**3GPP TSG-CT WG1 Meeting #123-eC1-202779**

**Electronic meeting, 16-24 April 2020 revision of C1-202337**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **24.501** | **CR** | **2114** | **rev** | **1** | **Current version:** | **16.4.1** |  |
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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:***  | CIoT user or small data container in CPSR message not forwarded |
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| ***Source to WG:*** | ZTE, InterDigital, Huawei, HiSilicon, Ericsson |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5G\_CIoT |  | ***Date:*** | 2020-04-16 |
|  |  |  |  |  |
| ***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:*** | The AMF may unsuccessfully attempt to forward a CIoT user/small data container received in a CONTROL PLANE SERVICE REQUEST message.As this is not a 5GMM issue, the AMF should accept the control plane service request message to keep the UE connected.However, in 5GS given the MM and SM clean split, the SMF may temporarily be unreachable by AMF which should not be a reason to reject the CPSR message and force the UE back to 5GMM-IDLE. There might be additional payload pending that still could be sent while the UE is connected.This issue is similar to the routing issue with the NAS transport procedure, i.e. a CIoT user data container may not be forwarded to the associated SMF due to network issues which is reported back to the UE in the DL NAS TRANSPORT message. To avoid the impact on the SERVICE ACCEPT message and the if the AMF can accept the 5GMM CPSR procedure itself, then the AMF sends the SERVICE ACCEPT message to the UE. For those unrouting CIoT user data container, the AMF will send it back to the UE using the DL NAS TRANSPORT message.If the 5GMM CPSR procedure fails itself, then the AMF sends the SERVICE REJECT message to the UE. In this case, the UE considers the CIoT user data container has not been delivered. |
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| ***Summary of change:*** | If the CIoT user data container or small data container in the CPSR message can not be forwarded, then the AMF can send the CIoT user data container back to the UE using the DL NAS TRANSPORT message. |
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| ***Consequences if not approved:*** | There is no mechanism to inform the UE that the user data container has not been forwarded. |
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| ***Clauses affected:*** | 5.4.5.3.1, 5.4.5.3.2, 5.6.1.8 |
|  |  |
|  | **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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\*\*\* First change \*\*\*\*\*

##### 5.4.5.3.1 General

The purpose of the network-initiated NAS transport procedure is to provide a transport of:

a) a single 5GSM message;

b) SMS;

c) an LPP message;

d) an SOR transparent container;

e) a single uplink 5GSM message which was not forwarded due to routing failure;

f) a single uplink 5GSM message which was not forwarded due to congestion control;

g) a UE policy container;

h) a single uplink 5GSM message which was not forwarded, because the PLMN's maximum number of PDU sessions has been reached;

h1) a single uplink 5GSM message which was not forwarded, because the maximum number of PDU sessions with active user-plane resources has been reached;

i) a single uplink 5GSM message which was not forwarded due to service area restrictions;

j) a UE parameters update transparent container;

k) a location services message;

l) a CIoT user data container;

l1) a single uplink CIoT user data container or control plane user data which was not forwarded due to routing failure;

l2) a single uplink CIoT user data container which was not forwarded due to congestion control; or

m) multiple of the above types.

from the AMF to the UE in a 5GMM message.

\*\*\*\*\* Nex change \*\*\*\*\*

##### 5.4.5.3.2 Network-initiated NAS transport procedure initiation

In 5GMM-CONNECTED mode, the AMF initiates the NAS transport procedure by sending the DL NAS TRANSPORT message, as shown in figure 5.4.5.3.2.1.

In case a) in subclause 5.4.5.3.1, i.e. upon reception from an SMF of a 5GSM message without an N1 SM delivery skip allowed indication for a UE or a 5GSM message with an N1 SM delivery skip allowed indication for a UE in the 5GMM-CONNECTED mode, the AMF shall:

a) include the PDU session information (PDU session ID) in the PDU session ID IE;

b) set the Payload container type IE to "N1 SM information"; and

c) set the Payload container IE to the 5GSM message.

In case b) in subclause 5.4.5.3.1, i.e. upon reception from an SMSF of an SMS payload, the AMF shall:

a) set the Payload container type IE to "SMS";

b) set the Payload container IE to the SMS payload; and

c) select the access type to deliver the DL NAS TRANSPORT message as follows in case the access type selection is required:

1) if the UE to receive the DL NAS TRANSPORT message is registered to the network via both 3GPP access and non-3GPP access, the 5GMM context of the UE indicates that SMS over NAS is allowed, the UE is in MICO mode, and the UE is in 5GMM-IDLE mode for 3GPP access and in 5GMM-CONNECTED mode for non-3GPP access, then the AMF selects non-3GPP access. Otherwise, the AMF selects either 3GPP access or non-3GPP access.

 If the delivery of the DL NAS TRANSPORT message over 3GPP access has failed, the AMF may re-send the DL NAS TRANSPORT message over the non-3GPP access.

 If the delivery of the DL NAS TRANSPORT message over non-3GPP access has failed, the AMF may re-send the DL NAS TRANSPORT message over the 3GPP access; and

2) otherwise, the AMF selects 3GPP access.

NOTE 1: The AMF selects an access type between 3GPP access and non-3GPP access based on operator policy.

In case c) in subclause 5.4.5.3.1 i.e. upon reception from an LMF of an LPP message payload, the AMF shall:

a) set the Payload container type IE to "LTE Positioning Protocol (LPP) message container";

b) set the Payload container IE to the LPP message payload received from the LMF;

c) set the Additional information IE to an LCS correlation identifier received from the LMF from which the LPP message was received.

NOTE 2: The LCS Correlation Identifier is assigned originally by the AMF except for LPP message transfer associated with event reporting for periodic or triggered location as described in subclause 6.3.1 of 3GPP TS 23.273 [6B], where the LMF assigns the correlation identifier. AMF and LMF assigned correlation identifiers can be distinguished by an implementation specific convention (e.g. use of a different number of octets) to enable an AMF to distinguish one from the other when received in the Additional Information IE in an UL NAS Transport message.

In case d) in subclause 5.4.5.3.1 i.e. upon reception of a steering of roaming information (see 3GPP TS 23.122 [5]) from the UDM to be forwarded to the UE, the AMF shall:

a) set the Payload container type IE to "SOR transparent container"; and

b) set the Payload container IE to the steering of roaming information (see 3GPP TS 23.122 [5]) received from the UDM.

In case e) in subclause 5.4.5.3.1, i.e. upon sending a single uplink 5GSM message which was not forwarded due to routing failure, the AMF shall:

a) include the PDU session ID in the PDU session ID IE;

b) set the Payload container type IE to "N1 SM information";

c) set the Payload container IE to the 5GSM message which was not forwarded; and

d) set the 5GMM cause IE to the 5GMM cause #90 "payload was not forwarded" or 5GMM cause #91 "DNN not supported or not subscribed in the slice". The AMF sets the 5GMM cause IE to the 5GMM cause #91 "DNN not supported or not subscribed in the slice", if the 5GSM message could not be forwarded since SMF selection fails because:

1) the DNN is not supported in the slice identified by the S-NSSAI used by the AMF; or

2) neither the DNN provided by the UE nor the wildcard DNN are in the subscribed DNN list of the UE for the S-NSSAI used by the AMF.

 Otherwise, the AMF sets the 5GMM cause IE to the 5GMM cause #90 "payload was not forwarded".

In case f) in subclause 5.4.5.3.1, i.e. upon sending a single uplink 5GSM message which was not forwarded due to congestion control, the AMF shall:

a) include the PDU session ID in the PDU session ID IE;

b) set the Payload container type IE to "N1 SM information";

c) set the Payload container IE to the 5GSM message which was not forwarded;

d) set the 5GMM cause IE to the 5GMM cause #22 "Congestion", the 5GMM cause #67 "insufficient resources for specific slice and DNN" or the 5GMM cause #69 "insufficient resources for specific slice"; and

e) include the Back-off timer value IE.

In case g) in subclause 5.4.5.3.1, i.e. upon reception of a UE policy container from the PCF to be forwarded to the UE, the AMF shall:

a) set the Payload container type IE to "UE policy container"; and

b) set the Payload container IE to the UE policy container received from the PCF.

In case h) in subclause 5.4.5.3.1, i.e. upon sending a single uplink 5GSM message which was not forwarded, because the PLMN's maximum number of PDU sessions has been reached, the AMF shall:

a) include the PDU session ID in the PDU session ID IE;

b) set the Payload container type IE to "N1 SM information";

c) set the Payload container IE to the 5GSM message which was not forwarded; and

d) set the 5GMM cause IE to the 5GMM cause #65 "maximum number of PDU sessions reached".

In case h1) in subclause 5.4.5.3.1, i.e. upon sending a single uplink 5GSM message which was not forwarded, because the maximum number of PDU sessions with active user-plane resources has been reached, the AMF shall:

a) include the PDU session ID in the PDU session ID IE;

b) set the Payload container type IE to "N1 SM information";

c) set the Payload container IE to the 5GSM message which was not forwarded; and

d) set the 5GMM cause IE to the 5GMM cause #92 "insufficient user-plane resources for the PDU session".

In case i) in subclause 5.4.5.3.1, i.e. upon sending a single uplink 5GSM message which was not forwarded due to service area restrictions, the AMF shall:

a) include the PDU session ID in the PDU session ID IE;

b) set the Payload container type IE to "N1 SM information";

c) set the Payload container IE to the 5GSM message which was not forwarded; and

d) set the 5GMM cause IE to the 5GMM cause #28 "Restricted service area".

In case j) in subclause 5.4.5.3.1 i.e. upon reception of UE parameters update data (see 3GPP TS 23.502 [9]) from the UDM to be forwarded to the UE, the AMF shall:

a) set the Payload container type IE to "UE parameters update transparent container"; and

b) set the contents of the Payload container IE to the UE parameters update data (see 3GPP TS 23.502 [9]) received from the UDM.

For case k) in subclause 5.4.5.3.1 upon reception from a location services application of a Location services message payload, the AMF shall:

a) set the Payload container type IE to "Location services message container"; and

b) set the Payload container IE to the Location services message payload.

For case k) in subclause 5.4.5.3.1 upon reception from an LMF of a Location services message payload, the AMF shall:

a) set the Payload container type IE to "Location services message container";

b) set the Payload container IE to the Location services message payload; and

c) set the Additional information IE to routing information associated with the LMF from which the Location services message payload was received.

NOTE 3: Case k) in subclause 5.4.5.3.1 supports transport of a Location services message container between a UE and an AMF and between a UE and an LMF. For transport between a UE and an LMF, the Additional information IE is included and provides routing information for the LMF. For transport between a UE and an AMF, the Additional information IE is not included.

In case l) in subclause 5.4.5.3.1, i.e. upon reception from an SMF of a user data container payload, the AMF shall:

a) include the PDU session ID in the PDU session ID IE;

b) set the Payload container type IE to "CIoT user data container"; and

c) set the Payload container IE to the user data container.

For case l1) in subclause 5.4.5.3.1, i.e. upon sending a single uplink CIoT user data container or control plane user data which was not forwarded due to routing failure , the AMF shall:

a) include the PDU session ID in the PDU session ID IE;

b) set the Payload container type IE to " CIoT user data container";

c) set the Payload container IE to the CIoT user data container or control plane user data which was not forwarded; and

d) set the 5GMM cause IE to the 5GMM cause #90 "payload was not forwarded".

NOTE 4: For case l1) in subclause 5.4.5.3.1, this is also applied for a single uplink CIoT user data container or control plane user data in the CONTRON PLANE SERVICE REQUEST message which was not forwarded due to routing failure.

For case l2) in subclause 5.4.5.3.1, i.e. upon sending a single uplink CIoT user data container which was not forwarded due to congestion control, the AMF shall:

a) include the PDU session ID in the PDU session ID IE;

b) set the Payload container type IE to " CIoT user data container";

c) set the Payload container IE to the CIoT user data container which was not forwarded;

d) set the 5GMM cause IE to the 5GMM cause #22 "Congestion" and include the Back-off timer value IE.

In case m) in subclause 5.4.5.3.1, the AMF shall:

a) set the Payload container type IE to "Multiple payloads";

b) set each payload container entry of the Payload container IE (see subclause 9.11.3.39) as follows:

i) set the payload container type field of the payload container entry to a payload container type value set in the Payload container type IE as specified for cases a) to l2) above;

ii) set the payload container entry contents field of the payload container entry to the payload container contents set in the Payload container IE as specified for cases a) to l2) above;

iii) set the optional IE fields, if any, to the optional associated information as specified for cases a) to l2) above.



Figure 5.4.5.3.2.1: Network-initiated NAS transport procedure

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.6.1.8 Abnormal cases on the network side

The following abnormal cases can be identified:

a) Lower layer failure.

 If a lower layer failure occurs before a SERVICE REJECT message has been sent to the UE or the service request procedure has been completed by the AMF, the AMF enters/stays in 5GMM-IDLE.

b) Protocol error.

 If the SERVICE REQUEST message or the CONTROL PLANE SERVICE REQUEST message is received with a protocol error, the AMF shall return a SERVICE REJECT message with one of the following 5GMM cause values:

#96 invalid mandatory information;

#99 information element non-existent or not implemented;

#100 conditional IE error; or

#111 protocol error, unspecified.

 The AMF stays in the current 5GMM mode.

c) More than one SERVICE REQUEST message or CONTROL PLANE SERVICE REQUEST message received before the procedure has been completed (i.e., before SERVICE REJECT message has been sent or service request procedure has been completed).

- If one or more of the information elements in the SERVICE REQUEST message or CONTROL PLANE SERVICE REQUEST message differs from the ones received within the previous SERVICE REQUEST message or CONTROL PLANE SERVICE REQUEST message, the previously initiated service request procedure shall be aborted and the new service request procedure shall be progressed;

- If the information elements do not differ, then the AMF shall continue with the previous service request procedure and shall not treat any further this SERVICE REQUEST message or this CONTROL PLANE SERVICE REQUEST message.

d) REGISTRATION REQUEST message received with "initial registration" or "emergency registration" in the 5GS registration type IE before a SERVICE REJECT message has been sent or the service request procedure has been completed.

 If a REGISTRATION REQUEST message with "initial registration" or "emergency registration" in the 5GS registration type IE is received and the service request procedure has not been completed or a SERVICE REJECT message has not been sent, the AMF may initiate the 5GMM common procedures, e.g. the primary authentication and key agreement procedure. The AMF may e.g. after a successful primary authentication and key agreement procedure execution, abort the service request procedure, delete the 5GMM context, indicate towards the SMF that the 5GMM context has been deleted and progress the new REGISTRATION REQUEST message.

e) REGISTRATION REQUEST message received with "mobility registration updating" or "periodic registration updating" in the 5GS registration type IE received before the service request procedure has been completed or a SERVICE REJECT message has been sent.

 If a REGISTRATION REQUEST message with "mobility registration updating" or "periodic registration updating" in the 5GS registration type IE is received and the service request procedure has not been completed or a SERVICE REJECT message has not been sent, the AMF may initiate the 5GMM common procedures, e.g. the primary authentication and key agreement procedure. The AMF may e.g. after a successful primary authentication and key agreement procedure execution, abort the service request procedure and progress the new REGISTRATION REQUEST message.

xx) CONTROL PLANE SERVICE REQUEST message received with the Data type field indicates "control plane user data" in the CIoT small data container IE or received with Payload container type IE set to "CIoT user data container" and:

1) the AMF does not have a PDU session routing context for the PDU session ID and the UE; or

2) the AMF unsuccessfully attempted to forward the user data conatiner and the PDU session ID,

 then the AMF may send back to the UE the CIoT user data container or control plane user data which was not forwarded as specified in subclause 5.4.5.3.1 case l1).

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