**3GPP TSG-RAN WG3 Meeting #123R3-240469**

**Athens, GR, 26 Feb – 01 Mar, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.401** | **CR** | 0349 | **rev** | **1** | **Current version:** | **18.0.0** |  |
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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:*** | Stage 2 update for LTM | | | | | | | | | |
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| ***Source to WG:*** | Huawei | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_enh2-Core | | | | |  | ***Date:*** | | | 2024-02-10 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***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 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:*** | | The LTM feature is introduced in Rel-18. However, the following issues and ambiguities still exist in stage 2.   * In the figure of intra-DU LTM, the message name after step 12 is not aligned to the one used in inter-DU LTM. * Request PRACH resources for early RACH is optional, however, the existing text in step 3 seems mandatory. * The CSI report Configuration of candidate cells do not need to transfer to the source DU and the other candidate DUs. * In step 5 and step 7 in inter-DU LTM, the description updated CSI resource configuration is missing. Similar issue in intra-DU LTM. * In NOTE2 in intra-DU LTM, the TCI state information, RACH configuration, and the LTM configuration IDs of the candidate cells are not needed to send to the gNB-DU anymore. * In step 7 in inter-DU LTM , there is no need to send the lower layer part of the reference configuration to the candidate gNB-DU(s), as it has been provided in step 3. * Some typos and errors exit in the figure and text in LTM with gNB-CU-UP change section. | | | | | | | | |
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| ***Summary of change:*** | | For section 8.2.1.4 Intra-gNB-DU LTM:   * In the figure, after step 12, change “Inter-cell Mobility Execution Decision” to “LTM Cell Switch Decision” to align to the inter-gNB-DU LTM. * In step 3, add “may” in sentence “The gNB-CU requests PRACH resources from the gNB-DU”, and add “The gNB-CU may xxx, or provide the lower layer reference configuration to the candidate gNB-DU” in the end of next sentence. * In step 5, remove “and the gNB-CU may send the CSI report configuration for all the accepted target candidate cells”, and add a new sentence “The gNB-CU may send the updated CSI resource configuration to the source gNB-DU.” * In step 6, add “updated” in between “the” and “CSI report configuration” * In NOTE 2, remove “candidate”, change “the CSI resource configuration” to “the updated CSI resource configuration”, remove “TCI state information, RACH configuration, and the LTM configuration IDs of the candidate cells.” * In step 15, add ”in the target cell” * In step 16, remove “target”   For section 8.2.1.5 Inter-gNB-DU LTM:   * In step 3, add sentence “The gNB-CU may xxx, or provide the lower layer reference configuration to the candidate gNB-DU.” * In step 5, remove “collected CSI report configuration”, and add “the LTM configuration IDs” and sentence “The gNB-CU may send the update CSI resource configuration to the source gNB-DU.” * In step 6, update “containing the CSI report configuration” to “containing the updated CSI report configuration of the source cell” * In step 7, remove “CSI report configuration”, and “The gNB-CU may also provide the lower layer part of the reference configuration to the candidate gNB-DU(s)” * Remove NOTE 2. * In step 8, remove “The candidate gNB-DU may also respond”, and add “(e.g., …)” * In step 13, add “to the target candidate cells”   For 8.2.1.6 LTM with gNB-CU-UP change:   * In the Figure, update step 8 to terminate the message in target gNB-DU * In step 9-10, add “to the source gNB-CU-UP” * In step 19-20, correct typo “gNB-DU” to “gNB-CU-UP” | | | | | | | | |
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| ***Consequences if not approved:*** | | Errors and ambiguities exit in state 2 text for LTM. | | | | | | | | |
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| ***Clauses affected:*** | | 8.2.1.4, 8.2.1.5, 8.2.1.6 | | | | | | | | |
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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:*** | |  | | | | | | | | |

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Start of changes\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

#### 8.2.1.4 Intra-gNB-DU LTM

This procedure is used for the case when the UE moves within the same gNB-DU during NR operation for LTM. Figure 8.2.1.4-1 shows the intra-gNB-DU LTM procedure for intra-NR.



Figure 8.2.1.4-1: Intra-gNB-DU LTM

1. The UE sends a *MeasurementReport* message (L3 measurement result) to the gNB-DU containing measurements of neighbouring cells. The gNB-DU sends an UL RRC MESSAGE TRANSFER message conveying the received *MeasurementReport* message to the gNB-CU.

2. The gNB-CU determines to initiate LTM configuration.

3. The gNB-CU sends a UE CONTEXT MODIFICATION REQUEST message to the gNB-DU for each candidate cell, containing one target candidate cell ID, the LTM configuration ID of the candidate cell, and LTM configuration ID mapping list, the CSI resource configuration. The gNB-CU may request PRACH resources from the gNB-DU. The gNB-CU may request the gNB-DU to provide the lower layer configuration for the purpose of generating the reference configuration or provide the lower layer reference configuration to the candidate gNB-DU.

4. If the gNB-DU accepts the request of LTM configuration, it responds with a UE CONTEXT MODIFICATION RESPONSE message including the generated lower layer RRC configurations (e.g., TCI state configuration, RACH configuration, and the CSI report configuration) for the accepted target candidate cell.

NOTE 1: Steps 3 and 4 may be initiated multiple times for LTM candidate cell preparation of multiple cells including the source cell.

5. The gNB-CU sends a UE CONTEXT MODIFICATION REQUEST message to the gNB-DU. The message may include the updated CSI resource configuration.

6. The gNB-DU responds with a UE CONTEXT MODIFICATION RESPONSE message which includes an updated lower layer configuration, e.g., containing the updated CSI report configuration of the source cell.

NOTE 2: In case of subsequent LTM, the CU-initiated UE Context Modification procedure may be invoked per each candidate cell to transfer to the gNB-DU the updated CSI resource configuration.

7. The gNB-CU sends a DL RRC MESSAGE TRANSFER message to the gNB-DU, which includes the generated *RRCReconfiguration* message with the LTM configuration.

8. The gNB-DU forwards the received *RRCReconfiguration* message to the UE.

9. The UE responds to the gNB-DU with an *RRCReconfigurationComplete* message.

10. The gNB-DU forwards the *RRCReconfigurationComplete* message to the gNB-CU via an UL RRC MESSAGE TRANSFER message.

11. Early synchronization to the target candidate cell(s) may be performed as specified in TS 38.300 [2].

12. The UE sends the L1 measurement result to the gNB-DU. The gNB-DU decides to execute LTM.

13. The gNB-DU sends the Cell Switch Command to the UE.

14. The gNB-DU sends the DU-CU CELL SWITCH NOTIFICATION message to the gNB-CU to indicate the initiation of the Cell Switch command to the UE including the target cell ID and the TCI state ID.

15. The gNB-DU detects the UE access in the target cell as specified in TS 38.300 [2].

16. The gNB-DU sends the ACCESS SUCCESS message to the gNB-CU with the target cell ID.

17. The UE sends an *RRCReconfigurationComplete* message to the gNB-DU.

18. The gNB-DU forwards the *RRCReconfigurationComplete* message to the gNB-CU via an UL RRC MESSAGE TRANSFER message.

19. The gNB-CU may send the UE CONTEXT MODIFICATION REQUEST message to the gNB-DU to release the resources of prepared cells.

20. The gNB-DU responds with a UE CONTEXT MODIFICATION RESPONSE message.

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

#### 8.2.1.5 Inter-gNB-DU LTM

This procedure is used for the case when the UE moves from one gNB-DU to another gNB-DU within the same gNB-CU during NR operation for LTM. Figure 8.2.1.5-1 shows the inter-gNB-DU LTM procedure for intra-NR.



Figure 8.2.1.5-1: Inter-gNB-DU LTM

1. The UE sends a *MeasurementReport* message (L3 measurement result) to the source gNB-DU containing measurements of neighbouring cells. The source gNB-DU sends an UL RRC MESSAGE TRANSFER message conveying the received *MeasurementReport* message to the gNB-CU.

2. The gNB-CU determines to initiate LTM configuration.

3. The gNB-CU sends a UE CONTEXT SETUP REQUEST message to the candidate gNB-DU(s) for each candidate cell, containing one target candidate cell ID, the LTM configuration ID of the candidate cell, LTM configuration ID mapping list, and the CSI resource configuration. The gNB-CU may indicate the source gNB-DU ID List, and requests PRACH resources from the candidate gNB-DU. The gNB-CU may request the candidate gNB-DU to provide the lower layer configuration for the purpose of generating the reference configuration or provide the lower layer reference configuration to the candidate gNB-DU.

4. If the candidate gNB-DU accepts the request of LTM configuration, it responds with a UE CONTEXT SETUP RESPONSE message including the generated lower layer RRC configurations (e.g., TCI state configuration, RACH configuration, and the CSI report configuration) for the accepted target candidate cell.

NOTE 1: The CU-initiated UE Context Modification procedure may be initiated for preparing candidate cells in the source gNB-DU as specified in step 3 and 4 in 8.2.1.4 Intra-gNB-DU LTM.

5. The gNB-CU sends a UE CONTEXT MODIFICATION REQUEST message to the source gNB-DU including the RACH configuration and the TCI state configuration and the LTM configuration IDs for the accepted target candidate cell(s) in other gNB-DU(s). The gNB-CU may send the updated CSI resource configuration to the source gNB-DU.

6. The source gNB-DU responds with a UE CONTEXT MODIFICATION RESPONSE message which includes an updated lower layer configuration, e.g., containing the updated CSI report configuration of the source cell.

7. The gNB-CU may send a UE CONTEXT MODIFICATION REQUEST message to the candidate gNB-DU(s) containing the information for subsequent LTM or for updating the configurations of candidate cells, . The gNB-CU may also provide the lower layer part of the reference configuration to the candidate gNB-DU(s).

8. The candidate gNB-DU responds with a UE CONTEXT MODIFICATION RESPONSE message including the updated lower layer configuration(e.g., the updated CSI report configuration).

NOTE 2: Step 7 may be also invoked by the gNB-CU after step 19, or step 22 by implementation.

9. The gNB-CU sends a DL RRC MESSAGE TRANSFER message to the source gNB-DU, which includes the generated *RRCReconfiguration* message with the LTM configuration.

10. The source gNB-DU forwards the received *RRCReconfiguration* message to the UE.

11. The UE responds to the source gNB-DU with an *RRCReconfigurationComplete* message.

12. The source gNB-DU forwards the *RRCReconfigurationComplete* message to the gNB-CU via an UL RRC MESSAGE TRANSFER message.

13. Early synchronization to the target candidate cell(s) may be performed as specified in TS 38.300 [2].

14.The candidate gNB-DU sends the TA value, the associated CFRA resource information, the candidate cell ID and the source gNB-DU ID to the source gNB-DU in the DU-CU TA INFORMATION TRANSFER message to the gNB-CU.

15. The gNB-CU forwards the TA value, and the associated CFRA resource information to the source gNB-DU in the CU-DU TA INFORMATION TRANSFER message.

16. The UE sends the L1 measurement result to the source gNB-DU.

17. The source gNB-DU decides to execute LTM to a candidate target cell.

18. The source gNB-DU sends the Cell Switch command to the UE.

19. The source gNB-DU sends the DU-CU CELL SWITCH NOTIFICATION message to the gNB-CU to indicate the initiation of the Cell Switch command to the UE, for which the message includes the target cell ID and the TCI state ID.

20. The gNB-CU forwards the target cell ID and the TCI state ID to the target gNB-DU in the CU-DU CELL SWITCH NOTIFICATION message.

21. The target gNB-DU detects the UE access as specified in TS 38.300 [2].

22. The target gNB-DU sends the ACCESS SUCCESS message to the gNB-CU with the target cell ID.

23. The UE sends an *RRCReconfigurationComplete* message to the target gNB-DU.

24. The target gNB-DU forwards the *RRCReconfigurationComplete* message to the gNB-CU via an UL RRC MESSAGE TRANSFER message.

25. The gNB-CU may send the UE CONTEXT RELEASE COMMAND message to the source gNB-DU to release the resources of prepared cells.

26. The source gNB-DU responds with a UE CONTEXT RELEASE COMPLETE message.

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#### 8.2.1.6 LTM with gNB-CU-UP change

Figure 8.2.1.6-1 shows the procedure used for LTM with the change of gNB-CU-UP within a gNB.

Figure 8.2.1.6-1 LTM with the change of gNB-CU-UP

0. The source gNB-DU forwards the Measurement Report to the gNB-CU-CP.

1. The gNB-CU-CP decides to initiate LTM configuration.

2. The gNB-CU-CP sends a BEARER CONTEXT SETUP REQUEST message containing UL TNL address information for NG-U to setup the bearer context in the target gNB-CU-UP.

3. The target gNB-CU-UP responds with a BEARER CONTEXT SETUP RESPONSE message containing the UL TNL address information for F1-U, DL TNL address information for NG-U, and the TNL address information for data forwarding to the target gNB-CU-UP.

4. LTM configuration procedures are performed between gNB-CU and candidate gNB-DUs, and between gNB-CU and source gNB-DU as specified from step 3 to step 8 in section 8.2.1.5.

5 - 6. The gNB-CU-CP sends the RRC Reconfiguration message to the UE.

7. The UE sends the lower layer measurement result to the source gNB-DU, and the source gNB-DU decides to execute LTM to a candidate target cell.

8. The source gNB-DU sends the DU-CU CELL SWITCH NOTIFICATION message to the gNB-CU-CP with the selected target cell ID.

9. The gNB-CU-CP forwards the selected target cell ID to the target gNB-DU in the CU-DU CELL SWITCH NOTIFICATION message.

10-11. The gNB-CU-CP performs the Bearer Context Modification procedure to retrieve the PDCP UL/DL status and to exchange the TNL address information for data forwarding for the bearers to the source gNB-CU-UP.

12-13. The gNB-CU-CP performs the Bearer Context Modification procedure to send the DL TNL address information for F1-U and the PDCP UL/DL status to the target gNB-CU-UP.

14. Data Forwarding may be performed from the source gNB-CU-UP to the target gNB-CU-UP.

15. The target gNB-DU detects the UE in the target cell.

16. The target gNB-DU sends an ACCESS SUCCESS message to the gNB-CU-CP.

17-19. Path Switch procedure is performed to update the DL TNL address information for the NG-U towards the core network.

20-21. Bearer Context Release procedure may be performed to release the UE context in the source gNB-CU-UP.

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