**3GPP TSG-RAN WG3 Meeting #129bis *R3-257283***

**Prague, Czech Republic, 13 – 17 October 2025**

|  |
| --- |
| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.401** | **CR** | **0494** | **rev** | **1** | **Current version:** | 19.0.0 |  |
|  |
| *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)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

|  |
| --- |
|  |
| ***Title:***  | Corrections for Multi-hop relay  |
|  |  |
| ***Source to WG:*** | ZTE Corporation, Samsung, Ericsson, LG Electronics |
| ***Source to TSG:*** | R3 |
|  |  |
| ***Work item code:*** | NR\_SL\_relay\_multihop-Core |  | ***Date:*** | 2025-09-30 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-19 |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | 1. In clause 6.1.6, editorial change to align with the terminology “**Intermediate U2N Relay UE**”.
2. RAN2 agreed that “When the RRC\_CONNECTED intermediate relay UE does re-establishment as a remote UE, the intermediate Relay UE sends a notification downstream, with the cause value to be confirmed in CR implementation.”. And the definition of Intermediate U2N Relay UE shows the intermediate U2N Relay UE connects to the network as a U2N Remote UE.

“**Intermediate U2N Relay UE**: a U2N Relay UE having both PC5 connection to a parent UE and PC5 connection to a child UE or a U2N Remote UE for serving the U2N Remote UE in case of multi-hop L2 U2N Relay communication. In this release, an intermediate U2N Relay UE first establishes a connection to the network as a U2N Remote UE before beginning to relay traffic for connected U2N Remote UEs.”It means that the Remote UE RRC Re-establishment (in clause 8.19.2) and RRC resume (in clause 8.19.3) procedures are applicable to Intermediate U2N Relay UE in multi-hop relay. So it is suggested to clarify this in the spec.1. The RRC connection resume procedure is in clause 8.19.3, so it is suggested to add 8.19.3 as reference.
2. Upon the reception of RRCReconfiguration, the Intermediate Relay UE may at most establish two PC5 RLC channels for relaying of Remote UE’s SRB0 over PC5, one PC5 RLC channel towards the First Relay UE, and the other towards the Last relay UE. So the current wording is not accurate enough.Upon the reception of RRCReconfiguration, the First Relay UE may establish a PC5 RLC channel towards the Intermediate Relay UE for relaying of Remote UE’s SRB0 over PC5; while for the PC5 RLC channel towards the Remote UE, a specified PC5 RLC channel is used as specified in the latest 38.300. So the current wording is ambiguous.
3. For SL multi-hop, the preparation of Uu relay RLC channels and PC5 relay RLC channels may take place before the interaction between the gNB and the AMF. However, the current procedural text does not specify the exact step at which this occurs, which may lead to mistake regarding the timing of the establishing the channels.
 |
|  |  |
| ***Summary of change:*** | 1. In clause 6.1.6, editorial change to align with the terminology “**Intermediate U2N Relay UE**”.
2. In clause 8.19.2 and 8.19.3, clarify these procedures are also applicable to Intermediate U2N Relay UE in multi-hop relay.
3. In clause 8.19.5, add clause 8.19.3 as reference for RRC connection resume procedure.
4. In clause 8.19.5, clarify the Intermediate/First U2N Relay UEs may need to establish PC5 Relay RLC channels towards both the parent UE and child UE.
5. In clause 8.19.5, add “i.e., after step 27” for NOTE 2.
 |
|  |  |
| ***Consequences if not approved:*** | The specification is not clear. |
|  |  |
| ***Clauses affected:*** | 6.1.6, 8.19.2, 8.19.3, 8.19.5 |
|  |  |
|  | **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 the First Change---------------***

### 6.1.6 Protocol stacks of L2 UE-to-Network Relay

The protocol stacks for the user plane and control plane of L2 U2N Relay architecture are described in Figure 6.1.6-1 and Figure 6.1.6-2, respectively. The single-hop relay protocol stack can be applicable to the multi-hop relay case with additional Intermediate U2N Relay UE(s). The Uu SRAP is terminated between U2N relay UE and gNB-DU.



Figure 6.1.6-1: User plane protocol stack for L2 UE-to-Network Relay



Figure 6.1.6-2: Control plane protocol stack for L2 UE-to-Network Relay

***-----------------Next Change-------------------***

### 8.19.2 Remote UE RRC Reestablishment

The signalling flow for Remote UE RRC Reestablishment is shown in Figure 8.19.2-1. The signalling flow can be also applicable to Intermediate U2N Relay UE in multi-hop relay, where the Intermediate U2N Relay UE acts as an U2N Remote UE to re-establish the RRC connection with the network.



Figure 8.19.2-1: Remote UE RRC Reestablishment procedure

1. The U2N Remote UE and the U2N Relay UE perform discovery procedure, and establish PC5 connection using NR ProSe procedure. This step may be omitted if PC5 connection was established.

2. The U2N Remote UE sends an *RRCReestablishmentRequest* message to the U2N Relay UE via PC5 Relay RLC Channel.

3~10. The gNB-CU allocates the local ID of the U2N Remote UE if the U2N Relay UE does not have it. The details of those steps can be referred to clause 8.19.1.

11. After receiving the local ID of the U2N Remote UE, the U2N Relay UE sends the *RRCReestablishmentRequest* message of the U2N Remote UE to gNB-DU.

12. The gNB-DU allocates a C-RNTI and a gNB-DU UE F1AP ID for the U2N Remote UE and sends the INITIAL UL RRC MESSAGE TRANSFER message to gNB-CU by encapsulating the *RRCReestablishmentRequest* message of the U2N Remote UE. In addition, the local ID of the U2N Remote UE, the gNB-DU UE F1AP ID of the U2N Relay UE and the sidelink configuration container for at least the PC5 Relay RLC channel configuration for relaying of U2N Remote UE’s SRB1 are included in the INITIAL UL RRC MESSAGE TRANSFER message.

13. The gNB-CU configures the U2N Relay UE with PC5 Relay RLC channel, Uu Relay RLC channel and bearer mapping for relaying of U2N Remote UE’s SRB1. According to the configuration from gNB-CU, the U2N Relay UE establishes a PC5 Relay RLC channel for relaying of U2N Remote UE’s SRB1 over PC5 and establishes a Uu Relay RLC channel for relaying of U2N Remote UE’s SRB1 over Uu.

NOTE 1: This step may be performed earlier, e.g., via steps 5~8.

14~23. The details of those steps can be referred to Steps 5~14 in clause 8.7. For L2 U2N relay, the RRC message(s) between the U2N Remote UE and the gNB-DU are relayed via the U2N Relay UE; Steps 18~19 may additionally perform the configurations of PC5 Relay RLC channel(s) for relaying of U2N Remote UE’s SRB1, SRB2 and DRBs.

24. The gNB-CU configures additional Uu Relay RLC channels between the gNB-DU and the U2N Relay UE, and additional PC5 Relay RLC channels for the U2N Relay UE for relaying of U2N Remote UE’s DRBs and SRBs. Also, such step may configure the bearer mapping between U2N Remote UE’s DRB/SRB and PC5/Uu Relay RLC channel at the U2N Relay UE.

NOTE 2: This step may be performed earlier.

### 8.19.3 Remote UE RRC Inactive to other states

The signalling flow for Remote UE from RRC Inactive to other states is shown in Figure 8.19.3-1. The signalling flow can be also applicable to Intermediate U2N Relay UE in multi-hop relay, where the Intermediate U2N Relay UE acts as an U2N Remote UE to resume the RRC connection with the network.



Figure 8.19.3-1: Remote UE RRC Resume procedure

1. The U2N Remote UE and the U2N Relay UE perform discovery procedure, and establish PC5 connection using NR ProSe procedure. This step may be omitted if PC5 connection was established.

2. The U2N Remote UE sends an *RRCResumeRequest* message to the U2N Relay UE via PC5 RLC Relay Channel.

3~10. The gNB-CU allocates the local ID of the U2N Remote UE if the U2N Relay UE does not have it. The details of those steps can be referred to clause 8.19.1.

11. After receiving the local ID of the U2N Remote UE, the U2N Relay UE sends the *RRCResumeRequest* message of the U2N Remote UE to gNB-DU.

12. The gNB-DU allocates a C-RNTI and a gNB-DU UE F1AP ID for the U2N Remote UE and sends the INITIAL UL RRC MESSAGE TRANSFER message to gNB-CU by encapsulating the *RRCResumeRequest* message of the U2N Remote UE. In addition, the local ID of the U2N Remote UE, the gNB-DU UE F1AP ID of the U2N Relay UE and the sidelink configuration container for at least the PC5 Relay RLC channel configuration for relaying of U2N Remote UE’s SRB1 are included in the INITIAL UL RRC MESSAGE TRANSFER message.

13. The gNB-CU configures the U2N Relay UE with PC5 Relay RLC channel, Uu Relay RLC channel and bearer mapping for relaying of U2N Remote UE’s SRB1. According to the configuration from gNB-CU, the U2N Relay UE establishes a PC5 Relay RLC channel for relaying of U2N Remote UE’s SRB1 over PC5 and establishes a Uu Relay RLC channel for relaying of U2N Remote UE’s SRB1 over Uu.

NOTE 1: This step may be performed earlier, e.g., via steps 5~8.

14~19. The details of those steps can be referred to Steps 5~10 in clause 8.6.2. For L2 U2N relay, the RRC message(s) between the U2N Remote UE and the gNB-DU are relayed via the U2N Relay UE; Steps 14~15 may additionally perform the configurations of PC5 Relay RLC channel(s) for relaying of U2N Remote UE’s SRB2 and DRBs.

20. The gNB-CU establishes additional Uu Relay RLC channels between the gNB-DU and the U2N Relay UE, and additional PC5 Relay RLC channels for the U2N Relay UE for relaying of U2N Remote UE’s DRBs and SRBs. Also, such step may configure the bearer mapping between U2N Remote UE’s DRB/SRB and PC5/Uu Relay RLC channel at the U2N Relay UE.

NOTE 2: This step may be performed earlier.

***-----------------Next Change-------------------***

### 8.19.5 Remote UE initial access for Multi-hop Layer-2 UE-to-Network Relay

The signalling flow for Remote UE Initial access is shown in Figure 8.19.5-1.



Figure 8.19.5-1: Overall procedure for Remote UE’s initial access via multi-hop relay

1. The U2N Remote UE, the First U2N Relay UE, the Intermediate U2N Relay UE, and the Last U2N Relay UE perform discovery procedure, and establish PC5 connection using NR ProSe procedure.

2. The U2N Remote UE sends an *RRCSetupRequest* message to the First U2N Relay UE via PC5 Relay RLC channel.

3. The First U2N Relay UE withholds the received RRC message. If the First U2N Relay UE is in RRC\_IDLE/RRC\_INACTIVE state, it should send its own *RRCSetupRequest* message to the Intermediate U2N Relay UE via PC5 Relay RLC channel in order to trigger the RRC connection establishment/resume procedure to enter RRC\_CONNECTED state upon reception of the RRC message from the U2N Remote UE. If the Intermediate U2N Relay UE is in RRC\_IDLE/RRC\_INACTIVE state, it should trigger the RRC connection establishment/resume procedure in clause 8.19.1 or 8.19.3 to enter RRC\_CONNECTED state upon reception of the RRC message from the First U2N Relay UE. If all Relay UEs are in RRC\_CONNECTED state, this step could be skipped.

4. The First U2N Relay UE in RRC\_CONNECTED state sends the *SidelinkUEInformationNR* message to the gNB-DU via the Intermediate U2N Relay UE and Last U2N Relay UE.

5. The gNB-DU sends the UL RRC MESSAGE TRANSFER message of the First U2N Relay UE by encapsulating the *SidelinkUEInformationNR* message to gNB-CU, and gNB-CU allocates the local ID of U2N Remote UE to uniquely identify the U2N Remote UE within the Last U2N Relay UE.

6. The gNB-CU sends the UE CONTEXT MODIFICATION REQUEST message of the Last U2N Relay UE to gNB-DU. Such message may request the establishment of Uu Relay RLC channel(s) and PC5 Relay RLC channel(s) for the transmission of U2N Remote UE’s SRB0.

7. The gNB-DU sends the UE CONTEXT MODIFICATION RESPONSE message of the Last U2N Relay UE to gNB-CU.

8. The gNB-CU sends the DL RRC MESSAGE TRANSFER message of the Last U2N Relay UE to gNB-DU by encapsulating the *RRCReconfiguration* message, which contains the local ID allocated to the U2N Remote UE. The *RRCReconfiguration* message shall also contain the Uu Relay RLC channel(s) configuration and PC5 Relay RLC channel(s) configuration if not configured and bearer mapping for relaying of U2N Remote UE’s SRB0.

9. The gNB-DU sends the *RRCReconfiguration* message to the Last U2N Relay UE to configure the local ID of the U2N Remote UE, the Uu Relay RLC channel(s) configuration, PC5 Relay RLC channel(s) configuration and bearer mapping for relaying of U2N Remote UE’s SRB0.

10. The Last U2N Relay UE sends the *RRCReconfigurationComplete* message to gNB-DU.

11. The gNB-DU sends the UL RRC MESSAGE TRANSFER message of the Last U2N Relay UE by encapsulating the *RRCReconfigurationComplete* message to gNB-CU.

12. The gNB-CU configures the Intermediate U2N Relay UE with the local ID allocated to the U2N Remote UE, PC5 Relay RLC channel and bearer mapping for relaying of U2N Remote UE’s SRB0. According to the configuration from gNB-CU, the Intermediate U2N Relay UE may establish PC5 Relay RLC channel(s) for relaying of U2N Remote UE’s SRB0 over PC5. This step follows the same signaling flow as described in steps 6-11.

13. The gNB-CU configures the First U2N Relay UE with the local ID allocated to the U2N Remote UE, PC5 Relay RLC channel and bearer mapping for relaying of U2N Remote UE’s SRB0. According to the configuration from gNB-CU, the First U2N Relay UE may establish a PC5 Relay RLC channel towards the Intermediate U2N Relay UE for relaying of U2N Remote UE’s SRB0 over PC5. This step follows the same signaling flow as described in steps 6-11.

14. After receiving the local ID of the U2N Remote UE and the PC5 Relay RLC channel(s) configuration and bearer mapping for relaying of U2N Remote UE’s SRB0, the First U2N Relay UE sends the *RRCSetupRequest* message of the U2N Remote UE to gNB-DU via the Intermediate U2N Relay UE and the Last U2N Relay UE. The local ID of the U2N Remote UE and RB ID for SRB0 are conveyed in the SRAP header.

15. The gNB-DU allocates a C-RNTI and a gNB-DU UE F1AP ID for the U2N Remote UE and sends the INITIAL UL RRC MESSAGE TRANSFER message to gNB-CU by encapsulating the *RRCSetupRequest* message of the U2N Remote UE. In addition, the local ID of the U2N Remote UE, the gNB-DU UE F1AP ID of the Last U2N Relay UE and the sidelink configuration container for the PC5 Relay RLC channel configuration for relaying of U2N Remote UE’s SRB1 are included in the INITIAL UL RRC MESSAGE TRANSFER message.

16. The gNB-CU allocates a gNB-CU UE F1AP ID for the U2N Remote UE and generates a *RRCSetup* message towards the U2N Remote UE. The RRC message is encapsulated in the DL RRC MESSAGE TRANSFER message, and includes the configurations of PC5 Relay RLC channel and bearer mapping at least for the transmission of U2N Remote UE’s SRB1.

17. The gNB-DU sends the *RRCSetup* message to the U2N Remote UE via the First U2N Relay UE, the Intermediate U2N Relay UE and Last U2N Relay UE.

18. The gNB-CU configures the Last U2N Relay UE with PC5 Relay RLC channel, Uu Relay RLC channel and bearer mapping for relaying of U2N Remote UE’s SRB1. According to the configuration from gNB-CU, the Last U2N Relay UE establishes a PC5 Relay RLC channel for relaying of U2N Remote UE’s SRB1 over PC5 and establishes a Uu Relay RLC channel for relaying of U2N Remote UE’s SRB1 towards gNB-DU if not configured yet.

The gNB-CU configures the First U2N Relay UE and the Intermediate U2N Relay UE with PC5 Relay RLC channel and bearer mapping for relaying of U2N Remote UE’s SRB1. According to the configuration from gNB-CU, the First U2N Relay UE and the Intermediate U2N Relay UE establish the PC5 Relay RLC channels for relaying of U2N Remote UE’s SRB1 over PC5 if not configured yet.

NOTE 1: Step 18 can be performed earlier, e.g., via Steps 6-13.

19. The U2N Remote UE sends the *RRCSetupComplete* message to the gNB-DU via the First U2N Relay UE, the Intermediate U2N Relay UE and Last U2N Relay UE.

20. The gNB-DU encapsulates the RRC message in the UL RRC MESSAGE TRANSFER message and sends it to the gNB-CU.

21. Upon receiving the *RRCSetupComplete* message of U2N Remote UE, the gNB-CU sends the INITIAL UE MESSAGE message to the AMF.

22. The AMF sends the INITIAL CONTEXT SETUP REQUEST message to the gNB-CU.

23. The gNB-CU sends the UE CONTEXT SETUP REQUEST message to establish the U2N Remote UE context in the gNB-DU. Such message may request the configuration of PC5 Relay RLC channels for the transmission of U2N Remote UE’s SRB2 and DRBs, and may also encapsulate the *SecurityModeCommand* message.

24. The gNB-DU sends the *SecurityModeCommand* message to the U2N Remote UE via the First U2N Relay UE, the Intermediate U2N Relay UE and Last U2N Relay UE.

25. The gNB-DU sends the UE CONTEXT SETUP RESPONSE message of the U2N Remote UE to the gNB-CU, which contains the configuration of PC5 Relay RLC channels for the transmission of U2N Remote UE’s SRB2 and DRBs.

26. The U2N Remote UE responds with the *SecurityModeComplete* message.

27. The gNB-DU encapsulates the RRC message in the UL RRC MESSAGE TRANSFER message and sends it to the gNB-CU.

28. The gNB-CU generates the *RRCReconfiguration* message for U2N Remote UE and encapsulates it in the DL RRC MESSAGE TRANSFER message. The *RRCReconfiguration* message contains the configuration of PC5 Relay RLC channels and bearer mapping for the transmission of U2N Remote UE’s SRB2 and DRBs.

29. The gNB-DU sends *RRCReconfiguration* message to the U2N Remote UE via the First U2N Relay UE, the Intermediate U2N Relay UE and Last U2N Relay UE.

30. The U2N Remote UE sends *RRCReconfigurationComplete* message to the gNB-DU via the First U2N Relay UE, the Intermediate U2N Relay UE and Last U2N Relay UE.

31. The gNB-DU encapsulates the RRC message in the UL RRC MESSAGE TRANSFER message and send it to the gNB-CU.

32. The gNB-CU sends the INITIAL CONTEXT SETUP RESPONSE message to the AMF.

33. The gNB-CU configures additional Uu Relay RLC channels between the gNB-DU and the Last U2N Relay UE, and additional PC5 Relay RLC channels for the First U2N Relay UE, the Intermediate U2N Relay UE, and the Last U2N Relay UE for relaying of U2N Remote UE’s DRBs and SRBs. Also, such step may configure the bearer mapping between U2N Remote UE’s DRB/SRB and PC5/Uu Relay RLC channel at the First U2N Relay UE, the Intermediate U2N Relay UE, and the Last U2N Relay UE.

NOTE 2: This step can be performed earlier, i.e., after step 27.

***-----------------End of the First Change---------------***