limit" trigger conditions are trigger thresholds configured in the Charging Characteristics applied to the PDU session. 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.

When the traffic is counted in more than one UPF, the CHF overrides these default triggers of volume limit for the all UPFs.

For converged charging, the following details of chargeable events and corresponding actions in the SMF are defined in Table 5.2.1.4.2:

Table 5.2.1.4.2: Chargeable events and their related actions in SMF

| Chargeable event | Conditions | SMF action |
| --- | --- | --- |
| Start of PDU session |  | Charging Data Request [Initial] with a possible request quota for later use. |
| Start of service data flow | If quota management is required, and valid quota for this rating group does not exist | Charging Data Request [Update] to request quota with a possible amount of quota. |
| If service identifier level reporting is required by the PCC rule | Start new counts with time stamps for the combination of the rating group and service id |
| If rating group level reporting is required by the PCC rule | Start new counts with time stamps for the rating group |
| If sponsored connectivity level reporting is required by the PCC rule | Start new counts with time stamps for the combination of the rating group, sponsor identity and application service provider identity |
| If charging resource, i.e. charging session, for the PDU session does not exist | Charging Data Request [Initial] with a possible request quota |
| Start of SDF additional access | If ATSSS is supported with access differentiated rating groups, quota management is required, and valid quota for this access rating group does not exist. | Charging Data Request [Update] to request quota with a possible amount of quota. |
| If ATSSS is supported with access differentiated rating groups, service identifier level reporting is required by the PCC rule | Start new counts with time stamps for the combination of the access rating group and service id |
| If ATSSS is supported with access differentiated rating groups, rating group level reporting is required by the PCC rule | Start new counts with time stamps for the access rating group |
| If ATSSS is supported with access differentiated rating groups, sponsored connectivity level reporting is required by the PCC rule | Start new counts with time stamps for the combination of the access rating group, sponsor identity and application service provider identity |
| Termination of service data flow | If service identifier level reporting is required by the PCC rule and this is the last service data flow for this combination of the rating group and service id | Close the counts with time stamps |
| If rating group level reporting is required by the PCC rule and this is the last service data flow utilizing that specific rating group | Close the counts with time stamps |
| If sponsored connectivity level reporting is required by the PCC rule and this was the last active service data flow for this combination of rating group, sponsor identity and application service provider identity | Close the counts with time stamps |
| Expiry of the Unit Count Inactivity Timer for the PDU session | If the corresponding trigger is enabled | Charging Data Request [Termination], indicating that charging session is terminated, and the PDU session is still activeMay include the configured Unit Count Inactivity Timer value  |
| End of PDU session in the SMF |  | Charging Data Request [Termination]Close the counts with time stamps |
| Quota specific chargeable events (e.g. threshold reached, QHT expires, quota exhaustion, validity time reached, forced re-authorization, expiry of quota holding time) | If the corresponding trigger is enabled | Charging Data Request [Update] with a possible request quotaClose the counts and start new counts with time stamps |
| Change of charging condition in the SMF (e.g. QoS change, Session-AMBR change, user location change, Radio access type change, PLMN change, Serving Node change, UE Time Zone change, change of UE presence in Presence Reporting Area(s), change of 3GPP PS Data Off status, handover cancel, GFBR guaranteed status change) | If the corresponding trigger is enabled | Close the counts and start new counts with time stamps for all active service data flows |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update] with a possible request quota. |
| Handover start | If the corresponding trigger is enabled | Close the counts with time stamps and start new counts with time stamps for active service data flows. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update] with a possible request quota. |
| Handover cancel | If the corresponding trigger is enabled | Close the counts with time stamps and start new counts with time stamps for active service data flows. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update] with a possible request quota. |
| Handover complete | If the corresponding trigger is enabled | Close the counts with time stamps and start new counts with time stamps for active service data flows. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" | Charging Data Request [Update] |
| 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" with the quota management is being performed and quota is granted per each UPF | Charging Data Request [Update] to request quota with a possible amount of quota. |
| Tariff time change |  | Close the counts and start new counts with time stamps |
| CHF response with session termination (e.g. Not Applicable), abort request |  | Charging Data Request [Termination]Close the counts with time stamps |
| Removal of a 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" with quota management is being performed and quota is granted per each UPF | Charging Data Request [Update]. |
| Insertion of I-SMF | If the corresponding trigger is enabled | Close the counts with time stamps for all active service data flows in SMF, open new accounts for all active service data flows with I-SMF information. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" with quota management is being performed and quota is granted per each UPF | Charging Data Request [Update] to request quota with a possible amount of quota.  |
| Removal of I-SMF | If the corresponding trigger is enabled | Close the counts with time stamps for the removed I-SMF |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" with quota management being performed and quota is granted per each UPF | Charging Data Request [Update]. |
| Change of I-SMF | If the corresponding trigger is enabled | Close the counts with time stamps for the removed I-SMF, open active traffic flows’ counts for the new I-SMF |
| If the corresponding trigger is enabled and the category is set to "immediate reporting" with quota management being performed and quota is granted per each UPF | Charging Data Request [Update]. |
| Addition of access | If the corresponding trigger is enabled | Close the counts with time stamps for all active service data flows usage report in SMF, open new counts for all active service data flows. |
| If the corresponding trigger is enabled and the category is set to "immediate reporting"  | Charging Data Request [Update] with a possible request quota.  |
| Removal of access | If the corresponding trigger is enabled | Close the counts with time stamps for all active service data flows usage report in SMF, open new counts for all active service data 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. |
| Expiry of time limit per rating group | 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 any matching service data flow is still active | Start new counts with time stamps |
| Expiry of data volume limit per rating group | 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 any matching service data flow is still active | Open a new service data container |
| Expiry of data event limit per rating group | 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 any matching service data flow is still active | Open a new service data container |
| Expiry of data event limit per PDU session | If the corresponding trigger is enabled | Charging Data Request [Update]Close the counts with time stamps |
| If the PDU session is still active | Start new counts with time stamps |
| Expiry of time limit per PDU session | If the corresponding trigger is enabled | Charging Data Request [Update]Close the counts with time stamps |
| If the PDU session is still active | Start new counts with time stamps |
| Expiry of data volume limit per PDU session |  | Charging Data Request [Update]Close the counts with time stamps |
| If the PDU session is still active | Start new counts with time stamps |
| Expiry of a limit of number of charging condition changes per PDU session |  | Charging Data Request [Update]Close the counts with time stamps |
| If the PDU session is still active | Start new counts with time stamps |
| Management intervention |  | Charging Data Request [Update]Close the counts with time stamps |
| If the PDU session is still active | Start new counts with time stamps |

When event based charging applies, the first occurrence of an event matching a service data flow template in PCC rule shall be considered as the start of a service.

How the termination of service data flows is detected, is specified in TS 23.503 [202]. Termination of the service data flow itself does not trigger Charging Data Request [Update].

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

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| **End of changes** |