**3GPP TSG-CT WG4 Meeting #111-eC4-224199v1**

**E-Meeting, 18th – 26th August 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** | **0758** | **rev** |  | **Current version:** |  |  |
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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:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** | CT4 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | A UE may perform mobility registration when it moves to non allowed area, and may later turn into IDLE state. If in this case, the SMF receives session report (e.g. DDN) for non priority service, it triggers N1N2MessageTransfer procedure but will be rejected by the AMF with application cause "UE\_IN\_NON\_ALLOWED\_AREA", as specified in TS29.518 clause 5.2.2.3.1.2.However, on receiving the 4xx response with application cause "UE\_IN\_NON\_ALLOWED\_AREA", the SMF behaviour is quite not clear. In current deployment, the uncontrolled SMF may keep sending N1N2MessageTransfer request to the AMF when it receives DL traffic, which results in unnecessary massive signalling comsuption to the AMF.To avoid such issue, it is proposed to clarify the SMF behaviour in this case:- The SMF shall regard the UE is only reachable for regulatory prioritized service.- The SMF may supress the subsequent message (e.g. N1N2MessageTransfer) to the AMF that is not related to regulatory prioritized service for a configured time. |
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| ***Summary of change:*** | Clarify the SMF behaviour when it receives "UE\_IN\_NON\_ALLOWED\_AREA" application error:- the SMF may either supress subsequent messge (e.g. N1N2MessageTransfer) to the AMF for non regulatory prioritized service. - the SMF should subscribe the Reachability-Report event for "UE Reachability Status Change" from the AMF, so as to get notified by the AMF when the UE becomes reachable again. |
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| ***Consequences if not approved:*** | The SMF behavior on receiving application error cause "UE\_IN\_NON\_ALLOWED\_AREA" is not clear, which may results in unnecessary massive signalling to the AMF. |
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| ***Clauses affected:*** | 5.2.2.3.1.2 |
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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 does not introduce any change to the OpenAPI file. |
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| ***This CR's revision history:*** | Rev#1:- Update the description of SMF behavior to make it concise. Add the SMF behavior of subscribing the Reachability-Report from the AMF. |

\* \* \* Begin of Changes \* \* \* \*

###### 5.2.2.3.1.2 Detailed behaviour of the AMF

When an NF service consumer is requesting to send N1 and/or N2 information and the UE is in CM-IDLE state for the access type for which the N1 and/or N2 information is related (called "associated access type" hereafter in this clause), the requirements specified in clause 5.2.2.3.1.1 shall apply with the following modifications:

NOTE: N1 and/or N2 Session Management information is related to the access type of the targeted PDU session for a single access PDU session, or to the Target Access received in the request for a MA PDU session; LCS related N2 (NRPPa) information is related to 3GPP access in this release of specification.

4xx and 5xx response cases shall also apply to UEs in CM-CONNECTED state, when applicable.

**2xx Response Cases:**

**Case A: When UE is CM-IDLE in 3GPP access and the associated access type is 3GPP access:**

a) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF should respond with the status code "200 OK", if "skipInd" attribute is set to "true" in the request body, with a response body that carries the cause "N1\_MSG\_NOT\_TRANSFERRED".

b) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "202 Accepted", if the asynchronous type communication is invoked and hence the UE is not paged, update the UE context and store N1 and/or N2 information and initiate communication with the UE and/or 5G-AN when the UE becomes reachable. In this case the AMF shall provide the URI of the resource in the AMF in the "Location" header of the response, which contains information regarding the stored N1/N2 message. The AMF shall also provide a response body containing the cause, "WAITING\_FOR\_ASYNCHRONOUS\_TRANSFER" that represents the current status of the N1/N2 message transfer;

c) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "202 Accepted", if paging is issued when the UE is in CM-IDLE and reachable for 3GPP access, with a response body that carries a cause "ATTEMPTING\_TO\_REACH\_UE" as specified in clause 4.2.3.3 and 5.2.2.2.7 of 3GPP TS 23.502 [3].

**Case B: When UE is CM-IDLE in Non-3GPP access but CM-CONNECTED in 3GPP access and the associated access type is Non-3GPP access:**

a) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "200 OK" with cause "N1\_N2\_TRANSFER\_INITIATED" and initiate N1 NAS SM message transfer via 3GPP access, if the NF service consumer (i.e. SMF) requests to send only N1 NAS SM message without any associated N2 SM information, and the current access type related to the PDU session is Non-3GPP access and the UE is CM-CONNECTED in 3GPP access.

b) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "202 Accepted", if NAS Notification procedure is issued when the UE is in CM-CONNECTED in 3GPP access, with a response body that carries a cause "ATTEMPTING\_TO\_REACH\_UE" as specified in step 4c of clause 4.2.3.3 and 5.2.2.2.7 of 3GPP TS 23.502 [3].

**Case C: When UE is CM-IDLE in both Non-3GPP access and 3GPP access and the associated access type is Non-3GPP access:**

All the bullets specified in Case A are applicable.

The NF Service Consumer shall not send any further signalling for the UE if it receives a POST response body with a cause "ATTEMPTING\_TO\_REACH\_UE" unless it has higher priority signalling. In such a case the response shall include the "Location" header containing the URI of the resource created in the AMF, which holds the status of the N1/N2 message transfer, e.g. ".../n1-n2-messages/{n1N2MessageId}". The AMF shall:

- store the N1 and/or N2 information related to 3GPP access and, when the UE responds with a Service Request, shall initiate communication with the UE and/or 5G-AN using the stored N1 and/or N2 information;

- store the N1 NAS SM information related to Non-3GPP access if no N2 information was received and the AMF initiated paging towards the UE. Later when the UE responds with a Service Request,the AMF shall initiate communication with the UE using the stored N1 information via 3GPP access;

- inform the SMF which invoked the service operation, that the access type of the PDU Session can be changed from Non-3GPP access to 3GPP access as specified in clause 5.2.2.3.2.1 of 3GPP TS 29.502 [16], when the UE responds with a "List Of Allowed PDU Sessions" and the indicated non-3GPP PDU session of the N2 (and N1 if received) information is included in the list; or

- notify the NF which invoked the service operation, as specified in clause 5.2.2.3.2, if the Notification URI is provided, when the AMF determines that the paging or NAS Notification has failed or when the UE responds with a "List Of Allowed PDU Sessions" and the indicated Non-3GPP PDU session of the N2 (and N1 if received) information is not included in the list.

**4xx Response Cases:**

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with status code "409 Conflict" in the following cases:

- if the UE is in 3GPP access and there is already an ongoing paging procedure with higher or same priority, the AMF shall set the application error as "HIGHER\_PRIORITY\_REQUEST\_ONGOING" in the "cause" attribute of the ProblemDetails structure of the POST response body. The AMF may provide a retry timer value to the NF Service Consumer in order for the NF Service Consumer to retry the request after the expiry of the timer. When the retry timer is provided, the NF Service Consumer shall not initiate the downlink messaging until the timer expires. The AMF may also provide the ARP value of the QoS flow that has triggered the currently ongoing highest priority paging, so that the NF Service Consumer (e.g. SMF) knows that if any subsequent trigger initiating downlink messaging for a QoS flow with the same or lower priority happens.

- if there is an ongoing registration procedure (see clause 4.2.3.3 of 3GPP TS 23.502 [3]) the AMF shall set the application error as "TEMPORARY\_REJECT\_REGISTRATION\_ONGOING" in the "cause" attribute of the ProblemDetails structure in the POST response body;

- if this is a request to transfer a N2 PDU Session Resource Modify Request or a N2 PDU Session Resource Release Command to a 5G-AN and if the UE is in CM-IDLE state at the AMF for the Access Network Type associated to the PDU session (see clauses 4.3.3 and 4.3.4 of 3GPP TS 23.502 [3] and clause 5.3.2.1 of 3GPP TS 23.527 [33]), the AMF shall set the application error "UE\_IN\_CM\_IDLE\_STATE" in the "cause" attribute of the ProblemDetails structure in the POST response body.

- if there is an ongoing Xn or N2 handover procedure (see clause 4.9.1.2.1 and 4.9.1.3.1 of 3GPP TS 23.502 [3]) the AMF shall set the application error as "TEMPORARY\_REJECT\_HANDOVER\_ONGOING" in the "cause" attribute of the ProblemDetails structure in the POST response body, if the AMF rejects the request due to the on-going handover.

- if the RAT Type is NB-IoT, and the UE already has 2 PDU Sessions with active user plane resources, the AMF shall set the application error as "MAX\_ACTIVE\_SESSIONS\_EXCEEDED" in POST response body.

- if Paging Restrictions information restricts the N1N2MessageTransfer request from causing paging (see clause 4.2.3.3 of 3GPP TS 23.502 [3]) the AMF shall set the application error as "REJECTION\_DUE\_TO\_PAGING\_RESTRICTION" in the "cause" attribute of the ProblemDetails structure in the POST response body.

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "403 Forbidden", if the UE is in a Non-Allowed Area and the service request is not for regulatory prioritized service. The AMF shall set the application error as "UE\_IN\_NON\_ALLOWED\_AREA" in POST response body.

- The NF service consumer (i.e. the SMF) that receives this application may either supress subsequent messge (e.g. N1N2MessageTransfer) to the AMF for non regulatory prioritized service. In this case, the NF service consumer (i.e. the SMF) should subscribe the Reachability-Report event for "UE Reachability Status Change" from the AMF, so as to get notified by the AMF when the UE becomes reachable again.

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "403 Forbidden ", if the NF service consumer (e.g. an LMF) is requesting to send N1 LPP message to the UE and the UE has indicated that it does not support LPP in N1 mode during registration procedure (see clause 5.5.1.2.2 and 5.5.1.3.2 of 3GPP TS 24.501 [11]). The AMF shall set the application error to "UE\_WITHOUT\_N1\_LPP\_SUPPORT" in POST response body.

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "403 Forbidden", if the request body includes an nfId IE indicating an SMF instance which is different from the stored SMF instance hosting the SM Context of the PDU session. The AMF shall set the application error to "INVALID\_SM\_CONTEXT" in POST response body. During procedures with SM Context relocation, e.g. UE mobility procedures with I-SMF insertion/change/removal, the AMF shall allow N1N2MessageTransfer from both SMF instances holding the old and new SM Contexts.

 The NF service consumer (i.e. the SMF) that receives this application error shall remove the SM Context for the PDU session and release the PDU session resource in (H-)SMF if available. The SMF shall not send a SMContextStatusNotification to the AMF for the PDU session release.

**5xx Response Cases:**

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "504 Gateway Timeout", if the UE is currently unreachable (e.g., due to the UE in MICO mode, the UE using extended idle mode DRX or the UE is only registered over Non-3GPP access and its state is CM-IDLE). The AMF shall set the application error as "UE\_NOT\_REACHABLE" in POST response body. If Extended Buffering Support Indication is received in the request, the AMF shall include the Estimated Maximum Waiting time in the response body when the message is rejected due to the UE in MICO mode or the UE using extended idle mode DRX.

\* \* \* End of Changes \* \* \* \*