**3GPP TSG-RAN WG3 Meeting #123R3-241072**

**Athens, Greece, 26th Feb – 1st Mar 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** | **0347** | **rev** | **1** | **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 | **X** | Core Network | **X** |

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| ***Title:*** | Corrections for SL Relay | | | | | | | | | |
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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, Huawei, LG Electronics | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_SL\_relay\_enh-Core | | | | |  | ***Date:*** | | | 2024-01-10 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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)* ***S*** *(adding to the sourcing companies’ CR statistics)*  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 following issues need to be addressed:   1. Section 8.19.4.3,  * The inter-gNB path switching can be based on Xn-HO, and NG-HO. Although there is no need to add the NG-HO call flow in TS 38.401, it is necessary to clarify the inter-gNB path switching can also be supported via NG-HO. * It is incorrect that the HANDOVER REQUEST message “**may**” include the candidate U2N Relay UE. Otherwise, target gNB cannot know it is a path switching to indirect path**.** * The figure uses both F1AP message name and F1AP procedure name. It needs to be updated to all use F1AP message name. * Other small clarifications.  1. Section 8.22.1/2/3/4, the figures do not align with the figure/description in TS 38.300  * No description on when the MP is setup. * No description on N3C indirect path setup.  1. In step 3 of Figures 8.22.1-1 and 8.22.3-1, there is no so-called direct path configuration in the UE CONTEXT SETUP REQUEST message and UE CONTEXT MODIFICATION REQUEST message. The information contained in the UE CONTEXT SETUP REQUEST message and UE CONTEXT MODIFICATION REQUEST message for direct path addition is the same as the configuration for the inter-gNB handover. 2. In Figure 8.22.1-1, the relay UE connects with gNB-CU via the gNB-DU2,the reconfiguration to relay UE in step 5 is not related with the gNB-DU1. 3. In Figure 8.22.1-1, the gNB-CU may decide to update the configuration on the indirect path for the remote UE, e,g., to release some DRBs on the indirect path. In this case, before step 6, a UE context modification procedure between gNB-CU and gNB-DU2 is needed. 4. In step 1 of Figures 8.22.2-1 and 8.22.4-1, the signaling for step 1 in the figure does not consider the MP case using N3C. 5. In step 3 of Figure 8.22.2-1, the reconfiguration to MP Relay UE is performed among MP Relay UE, the gNB-DU2 and the gNB-CU, not related with gNB-CU1. 6. In Figure 8.22.2-1, the gNB-CU may decide to update the configuration on the direct path for the remote UE, e,g., to release some DRBs on the direct path. In this case, before step 6, a UE context modification procedure between gNB-CU and gNB-DU1 is needed. 7. Other editorials. | | | | | | | | |
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| ***Summary of change:*** | | 1. Section 8.19.4.3,  * Clarify the inter-gNB path switching can be based on Xn-HO, and NG-HO. * Delete the “may” regarding HANDOVER REQUEST message “may” include the candidate U2N Relay UE. * Correct the figure to use F1AP message name, rather procedure name. * Other small clarifications.  1. Section 8.22, corrections to align with the figure/description in TS 38.300  * add a step at the end to describe when the MP is setup. * Clarify the N3C indirect path is up to MP Remote UE’s implementation.  1. In step 3 of Figures 8.22.1-1 and 8.22.3-1, the information contained in the UE CONTEXT SETUP REQUEST message and UE CONTEXT MODIFICATION REQUEST message for direct path addition includes at least the HandoverPreparationInformation IE and the serving cell ID on the direct path. 2. In Figure 8.22.1-1, step 5 should not related with the gNB-DU1, i.e., put the line related to gNB-DU1 above step 5. 3. In Figure 8.22.1-1, add an optional UE context modification procedure between gNB-CU and gNB-DU2 to update the configuration on the indirect path, as shown in the newly added step 5a and 5b. correspondingly, add the description for step 5a and 5b as follows.   5a. The gNB-CU may send an UE CONTEXT MODIFICATION REQUEST message to the gNB-DU2 to query the latest configuration if the configuration of the MP Remote UE on the indirect path is updated.  5b. The gNB-DU2 responds with an UE CONTEXT MODIFICATION RESPONSE message that includes the configuration information.”   1. In step 1 of Figures 8.22.2-1 and 8.22.4-1, change the signaling description to “candidate relay UE reporting” in the figure. 2. The MP remote UE can trigger the MP Relay UE via N3C by implementation if the MP Relay UE is in RRC\_IDLE/RRC\_INACTIVE state.” 3. In step 3 of Figure 8.22.2-1, the reconfiguration to MP Relay UE is not related with gNB-DU1, thus move the step 3 under the line related to gNB-DU1. 4. In Figure 8.22.2-1, add an optional UE context modification procedure between gNB-CU and gNB-DU1 before step 6 to update the configuration on the direct path. correspondingly, the following text procedures are added.   “6a. The gNB-CU may send an UE CONTEXT MODIFICATION REQUEST message to the gNB-DU1 to query the latest configuration if the configuration of the MP Remote UE on the direct path is updated.  6b. The gNB-DU1 responds with an UE CONTEXT MODIFICATION RESPONSE message that includes the configuration information.”   1. Fix the editorials | | | | | | | | |
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| ***Consequences if not approved:*** | | Errors remain in the specification. | | | | | | | | |
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| ***Clauses affected:*** | | 8.19.4.3, 8.22.1, 8.22.1, 8.22.2, 8.22.3, 8.22.4 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
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| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | | Rev 1: merge the changes in 8.22.1 and 8.22.2 from R3-240619. | | | | | | | | |

**<<<<<< START OF CHANGE >>>>>>**

#### 8.19.4.3 Inter-gNB-CU switch from direct to indirect path

The inter-gNB-CU switch from direct to indirect path can be based on Xn handover procedure or NG handover procedure. The signalling flow for U2N Remote UE switch from direct to indirect path with gNB-CU change based on Xn handover procedure is shown in Figure 8.19.4.3-1.



Figure 8.19.4.3-1. U2N Remote UE Direct-to-indirect Path Switch with gNB-CU change procedure

1. The Uu measurement configuration and measurement report signalling are performed between U2N Remote UE and source gNB-CU to evaluate both relay link measurement and Uu link measurement. The U2N Remote UE may report one or multiple candidate U2N Relay UE(s) and Uu measurement results after it measures/discovers the candidate U2N Relay UE(s).

2. The source gNB-CU decides to switch the U2N Remote UE to one of the candidate U2N Relay UE(s).

3. The source gNB-CU sends the XnAP HANDOVER REQUEST message to the target gNB-CU. The HANDOVER REQUEST message include a list of candidate U2N Relay UE(s) IDs of same cell of the target gNB.

4. The target gNB-CU decides to accept the indirect path switching, and select the target U2N Relay UE from the candidate U2N Relay UE(s).

5. The reconfiguration to target U2N Relay UE is performed among target U2N Relay UE, the target gNB-DU and target gNB-CU, if the target U2N Relay UE is in RRC\_CONNECTED state. The target gNB-CU allocates the local ID for the U2N Remote UE. The target gNB-CU sends an *RRCReconfiguration* message to the target U2N Relay UE. If the target U2N Relay UE is in RRC\_IDLE/INACTIVE state, this step is skipped and the configuration to the target U2N Relay UE is performed in Step 15.

6. The target gNB-CU sends the UE CONTEXT SETUP REQUEST message for the U2N Remote UE to the target gNB-DU, which contains the path switch configuration at least.

7. The target gNB-DU responds with the UE CONTEXT SETUP RESPONSE message to the target gNB-CU.

8. The target gNB-CU responds the source gNB-CU with an XnAP HANDOVER REQUEST ACKNOWLEDGE message by including the *RRCReconfiguration* message. The contents in the *RRCReconfiguration* message may include at least path switch configuration, PC5 Relay RLC channel configuration for relay traffic, bearer mapping and the associated radio bearer(s).

9. The source gNB-CU sends to the source gNB-DU the UE CONTEXT MODIFICATION REQUEST message to send the handover command to the U2N Remote UE, and to indicate to stop the data transmission for the U2N Remote UE.

10. The source gNB-DU sends the *RRCReconfiguration* message to the U2N Remote UE. The U2N Remote UE stops UP and CP transmission over Uu after reception of *RRCReconfiguration* message from the source gNB.

11. The source gNB-DU sends the UE CONTEXT MODIFICATION RESPONSE message to the source gNB-CU.

12. The source gNB-CU sends an XnAP SN STATUS TRANSFER message to the target gNB-CU.

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

14. The U2N Remote UE establishes PC5 connection with target U2N Relay UE.

15. The U2N Remote UE completes the path switch procedure by sending the *RRCReconfigurationComplete* message to the target gNB-DU via the target U2N Relay UE. In case the target U2N Relay UE is in RRC\_IDLE/ INACTIVE state when receiving the *RRCReconfigurationComplete* message, the reception of the *RRCReconfigurationComplete* message will first trigger RRC setup/resume procedure for the target U2N Relay UE to enter RRC\_CONNECTED state.

16. The target gNB-DU sends the UL RRC MESSAGE TRANSFER message to target gNB-CU by including the *RRCReconfigurationComplete* message.

17. Path Switch procedure is performed to switch the DL data path towards the target gNB-CU and to establish an NG-C interface instance towards the target gNB-CU.

18. The target gNB-CU sends an XnAP UE CONTEXT RELEASE message to the source gNB-CU.

19. The source gNB-CU sends an UE CONTEXT RELEASE COMMAND message to the source gNB-DU to release the UE context of the U2N Remote UE in the source gNB-DU.

20. The source gNB-DU releases the UE context of the U2N Remote UE, and responds the gNB-CU with an UE CONTEXT RELEASE COMPLETE message.

**<<<<<< NEXT CHANGE >>>>>>**

## 8.22 Overall procedures for multi-path support

### 8.22.1 Inter-DU direct path addition on top of indirect path

The signalling flow for inter-DU direct path addition is shown in Figure 8.22.1-1. This procedure is only applicable to the MP Remote UE using PC5 link.



Figure 8.22.1-1: Signalling procedure of inter-DU direct path addition on top of indirect path

1. The Uu measurement configuration and measurement report signalling are performed between MP Remote UE and the gNB-CU to evaluate both relay link measurement and Uu link measurement. The MP Remote UE may report Uu measurement results of neighboring cells and one or multiple candidate MP Relay UE(s).

2. The gNB-CU decides to add the direct path to MP Remote UE under a different gNB-DU (i.e., gNB-DU1).

NOTE: Mode 1 resource configuration cannot be configured for MP Remote UE in inter-gNB-DU multi-path relay in this release.

3. The gNB-CU sends the UE CONTEXT SETUP REQUEST message for the MP Remote UE to the gNB-DU1, which contains at least the *HandoverPreparationInformation* IE and the serving cell ID on the direct path.

4. The gNB-DU1 responds to the gNB-CU with a UE CONTEXT SETUP RESPONSE message.

5. The gNB-CU sends an *RRCReconfiguration* message to the MP Relay UE to update the indirect path configuration if necessary.

5a. The gNB-CU may send an UE CONTEXT MODIFICATION REQUEST message to the gNB-DU2 to query the latest configuration if the configuration of the MP Remote UE on the indirect path is updated.

5b. The gNB-DU2 responds with an UE CONTEXT MODIFICATION RESPONSE message that includes the configuration information.

6. The gNB-CU sends the UE CONTEXT MODIFICATION REQUEST message for MP Remote UE by including the direct path addition information and the *RRCReconfiguration* message to the gNB-DU2. The gNB-DU2 may update the stored UE context for MP Remote UE. The contents in the *RRCReconfiguration* message may include at least direct path addition configuration, RLC channel configuration, bearer mapping and the associated radio bearer(s).

7. The gNB-DU2 sends the *RRCReconfiguration* message to the MP Remote UE via the MP Relay UE.

8. The gNB-DU2 sends the UE CONTEXT MODIFICATION RESPONSE message to the gNB-CU.

9. The MP Remote UE performs random access procedure at the gNB-DU1.

10. The MP Remote UE sends the *RRCReconfigurationComplete* message to the gNB-DU1 via direct path in order to complete the direct path addition procedure.

10a. In case the SRB1 with duplication is configured, the MP Remote UE also sends the *RRCReconfigurationComplete* message to the gNB-DU2 via indirect path.

11. The gNB-DU1 sends the UL RRC MESSAGE TRANSFER message including the *RRCReconfigurationComplete* message received in step 10, to gNB-CU.

11a. In case the SRB1 with duplication is configured, the gNB-DU2 also sends the UL RRC MESSAGE TRANSFER message including the *RRCReconfigurationComplete* message received in step 10a, to gNB-CU.

12. The MP Remote UE performs data transmission and reception by using both the direct path and the indirect path served by a MP Relay UE.

### 8.22.2 Inter-DU indirect path addition on top of direct path

The signalling flow for inter-DU indirect path addition is shown in Figure 8.22.2-1.



Figure 8.22.2-1 Signalling procedure of inter-DU indirect path addition on top of direct path

1. If the MP Remote UE is connected with the MP Relay UE using PC5 link, the Uu measurement configuration and measurement report signalling are performed between MP Remote UE and the gNB-CU to evaluate relay link measurement and Uu link measurement. The MP Remote UE may report Uu measurement results of neighboring cells and one or multiple candidate MP Relay UE(s).

In case that the MP Remote UE is connected with the MP Relay UE using N3C and the MP Relay UE is in RRC\_CONNECTED state, the MP Remote UE reports at least the list of the C-RNTI and the cell ID of one or multiple candidate MP Relay UE(s).

2. The gNB-CU decides to add the indirect path via MP Relay UE to MP Remote UE under a different gNB-DU (i.e., gNB-DU2).

NOTE: Mode 1 resource configuration cannot be configured for MP Remote UE in inter-gNB-DU multi-path relay in this release.

3. The reconfiguration to MP Relay UE is performed among MP Relay UE, the gNB-DU2 and the gNB-CU if MP Relay UE is in RRC\_CONNECTED state. The gNB-CU sends an *RRCReconfiguration* message to the MP Relay UE. If the MP Relay UE is in RRC\_IDLE/INACTIVE state, this step is skipped.

4. The gNB-CU sends the UE CONTEXT SETUP REQUEST message for the MP Remote UE to the gNB-DU2, which contains the indirect path addition configuration at least.

5. The gNB-DU2 responds to the gNB-CU with a UE CONTEXT SETUP RESPONSE message.

6a. The gNB-CU may send an UE CONTEXT MODIFICATION REQUEST message to the gNB-DU1 to query the latest configuration if the configuration of the MP Remote UE on the direct path is updated.

6b. The gNB-DU1 responds with an UE CONTEXT MODIFICATION RESPONSE message that includes the configuration information.6. The gNB-CU sends the DL RRC MESSAGE TRANSFER message for MP Remote UE by including the *RRCReconfiguration* message to gNB-DU1. If the MP Remote UE is connected with the MP Relay UE using the PC5 link, the contents in the *RRCReconfiguration* message may include at least indirect path addition configuration, PC5 Relay RLC channel configuration for relay traffic, bearer mapping and the associated radio bearer(s). If the MP Remote UE is using N3C, the contents in the *RRCReconfiguration* message may include at least indirect path addition configuration, bearer mapping and the associated radio bearer(s).

7. The gNB-DU1 sends the *RRCReconfiguration* message to the MP Remote UE.

8. If the MP Remote UE is using the PC5 link, the MP Remote UE establishes PC5 connection with the target MP Relay UE.

If the MP Remote UE is connected with the MP Relay UE using N3C, this step is skipped.

9. The MP Remote UE sends the *RRCReconfigurationComplete* message to the gNB-DU1 via direct path in order to complete the indirect path addition procedure.

9a. In case the SRB1 with duplication is configured, the MP Remote UE also sends the *RRCReconfigurationComplete* message to the gNB-DU2 via indirect path.

NOTE: In the case that the target MP Relay UE for indirect path addition is in RRC\_IDLE/INACTIVE state, how the MP Remote UE triggers the MP Relay UE to be in RRC\_CONNECTED state is specified in TS 38.300 [2].

10. The gNB-DU1 sends the UL RRC MESSAGE TRANSFER message to gNB-CU by including the *RRCReconfigurationComplete* message received in step 9.

10a. In case the SRB1 with duplication is configured, the gNB-DU2 also sends the UL RRC MESSAGE TRANSFER message to gNB-CU by including the *RRCReconfigurationComplete* message received in step 9a.

11. The MP Remote UE performs data transmission and reception by using both the direct path and the indirect path served by a MP Relay UE.

### 8.22.3 Intra-DU direct path addition on top of indirect path

The signaling flow for intra-DU direct path addition is shown in Fig. 8.22.3-1. This procedure is only applicable to the MP Remote UE using PC5 link.



Figure 8.22.3-1: Signalling procedure of intra-DU direct path addition on top of indirect path

1. The Uu measurement configuration and measurement report signalling are performed between MP Remote UE and gNB-CU to evaluate both relay link measurement and Uu link measurement. The MP Remote UE may report Uu measurement results of neighboring cells and one or multiple candidate MP Relay UE(s).

2. The gNB-CU decides to add the direct path to MP Remote UE under the same gNB-DU.

3. The gNB-CU sends the UE CONTEXT MODIFICATION REQUEST message for the MP Remote UE to the gNB-DU, which contains at least the *HandoverPreparationInformation* IE and the serving cell ID on the direct path.

4. The gNB-DU responds to the gNB-CU with a UE CONTEXT MODIFICATION RESPONSE message.

5. The gNB-CU sends an *RRCReconfiguration* message to the MP Relay UE to update the indirect path configuration if necessary.

6. The gNB-CU sends the DL RRC MESSAGE TRANSFER message for MP Remote UE by including the *RRCReconfiguration* message to the gNB-DU. The contents in the *RRCReconfiguration* message may include at least direct path addition configuration, RLC channel configuration, bearer mapping and the associated radio bearer(s).

7. The gNB-DU sends the *RRCReconfiguration* message to the MP Remote UE.

8. The MP Remote UE performs random access procedure at the gNB-DU.

9. The MP Remote UE sends the *RRCReconfigurationComplete* message to the gNB-DU via direct path in order to complete the direct path addition procedure.

9a. In case the SRB1 with duplication is configured, the *RRCReconfigurationComplete* message is also sent to the gNB-DU via indirect path.

10/10a. The gNB-DU sends the UL RRC MESSAGE TRANSFER message to gNB-CU by including the *RRCReconfigurationComplete* message.

11. The MP Remote UE performs data transmission and reception by using both the direct path and the indirect path served by a MP Relay UE.

### 8.22.4 Intra-DU indirect path addition on top of direct path

The signaling flow for intra-DU indirect path addition is shown in Fig. 8.22.4-1.



Figure 8.22.4-1: Signalling procedure of intra-DU indirect path addition on top of direct path

1. If the MP Remote UE is connected with the MP Relay UE using PC5 link, the Uu measurement configuration and measurement report signalling are performed between MP Remote UE and gNB-CU to evaluate relay link measurement and Uu link measurement. The MP Remote UE may report Uu measurement results of neighboring cells and one or multiple candidate MP Relay UE(s).

In case that the MP Remote UE is connected with the MP Relay UE using N3C and the MP Relay UE is in RRC\_CONNECTED state, the MP Remote UE reports at least the list of the C-RNTI and the cell ID of one or multiple candidate MP Relay UE(s).

2. The gNB-CU decides to add the indirect path via MP Relay UE to MP Remote UE under the same gNB-DU.

3. The reconfiguration to MP Relay UE is performed among MP Relay UE, gNB-DU and gNB-CU if MP Relay UE is in RRC\_CONNECTED state. The gNB-CU sends an *RRCReconfiguration* message to the MP Relay UE. If the MP Relay UE is in RRC\_IDLE/INACTIVE state, this step is skipped.

4. The gNB-CU sends the UE CONTEXT MODIFICATION REQUEST message for the MP Remote UE to the gNB-DU, which contains the indirect path addition configuration at least.

5. The gNB-DU responds to the gNB-CU with a UE CONTEXT MODIFICATION RESPONSE message.

6. The gNB-CU sends the DL RRC MESSAGE TRANSFER message for MP Remote UE by including the *RRCReconfiguration* message to gNB-DU. If the MP Remote UE is connected with the MP Relay UE using the PC5 link, the contents in the *RRCReconfiguration* message may include at least indirect path addition configuration, PC5 Relay RLC channel configuration for relay traffic, bearer mapping and the associated radio bearer(s). If the MP Remote UE is using N3C, the contents in the *RRCReconfiguration* message may include at least indirect path addition configuration, bearer mapping and the associated radio bearer(s).

7. The gNB-DU sends the *RRCReconfiguration* message to the MP Remote UE.

8. If the MP Remote UE is using the PC5 link, the MP Remote UE establishes PC5 connection with the target MP Relay UE.

If the MP Remote UE is using N3C, this step is skipped.

9. The MP Remote UE sends the *RRCReconfigurationComplete* message to the gNB-DU via direct path to complete the indirect path addition procedure.

9a. In case the SRB1 with duplication is configured, the *RRCReconfigurationComplete* message is also sent to the gNB-DU via indirect path.

NOTE: In the case that the target MP Relay UE for indirect path addition is in RRC\_IDLE/INACTIVE state, how the MP Remote UE triggers the MP Relay UE to be in RRC\_CONNECTED state is specified in TS 38.300 [2].

10/10a. The gNB-DU sends the UL RRC MESSAGE TRANSFER message to gNB-CU by including the *RRCReconfigurationComplete* message.

11. The MP Remote UE performs data transmission and reception by using both the direct path and the indirect path served by a MP Relay UE.

**<<<<<< END OF CHANGE >>>>>>**