**3GPP TSG-SA2 Meeting #137-E *S2-2001803***

**Elbonia, February 24 – 27, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **23.501** | **CR** | **2128** | **rev** | **-** | **Current version:** | **16.3.0** |  |
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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 | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | Sending EPS APN rate control information during PDU session establishment |
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| ***Source to WG:*** | Qualcomm Incorporated, Ericsson |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | 5G\_CIoT |  | ***Date:*** | 2020-02-07 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | If a PDU session is established for a DNN/S-NSSAI that supports interworking with EPS and for which APN rate control parameters are configured, then those are currently not provided to the UE. As a result the UE will not have the APN rate control parameters when moving to EPS. |
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| ***Summary of change:*** | Clarify that the SMF can provide APN rate control information to the UE:- the APN Rate Control Status for the APN that is equal to the DNN, if available at the SMF; otherwise,- the configured APN Rate Control parameters for the APN that is equal to the DNN. |
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| ***Consequences if not approved:*** | UE cannot enforce APN rate control parameters when establishing a PDU session in 5GS and subsequently moving to EPS. |
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| ***Clauses affected:*** |  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\* Begin of changes \*\*\*

#### 5.17.2.1 General

Interworking with EPC in this clause refers to mobility procedures between 5GC and EPC/E-UTRAN, except for clause 5.17.2.4. Network slicing aspects for EPS Interworking are specified in clause 5.15.7

In order to interwork with EPC, the UE that supports both 5GC and EPC NAS can operate in single-registration mode or dual-registration mode:

- In single-registration mode, UE has only one active MM state (either RM state in 5GC or EMM state in EPC) and it is either in 5GC NAS mode or in EPC NAS mode (when connected to 5GC or EPC, respectively). UE maintains a single coordinated registration for 5GC and EPC. Accordingly, the UE maps the EPS-GUTI to 5G GUTI during mobility between EPC and 5GC and vice versa following the mapping rules in Annex B. To enable re-use of a previously established 5G security context when returning to 5GC, the UE also keeps the native 5G-GUTI and the native 5G security context when moving from 5GC to EPC.

- In dual-registration mode, UE handles independent registrations for 5GC and EPC using separate RRC connections. In this mode, UE maintains 5G-GUTI and EPS-GUTI independently. In this mode, UE provides native 5G-GUTI, if previously allocated by 5GC, for registrations towards 5GC and it provides native EPS-GUTI, if previously allocated by EPC, for Attach/TAU towards EPC. In this mode, the UE may be registered to 5GC only, EPC only, or to both 5GC and EPC.

 Dual-registration mode is intended for interworking between EPS/E-UTRAN and 5GS/NR. A dual-registered UE should not send its E-UTRA connected to 5GC and E-UTRAN radio capabilities to NR access when connected to 5GS/NR to avoid being handed over to 5GC-connected E-UTRA or to E-UTRAN.

NOTE 1: This is to prevent the dual registered UE from being connected to the same E-UTRA cell either connected to EPC or 5GC simultaneously using separate RRC connections via single RAN node as a result of handover. If a dual- registered UE implementation chooses to send its E-UTRA capability when connected to 5GS/NR, the UE and the network behaviour when UE enters a 5GC-connected E-UTRA is not further specified. If however the UE is registered with 5GS/NR only, the UE can send its E-UTRA capability in order to allow inter-RAT handover to E-UTRA/5GC and Dual Connectivity with multiple RATs.

 If a dual-registered UE had not sent its E-UTRA connected to 5GC and E-UTRAN radio capabilities to 5GS and the UE needs to initiate emergency services, it shall locally re-enable its E-UTRA connected to 5GC and E-UTRAN radio capabilities in order to perform domain selection for emergency services as defined in TS 23.167 [18].

NOTE 2: However even in this case, the UE is still not expected to connect to E-UTRAN/EPC and E-UTRA/5GC simultaneously using separate RRC connection via single RAN node as a result of the domain selection for emergency services.

The support of single registration mode is mandatory for UEs that support both 5GC and EPC NAS.

During E-UTRAN Initial Attach, UE supporting both 5GC and EPC NAS shall indicate its support of 5G NAS in UE Network Capability described in clause 5.11.3 of TS 23.401 [26].

During registration to 5GC, UE supporting both 5GC and EPC NAS shall indicate its support of EPC NAS.

NOTE 3: This indication may be used to give the priority towards selection of PGW-C + SMF for UEs that support both EPC and 5GC NAS.

If the EPC supports "Ethernet" PDU Session Type, and the 5GSM Capabilities indicate that the UE supports Ethernet PDN type in EPC, then PDU Session type "Ethernet" is transferred to EPC as "Ethernet". Otherwise, PDU Session types "Ethernet" and "Unstructured" are transferred to EPC as "non-IP" PDN type (when supported by UE and network). If the UE or EPC does not support Ethernet PDN type in EPC, the UE sets the PDN type to non-IP when it moves from 5GS to EPS and after the transfer to EPS, and the UE and the SMF shall maintain information about the PDU Session type used in 5GS, i.e. information indicating that the PDN Connection with "non-IP" PDN type corresponds to PDU Session type Ethernet or Unstructured respectively. This is done to ensure that the appropriate PDU Session type will be used if the UE transfers to 5GS.

PDN type "non-IP" is transferred to 5GS as "Unstructured" PDU Session type if it is successfully transferred.

It is assumed that if a UE supports Ethernet PDU Session type and/or Unstructured PDU Session type in 5GS it will also support non-IP PDN type in EPS. If this is not the case, the UE shall locally delete any EBI(s) corresponding to the Ethernet/Unstructured PDU Session(s) to avoid that the Ethernet/Unstructured PDU Session(s) are transferred to EPS.

Networks that support interworking with EPC, may support interworking procedures that use the N26 interface or interworking procedures that do not use the N26 interface. Interworking procedures with N26 support provides IP address continuity on inter-system mobility to UEs that support 5GC NAS and EPC NAS and that operate in single registration mode. Networks that support interworking procedures without N26 shall support procedures to provide IP address continuity on inter-system mobility to UEs operating in both single-registration mode and dual-registration mode. In such networks, AMF shall provide the indication that interworking without N26 is supported to UEs during initial Registration in 5GC or MME may optionally provide the indication that interworking without N26 is supported in the Attach procedure in EPC as defined in TS 23.401 [26].

If the network does not support interworking with EPC, network shall not indicate support for "interworking without N26" to the UE.

When the HSS+UDM is required to provide the subscription data to the MME, for each APN, only one PGW-C+SMF FQDN and associated APN is provided to the MME according to TS 23.401 [26].

For interworking without N26 interface:

- if the PDU session supports interworking, the PGW-C+SMF stores the PGW-C+SMF FQDN to SMF context in HSS+UDM when the SMF is registered to HSS+UDM.

- For an APN, the HSS+UDM selects one of the stored PGW-C+SMF FQDN based on operator's policy.

For interworking with N26 interface:

- For a DNN, AMF determines PDU session(s) associated with 3GPP access in only one PGW-C+SMF supporting EPS interworking via EBI allocation procedure as described in clause 4.11.1.4.1 of TS 23.502 [3].

- If the network supports EPS interworking of non-3GPP access connected to 5GC, the AMF serving 3GPP access notifies the UDM to store the association between DNN and PGW-C+SMF FQDN which supports EPS interworking as Intersystem continuity context, to avoid MME receiving inconsistent PGW-C+SMF FQDN from AMF and HSS+UDM.

- The AMF updates Intersystem continuity context if the PGW-C+SMF and DNN association is changed due to the AMF selecting another PGW-C+SMF for EPS interworking for the same DNN.

- If the PGW-C+SMF FQDN and associated DNN exists in Intersystem continuity context, the HSS+UDM provides MME with PGW-C+SMF FQDN and associated APN.

It does not assume that the HSS+UDM is aware of whether N26 is deployed in the serving network. The HSS+UDM check the Intersystem continuity context first. If no PGW-C+SMF FQDN associated with an DNN exists in Intersystem continuity context, the HSS+UDM selects one of the PGW-C+SMF FQDN for the APN from SMF context based on operator's policy.

In entire clause 5.17.2 the terms "initial attach", "handover attach" and "TAU" for the UE procedures in EPC can alternatively be combined EPS/IMSI Attach and combined TA/LA depending on the UE configuration defined in TS 23.221 [23].

If a UE in MICO mode moves to E-UTRAN connected to EPC and any of the triggers defined in clause 5.4.1.3 occur, then the UE shall locally disable MICO mode and perform the TAU or Attach procedure as defined in clause 5.17.2. The UE can renegotiate MICO when it returns to 5GS during (re-)registration procedure.

IP address preservation for IP PDU sessions cannot be ensured on subsequent mobility from EPC/E-UTRAN to GERAN/UTRAN to a UE that had initially registered in 5GS and moved to EPC/E-UTRAN.

NOTE 4: The SMF+PGW-C might not include the GERAN/UTRAN PDP Context anchor functionality. Also, 5GC does not provide GERAN/UTRAN PDP Context parameters to the UE when QoS flows of PDU Session are setup or modified in 5GS. Hence, the UE might not be able to activate the PDP contexts when it transitions to GERAN/UTRAN.

IP address preservation for IP PDU sessions cannot be ensured on subsequent mobility from EPC/E-UTRAN to 5GS to a 5GS NAS capable UE that had initially attached via GERAN/UTRAN and moved to EPC/E-UTRAN.

NOTE 5: The SMF+PGW-C might not include the GERAN/UTRAN PDP Context anchor functionality. Also, 5GS NAS capable UE does not indicate the support of this capability to the network during GPRS attach via GERAN/UTRAN. Hence, SMF+PGW-C might not be selected for the UE's PDP contexts that are setup in GERAN/UTRAN.

When a PDU session is moved from 5GS to EPS, the PGW-C+SMF keeps the registration and subscription in HSS+UDM until the corresponding PDN connection is released. The PGW-C+SMF may receive notification of subscription update regarding the DNN(s) which are associated with the PDN connection(s) connecting via EPS. In this case the PGW-C+SMF shall not trigger any action to those PDN connection(s). Instead, the MME will receive subscription update and trigger corresponding actions according to TS 23.401 [26].

If APN Rate Control is used when the UE moves from EPC to 5GC then the P-GW/SCEF and UE store the current APN Rate Control Status for an APN. If while connected to 5GC the last PDU Session to a DNN that is the same as the APN identified in the APN Rate Control status is released then the APN Rate Control Status may be stored in the AMF in addition to the Small Data Rate Control Status and the UE discards the APN Rate Control Status. The APN Rate Control Status is stored in the AMF so it can be provided to the MME during mobility to EPC and subsequently applied at establishment of a new first PDN Connection to the same APN , if valid. The APN Rate Control Status is provided to the PGW-U+UPF if a first new PDU Session is established towards the DNN that is the same as the APN identified in the APN Rate Control status if the UE moves back to EPC, taking into account its validity period.

If a PDU session is established for a DNN and S-NSSAI that supports interworking with EPS, then the SMF may provide APN rate control information to the UE during PDU Session Establishment:

- the APN Rate Control Status for the APN that is equal to the DNN, if available at the SMF; otherwise,

- the configured APN Rate Control parameters for the APN that is equal to the DNN.

NOTE 6: If the APN Rate Control Status is provided to a PGW-U+UPF it is not used for Small Data Rate Control while the UE is connected to 5GC, it is only used as the APN Rate Control Status if the UE moves to EPC.

NOTE 7: Encoding of APN and DNN specified in TS 23.003 [19] allows the comparison of EPS APN and 5GS DNN.

If a Service Gap timer is running in the AMF when the UE moves from 5GC to EPC, the AMF stops the running Service Gap timer. If the UE returns to 5GC from EPC the AMF provides the Service Gap Time to the UE as described in clause 5.31.16.

If a Service Gap timer is running in the MME when the UE moves from EPC to 5GC, the MME stops the running Service Gap timer. If the UE returns to E-UTRAN connected to EPC from 5GC the MME provides the Service Gap Time to the UE as described in TS 23.401 [26].

If a Service Gap timer is running in the UE when the UE moves to from 5GC to EPC and if Service Gap Time is received from the MME, the Service Gap timer is kept running in the UE and applied for EPC. If a Service Gap timer is running in the UE when the UE moves to 5GC and if Service Gap Time is received from the AMF, the Service Gap timer is kept running in the UE and applied in 5GS.

\*\*\* End of changes \*\*\*