3GPP TSG-RAN WG3 #119 R3-23xxxx

27th Feb – 3rd Mar 2023

Athens, Greece

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.401** | **CR** | **0273** | **rev** | **2** | **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 | **x** | Core Network |  |

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| ***Title:*** | Clarification on SDT to 38.401 | | | | | | | | | |
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| ***Source to WG:*** | ZTE, Huawei, China Telecommunication, Ericsson, CATT | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_SmallData\_INACTIVE-Core | | | | |  | ***Date:*** | | | 2023-02-14 |
|  |  | | | |  | |  | | |  |
| ***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 can be 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:*** | | When a UE’s mode is changed from RRC\_inactive to others (e.g., RRC connected or RRC\_idle), the UE shall send RRCResumeRequest message via either RACH resource or CG resource to network, then, the network shall, retrieve UE context via I-RNTI if needed, and verify it via MAC-I, by means of RRCResumeRequest message. If successfully, the network will send RRCResume message to UE, and it will, for split gNB, set up F1 connection and modify E1 bearer. Otherwise, i.e., either not retrieve or not verify the UE context data, the network will reject the RRC Resume procedure.  For RACH based RRC Resume procedure, it has been captured in **TS38.300** *(section 9.2.2.4.1 UE triggered transition from RRC\_INACTIVE to RRC\_CONNECTED)* and **TS38.401** *(section 8.6.2 RRC inactive to other states)*.  However, for RA-SDT and CG-SDT, it is not specified whether the gNB-CU-CP shall verify UE context after receiving RRCResume message. | | | | | | | | |
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| ***Summary of change:*** | | When UE uses RA-SDT or CG-SDT resource to send RRCResumeRequest message, the gNB-CU-CP’s behavior shall be specified, i.e., it shall retrieve UE context via I-RNTI and verify it via MAC-I by means of RRCResumeRequest message. If successfully, the gNB-CU-CP is allowed to resume SDT bearer.  Impact assessment towards the previous version of the specification (same release):  This CR has isolated impact with the previous version of the specification (same release) because it only influences SDT procedure..  The impact can be considered isolated because the change only influences SDT procedure. | | | | | | | | |
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| ***Consequences if not approved:*** | | When UE uses RA-SDT or CG-SDT resource to send RRCResumeRequest message, the gNB-CU-CP’s behaviour is not specified. | | | | | | | | |
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| ***Clauses affected:*** | | 8.18 | | | | | | | | |
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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:*** | | Rev0: R3-230113  Rev1: R3-230826 | | | | | | | | |

## 8.18 Overall procedure for Small Data Transmission during RRC Inactive

### 8.18.1 RACH based SDT

The procedure for RACH based small data transmission in RRC Inactive is shown in Figure 8.18.1-1.



Figure 8.18.1-1: RACH based Small Data Transmission in RRC Inactive state.

1. The UE in RRC Inactive sends the *RRCResumeRequest* message together with UL SDT data and/or UL SDT signalling.

2. The gNB-DU buffers the UL SDT data and/or UL SDT signalling.

3. The step 3 is as defined in step 4 in clause 8.6.2, including an indication of SDT access. The gNB-DU may also provide SDT assistance information.

4-5. If UE context is successfully retrieved and verified, the steps 4-5 are as defined in steps 6-7 in clause 8.9.6.2. The UL SDT data, if any, is forwarded to the gNB-CU-UP, and the UL signalling, if any, is forwarded to the gNB-CU-CP via the UL RRC MESSAGE TRANSFER message, in which any UL NAS PDU is delivered to AMF.

NOTE 1: In case that full UE context is retrieved from another gNB-CU-CP as specified in TS 38.300 [2], the gNB-CU-CP first establishes the UE context in the gNB-CU-UP via the Bearer Context Setup procedure and F1-U UL TEIDs are retrieved before step 4. The BEARER CONTEXT SETUP REQUSET message may include an indication to suspend non-SDT bearers, and in this case, the BEARER CONTEXT MODIFICATION REQUEST message in step 6 does not include resume indication for SDT DRBs.

NOTE 2: In case that only partial UE context for SDT including F1-U UL TEIDs is retrieved from another gNB-CU-CP as specified in TS 38.300 [2], the gNB-CU-CP uses those F1-U UL TEIDs for steps 4-5, and the subsequent steps 6-7 are not executed. The F1-U DL TEIDs received from the gNB-DU in step 5 should be forwarded to the other gNB-CU-CP, to be used for transferring of the DL SDT data. In addition, the UL SDT data, if any, is forwarded from the gNB-DU to the gNB-CU-UP of the other gNB-CU-CP for which the partial context is retrieved, and the UL signalling, if any, is forwarded from the gNB-CU-CP to the other gNB-CU-CP (the last serving gNB-CU-CP) via the XnAP RRC TRANSFER message.

NOTE 3: The other gNB-CU-UP may need to buffer the UL SDT data if received before the SDT bearer(s) are resumed.

6. The gNB-CU-CP sends the BEARER CONTEXT MODIFICATION REQUEST message including an resume indication for SDT DRBs. The gNB-CU-CP also includes the F1-U DL TEIDs received from the gNB-DU in step 5.

7. The gNB-CU-UP responds with the BEARER CONTEXT MODIFICATION RESPONSE message.

NOTE 4: When the SDT transmission is completed, the gNB-CU shall transmit the UE CONTEXT RELEASE COMMAND message to the gNB-DU. If CG-SDT is (re-)configured, the gNB-CU may request the gNB-DU to keep CG-SDT configuration and resources in the UE CONTEXT RELEASE COMMAND message.

### 8.18.2 CG based SDT

The procedure for CG based small data transmission in RRC Inactive is shown in Figure 8.18.2-1.



Figure 8.18.2-1: CG based Small Data Transmission in RRC Inactive state.

1. The gNB-CU decides to move UE into RRC\_INACTIVE state.

2. The gNB-CU-CP decides to configure CG-SDT, it sends UE CONTEXT MODIFICATION REQUEST message including a query indication for CG-SDT related resource configuration associated with the information of SDT Radio Bearer(s).

3. The gNB-DU sends the UE CONTEXT MODIFICATION RESPONSE message including the CG-SDT related resource configurations for the requested SDT Radio Bearer(s) within the *DU to CU RRC Information* IE.

4. The gNB-CU-CP sends the BEARER CONTEXT MODIFICATION REQUEST towards the gNB-CU-UP, with the suspend indication.

5. The gNB-CU-UP sends the BEARER CONTEXT MODIFICATION RESPONSE towards the gNB-CU-CP.

6. The gNB-CU-CP sends the UE CONTEXT RELEASE COMMAND message to the gNB-DU including an *RRCRelease* message to the UE with the CG-SDT information within suspend configuration. The gNB-CU notifies the gNB-DU to keep the SDT RLC config, F1-U tunnels, F1AP UE association, and store the CG resource for SDT when the UE is entering RRC\_INACTIVE state with an explicit CG-SDT kept indicator.

7. The gNB-DU sends the *RRCRelease* message to UE.

8. The gNB-DU sends UE CONTEXT RELEASE COMPLETE message. The gNB-DU keeps the SDT RLC config, F1-U tunnels, F1AP UE association, and stores the CG resource for SDT when the UE entering RRC\_INACTIVE. The gNB-DU also stores the C-RNTI, CS-RNTI, and which bearers are CG-SDT bearers.

After a period of time of the UE being in RRC\_INACTIVE state.

9. The UE decides to perform CG based SDT procedure, it sends the *RRCResumeRequest* message together with UL SDT data/UL NAS PDU.

10. The gNB-DU sends the UL RRC MESSAGE TRANSFER message including the *RRCResumeRequest* message to indicate the access due to CG-SDT.

11/12. If UE context is successfully retrieved and verified, the gNB-CU-CP initiates the BEARER CONTEXT MODIFICATION procedure to resume SDT DRBs.

13 – 13a. The gNB-DU sends the UL SDT data, if any, to the gNB-CU-UP, and/or sends the UL signalling, if any, to the gNB-CU-CP via the UL RRC MESSAGE TRANSFER message, in which any UL NAS PDU is delivered to AMF.

NOTE 1: When the SDT transmission is completed, the gNB-CU shall transmit the UE CONTEXT RELEASE COMMAND message to the gNB-DU. If CG-SDT is re-configured, the gNB-CU may request the gNB-DU to keep CG-SDT configuration and resources in the UE CONTEXT RELEASE COMMAND message.

### 8.18.3 RA-SDT or non-SDT with CG-SDT configuration

The procedure for the case where the UE has CG-SDT resource configurations but decides to perform RACH based small data transmission in RRC Inactive or to perform RACH procedure to transit to RRC Connected (see TS 38.321 [30] clause 5.27) is shown in Figure 8.18.3-1.



Figure 8.18.3-1: RA-SDT or non-SDT with CG-SDT configuration.

1. The UE in RRC Inactive sends *RRCResumeRequest* message. If the UE decides to perform RACH based SDT procedure, it also sends UL SDT data and/or UL SDT signalling.

2. The gNB-DU buffers the UL SDT data and/or UL SDT signalling.

3. The gNB-DU sends the INITIAL UL RRC MESSAGE TRANSFER message to the gNB-CU-CP, including a new gNB-DU UE F1AP ID, and in case of RACH based SDT access, the gNB-DU provides an indication of SDT access and may also the SDT assistance information.

4. If UE context is successfully retrieved and verified, the gNB-CU-CP sends the UE CONTEXT SETUP REQUEST message with the stored F1 UL TEIDs and the new gNB-DU UE F1AP ID received in step 3.

In case that the gNB-DU is the one that sent the *RRCRelease* message with CG-SDT resource configurations to the UE, the gNB-CU-CP also includes the old gNB-DU UE F1AP ID and the old gNB-CU F1AP UE ID within the *Old CG-SDT Session Info* IE of the UE CONTEXT SETUP REQUEST message.

In case that the gNB-CU-CP is the one that generated the *RRCRelease* message with CG-SDT resource configurations but the gNB-DU is not the old gNB-DU that sent the *RRCRelease* message to the UE, the gNB-CU-CP initiates the UE Context Release procedure by sending the UE CONTEXT RELEASE COMMAND message to the old gNB-DU.

In case that the UE accesses a gNB other than the last serving gNB, upon receiving the RETRIEVE UE CONTEXT REQUEST message from the receiving gNB-CU-CP, the last serving gNB-CU-CP initiates the UE Context Release procedure by sending the UE CONTEXT RELEASE COMMAND message to the last serving gNB-DU.

5. The gNB-DU sends the UE CONTEXT SETUP RESPONSE message with the new gNB-DU UE F1AP ID. In case the old gNB-DU UE F1AP ID is received within the *Old CG-SDT Session Info* IE in step 4, the gNB-DU retrieves the stored CG-SDT resource configurations and UE context based on the *Old CG-SDT Session Info* IE, if any, and associates them with the new gNB-DU F1AP UE ID.