**3GPP TSG-RAN WG3 Meeting #121 *R3-23xxxx***

**Toulouse, France, 21 – 25 Aug, 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.401** | **CR** | **0302** | **rev** | **1** | **Current version:** | **17.5.0** |  |
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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:***  | Support of oversize UL SDT Data Arrival [Large SDT Uplink Data] |
|  |  |
| ***Source to WG:*** | Huawei, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated, ZTE |
| ***Source to TSG:*** | R3 |
|  |  |
| ***Work item code:*** | TEI18 |  | ***Date:*** | 2023-08-23 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-18 |
|  | *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:*** | At RAN3#120 the scenario of large data volume during MO-SDT transaction presented in tdoc R3-232721 was acknowledged and also the need to investigate and select a solution to help gNB-CU CP determining when sending the UE to RRC\_connected in this scenario. This CR implements the solution 3 of tdoc R3-232721 in order to align with equivalent work being decided for the downlink data arrival at the CU UP (see MT-SDT ongoing work) “the gNB-CU CP sends to the gNB-DU at context setup a value of buffer threshold above which it requests the gNB-DU to inform when it is overcome”. |
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| ***Summary of change:*** | Introduce the stage2 description about the mentioned solution 3, i.e. add NOTE to describe the handling of gNB-DU and gNB-CU in case of oversize UL data arrival during SDT procedure.  |
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| ***Consequences if not approved:*** | During SDT transaction the UE continues in RRC inactive even if large uplink packets are sent in uplink resulting in poor radio efficiency for the data transfer. |
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| ***Clauses affected:*** | 8.18.1, 8.18.2 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.473 CR 1213TS 38.300 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:*** |  |

***-------Start of the change--------***

## 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 as specified in TS 38.300 [2], 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: Upon receiving the UE INACTIVITY NOTIFICATION message without SDT volume threshold crossed indication from the gNB-DU and deciding to terminate the SDT, the gNB-CU, if serving the UE, 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.

Upon receiving the BSR from UE, in case the UL data size indicated by the BSR is larger than the threshold provided from the gNB-CU-CP, the gNB-DU sends UE INACTIVITY NOTIFICATION message with the SDT volume threshold crossed indication to the gNB-CU-CP. Upon receiving such indication, the gNB-CU-CP may terminate the ongoing SDT procedure, by sending the *RRCResume* message to move the UE to RRC\_CONNECTED, or by sending *RRCRelease* message to move the UE to RRC\_INACTIVE.

### 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 as specified in TS 38.300 [2], 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: Upon receiving the UE INACTIVITY NOTIFICATION message without SDT volume threshold crossed indication from the gNB-DU and deciding to terminate the SDT, 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.

Upon receiving the BSR from UE, in case the UL data size indicated by the BSR is larger than the threshold provided from the gNB-CU-CP, the gNB-DU sends UE INACTIVITY NOTIFICATION message with the SDT volume threshold crossed indication to the gNB-CU-CP. Upon receiving such indication, the gNB-CU-CP may terminate the ongoing SDT procedure, by sending the *RRCResume* message to move the UE to RRC\_CONNECTED, or by sending *RRCRelease* message to move the UE to RRC\_INACTIVE.

### 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 as specified in TS 38.300 [2], the gNB-CU-CP sends the UE CONTEXT SETUP REQUEST message with the stored (or retrieved from the last serving gNB) 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.

***-------End of the change--------***