**3GPP TSG-CT WG1 Meeting #137-eC1-22xxxx**

**E-Meeting, 18th – 26th August 2022 *(was C1-224815)***

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **24.501** | **CR** | **4538** | **rev** | **1** | **Current version:** | **17.7.1** |  |
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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 |  |

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| ***Title:***  | The RAN paging handling for MUSIM UE in 5GS |
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| ***Source to WG:*** | vivo, Qualcomm, Huawei, HiSilicon |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | MUSIM |  | ***Date:*** | 2022-08-05 |
|  |  |  |  |  |
| ***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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | RAN2 has discussed whether MUSIM UE in RRC\_INACTIVE may not be able to send NAS busy indication as MUSIM UE in RRC\_IDLE, and sends the LS (R2-2206837) to inform CT1 of the following the RAN2's agreements in TS 38.331:*NOTE: A MUSIM UE may not initiate the RRC connection resumption procedure, e.g. when it decides not to respond to the Paging message due to UE implementation constraints as specified in TS 24.501 [23].*However the current CT1 specification specifies that the UE shall initiate the service request to respond the RAN paging. The CT1 specification and the RAN2 specification is not consistent. The above implementation option shall be specified in the CT1 specification to keep the consistance. |
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| ***Summary of change:*** | The MUSIM UE in 5GMM-CONNECTED mode with RRC inactive indication is allowed to not initiate the service request for responding to paging as the MUSIM UE in 5GMM-IDLE mode.Backwards compatibility analysis:The change has no impact on the signalling interface, so there is no backwards compatible issue on the change of this CR. |
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| ***Consequences if not approved:*** | Misalignment with RAN2 R17 specification. The MUSIM UE would have to respond to each RAN paging even those the UE decides to reject, which would cause negative impact on user experience. |
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| ***Clauses affected:*** | 5.3.1.4 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* First Change \* \* \* \*

#### 5.3.1.4 5GMM-CONNECTED mode with RRC inactive indication

This subclause is only applicable for UE's 5GMM mode over 3GPP access. The 5GMM-CONNECTED mode with RRC inactive indication is not supported when the UE is in NB-N1 mode.

The UE is in 5GMM-CONNECTED mode with RRC inactive indication when the UE is in:

a) 5GMM-CONNECTED mode over 3GPP access at the NAS layer; and

b) RRC\_INACTIVE state at the AS layer (see 3GPP TS 38.300 [27]).

Unless stated otherwise, the UE behaviour in 5GMM-CONNECTED mode with RRC inactive indication follows the UE behaviour in 5GMM-CONNECTED over 3GPP access, except that:

a) the UE shall apply the mobility restrictions; and

b) the UE shall perform the PLMN selection procedures

as in 5GMM-IDLE mode over 3GPP access.

The UE shall transition from 5GMM-CONNECTED mode over 3GPP access to 5GMM-CONNECTED mode with RRC inactive indication upon receiving an indication from the lower layers that the RRC connection has been suspended.

NOTE 1: Any pending procedure or uplink data packet when receiving an indication from the lower layers that the RRC connection has been suspended, triggers a request to the lower layers to transition to RRC\_CONNECTED state. This is also the case when the pending procedure or uplink data packet triggered a previous request to the lower layers to transition to RRC\_CONNECTED state.

Upon:

a) a trigger of a procedure which requires sending of a NAS message different from a REGISTRATION REQUEST message with the NG-RAN-RCU bit of the 5GS update type IE set to "UE radio capability update needed";

b) an uplink user data packet to be sent for a PDU session with suspended user-plane resources;

c) a trigger to request resources for 5G ProSe direct discovery over PC5 or 5G ProSe direct communication over PC5; or

d) a trigger to request resources for V2X communication over PC5 (see 3GPP TS 23.287 [6C]);

the UE in 5GMM-CONNECTED mode with RRC inactive indication over 3GPP access shall request the lower layers to transition to RRC\_CONNECTED state (see 3GPP TS 38.300 [27]).

NOTE 2: If the UE supports Small Data Transmission (SDT) (see 3GPP TS 38.300 [27]), the following applies:

a) if the UE due to pending uplink NAS messages or user data packets is requesting the lower layers to transition to RRC\_CONNECTED state, but has not received a response from the lower layers, the UE can send the pending NAS messages or user data packets to the lower layers, and can receive multiple downlink NAS messages or multiple downlink user data packets from the lower layers while the UE remains in 5GMM-CONNECTED mode with RRC inactive indication over 3GPP access (i.e., without transitioning to 5GMM-CONNECTED mode). When the NAS layer triggers the transmission of pending uplink NAS messages or user data packets, and if the SDT is ongoing, the NAS layer will receive the response from the lower layers only after the SDT session has completed or failed;

b) the NAS layer is not aware of the classification of NAS messages or the user data packets as belonging to the SDT session at the lower layers; and

c) the setting of access category and the RRC establishment cause indicated to the lower layers when sending the pending uplink user data packets while the UE remains in 5GMM-CONNECTED mode with RRC inactive indication, is left to implementation.

Upon a trigger to send a REGISTRATION REQUEST message with the NG-RAN-RCU bit of the 5GS update type IE set to "UE radio capability update needed", the UE in 5GMM-CONNECTED mode with RRC inactive indication shall move to 5GMM-IDLE mode over 3GPP access and proceed with the registration procedure for mobility and periodic registration as specified in subclause 5.5.1.3.2.

The UE shall transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-CONNECTED mode over 3GPP access upon receiving an indication from the lower layers that the UE has transitioned to RRC\_CONNECTED state (see 3GPP TS 38.300 [27]).

NOTE 3: The AMF can be aware of the transition between 5GMM-CONNECTED mode and 5GMM-CONNECTED mode with RRC inactive indication for a UE (see 3GPP TS 23.502 [9]).

The UE shall trigger a transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-IDLE mode upon selection of a PLMN that is not an equivalent PLMN to the registered PLMN. The UE shall not trigger a transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-IDLE mode upon entering a new PLMN which is in the list of equivalent PLMNs.

The UE shall trigger a transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-IDLE mode upon receiving REFRESH command from the UICC as specified in subclause 5.4.5.3.3.

If the UE in 5GMM-CONNECTED mode with RRC inactive indication receives an indication from the lower layers that the RRC connection has been suspended, the UE shall stay in 5GMM-CONNECTED mode with RRC inactive indication. The UE shall re-initiate any pending procedure that had triggered the request to the lower layers to transition to RRC\_CONNECTED state, if still needed.

When the UE in 5GMM-CONNECTED mode with RRC inactive indication receives a fallback indication from lower layers, and the UE has no pending NAS procedure and no pending uplink user data for PDU session(s) with user-plane resources already established, the UE shall:

a) enter 5GMM-IDLE mode; and

b) initiate the registration procedure for mobility and periodic registration update as specified for case o) in subclause 5.5.1.3.2.

If the UE requests the lower layers to transition to RRC\_CONNECTED state at initiation of a registration procedure, a service request procedure or a de-registration procedure, upon fallback indication from lower layers, the UE shall:

- enter 5GMM-IDLE mode;

- proceed with the pending procedure; and

- if the pending procedure is a service request or registration request procedure and the SERVICE REQUEST message, the CONTROL PLANE SERVICE REQUEST message or the REGISTRATION REQUEST message does not include UE request type IE with Request type value set to "NAS signalling connection release", the UE shall include the Uplink data status IE in the SERVICE REQUEST message, the CONTROL PLANE SERVICE REQUEST message or in the REGISTRATION REQUEST message, indicating the PDU session(s) without active user-plane resources for which the UE has pending user data to be sent, if any, and the PDU session(s) for which user-plane resources were active prior to receiving the fallback indication, if any (see subclauses 5.5.1.3 and 5.6.1 for further details).

If the UE requests the lower layers to transition to RRC\_CONNECTED state for other reason than initiation of a registration procedure, or for other reason than a service request procedure, or for other reason than a de-registration procedure, upon fallback indication from lower layers, the UE shall:

1) enter 5GMM-IDLE mode;

2) initiate the service request procedure and include the Uplink data status IE in the SERVICE REQUEST message or the CONTROL PLANE SERVICE REQUEST message indicating the PDU session(s) for which user-plane resources were active prior to receiving the fallback indication, if any (see subclause 5.6.1 for further details). If the procedure that triggered the request to the lower layers to transition to RRC\_CONNECTED state is the UE-initiated NAS transport procedure and the UE had SMS, location services message, or CIoT user data to send, the UE shall also include the SMS, location services message, or CIoT user data in the CONTROL PLANE SERVICE REQUEST message as described in subclause 5.6.1.2.2; and

3) upon successful service request procedure completion, proceed with any pending procedure.

If the UE in 5GMM-CONNECTED mode with RRC inactive indication receives a fallback indication from lower layers, and the UE has pending uplink user data for PDU session(s) with user-plane resources already established but no pending NAS procedure, the UE shall:

1) enter 5GMM-IDLE mode; and

2) initiate the service request procedure and include the Uplink data status IE in the SERVICE REQUEST message or the CONTROL PLANE SERVICE REQUEST message indicating the PDU session(s) for which user-plane resources were active prior to receiving the fallback indication (see subclause 5.6.1 for further details).

In the above cases when the UE receives a fallback indication from lower layers, if the UE is in non-allowed area or not in allowed area, the UE shall behave as specified in subclause 5.3.5.

If the UE in 5GMM-CONNECTED mode with RRC inactive indication receives an indication from the lower layers that the resumption of the RRC connection has failed, and:

a) if the lower layers indicate that access barring is applicable for all access categories except categories 0 and 2, or access barring is applicable for all access categories except category 0, the UE shall:

1) stay in 5GMM-CONNECTED mode with RRC inactive indication;

b) else, the UE shall:

1) enter 5GMM-IDLE mode; and

2) initiate the registration procedure for mobility and periodic registration update used for mobility (i.e. the 5GS registration type IE set to "mobility registration updating" in the REGISTRATION REQUEST message) for N1 NAS signalling connection recovery as specified for case f) in subclause 5.5.1.3.2.

NOTE 4: An indication from the lower layer that the RRC connection has been released with cause "RRC resume failure" can be considered as an indication that the resumption of the RRC connection has failed.

The UE shall transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-IDLE mode over 3GPP access upon receiving from the lower layers:

a) indication of transition from RRC\_INACTIVE state to RRC\_IDLE state; or

b) indication of cell selection to E-UTRAN or another RAT that the UE supports.

If the UE in 5GMM-CONNECTED mode with RRC inactive indication receives an indication from the lower layers about the cell (re-)selection to different RAT that the UE supports, the UE shall initiate the registration procedure for mobility or periodic registration update used for mobility (i.e. the 5GS registration type IE set to "mobility registration updating" in the REGISTRATION REQUEST message) as specified in subclause 5.5.1.3.2.

If the UE in 5GMM-CONNECTED mode with RRC inactive indication receives an indication from the lower layers of a transition from RRC\_INACTIVE state to RRC\_IDLE state and 5GMM-REGISTERED.LIMITED-SERVICE is entered, the UE shall subsequently upon entering state 5GMM-REGISTERED.NORMAL-SERVICE and if there is no uplink user data or signalling pending, initiate the registration procedure for mobility and periodic registration update used for mobility (i.e. the 5GS registration type IE set to "mobility registration updating" in the REGISTRATION REQUEST message) for N1 NAS signalling connection recovery as specified in subclause 5.5.1.3.2.

If the UE in 5GMM-CONNECTED mode with RRC inactive indication receives an indication from the lower layers about RAN paging and the MUSIM UE decides not to initiate the service request procedure with service type set to “mobile terminated services” to respond to the RAN paging, the UE may initiate the service request procedure and set request type to "NAS signalling connection release" in the UE request type IE and service type to "signalling" in the SERVICE REQUEST message to reject the RAN paging as specified in subclause 5.6.1.2 for case o of subclause 5.6.1.1. The UE may include its paging restriction preferences in the Paging restriction IE in the SERVICE REQUEST message as specified in subclause 5.6.1.2 for case o of subclause 5.6.1.1.

NOTE 5: The interworking between the NAS layer and the AS layer triggered by RAN paging is up to UE implementation.

NOTE 6: As an implementation option, the MUSIM UE is allowed to not respond to RAN paging based on the information available in the paging message, e.g. voice service indication.

Upon receiving AMF paging indication from the lower layers, the UE shall transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-IDLE mode over 3GPP access and handle the AMF paging same as the paging request received in the 5GMM-IDLE mode over 3GPP access as specified in subclause 5.6.1.

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