**3GPP TSG-RAN WG2 Meeting #115e R2-21XXXX**

**E-Meeting, 9th - 27th Aug 2021**

**Source: Xiaomi**

**Title:****Summary of 8.7.2.1 on control plane procedures**

**Agenda Item:** **8.7.2.1**

**Document for:** **Discussion and Decision**

# Introduction

This contribution provides summary of contributions under 8.7.2.1 on control plane procedures. The proposals related to email discussion of [Post114-e][605] on SI and paging forwarding are not included in this summary. Therefore, proposals about on-demand SI, SI acquire before PC5 connection established, short message forwarding, essential SI definition, voluntarily SIB forwarding and paging monitoring when relay UE in CONNECTED are not included.

# Discussion

## 2.1 Uu RLC configuration for remote UE’s SRB0/1

It’s still FFS which Uu RLC configuration is used for remote UE’s SRB0/1. Following contributions discussed about this issue,

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| Tdoc | Proposal |
| [1] R2-2106989  CATT | Proposal 1: For the delivery of remote UE’s SRB0, CCCH configuration is used in Uu interface.  Proposal 2: For the delivery of remote UE’s SRB1 which contains the RRC Resume message, the default SRB1 configuration can be used in Uu interface.  Proposal 3: For the delivery of remote UE’s SRB1 which contains the RRC Reestablishment message, the default SRB1 configuration can be used in Uu interface. |
| [4] R2-2107103  Qualcomm | Proposal 1: For the delivery of remote UE’s SRB0 RRC message and SRB1 RRC message such as RRCResume and RRCReestablishment message, gNB assigns relay UE a remote UE common Uu RLC channel after the relay UE enters CONNECTED state with its L2 Relay capability indicated/authorized |
| [6] R2-2107176  Samsung | Proposal 1: Fixed Uu RLC channel configuration is used for the delivery of Remote UE’s SRB0 message.  Proposal 2: Default Uu RLC channel configuration is used for the delivery of Remote UE’s RRCResume and RRCReestablishment messages. |
| [7] R2-2107231  Huawei | Proposal 1b: The dedicated signaling (with default value) is used for the Uu RLC configuration of remote UE SRB0.  Proposal 2: In case relay UE was in IDLE/INACTIVE, relay UE forwards remote UE’s Msg3, after gNB configures relay UE with the specific Uu RLC for remote UE’s SRB0.  Proposal 4b: The dedicated signaling (with default value) is used for the Uu RLC configuration of remote UE SRB1 for RRCResume and RRCReestablishment;  Proposal 5: The dedicated signaling (with default value) is used for the PC5 RLC and Uu RLC configuration of remote UE SRB1 for RRCReconfigurationComplete in path switch to indirect path. |
| [9] R2-2107273  InterDigital | Proposal 1: The first RRC message from the remote UE is carried by SRB1 of the relay UE. |
| [13] R2-2107306  Intel | Proposal 1: RAN2 agree to one of the following options for relaying Remote UE’s first message over the Uu RLC channel: a) default configuration that is re-configurable by network or b) Remote UE-specific network configuration.  Proposal 5: Relaying of Remote UE’s SRB0 and SRB1 can be done using network configuration to reduce specification impact. |
| [15] R2-2107541  Futurewei | Proposal 1: Uu RLC channel is network configurable for the delivery of remote UE’s SRB0 or SRB1 messages. |
| [20] R2-2107757  VIVO | Proposal 1 For the delivery of L2 Remote UE SRB0 signalling over Uu RLC channel, network configuration via dedicated signalling is used.  Proposal 2 For the delivery of L2 Remote UE SRB0 signalling over Uu RLC channel, RAN2 assumes that neither specified nor default configuration is introduced in this release.  Proposal 3 For the delivery of L2 Remote UE SRB1 signalling (RRCResume and RRCReestablishment) over Uu RLC channel, network configuration via dedicated signalling is used.  Proposal 4 For the delivery of L2 Remote UE SRB1 signalling (RRCResume and RRCReestablishment) over Uu RLC channel, RAN2 assumes that neither specified nor default configuration is introduced in this release. |
| [26] R2-2108145  ZTE | Proposal 1: Only network configuration of Uu RLC channel for the delivery of remote UE’s SRB0 RRC message and Remote UE’s SRB1 RRC message such as RRCResume and RRCReestablishment message is considered. |
| [33] R2-2108458  Nokia | Proposal 1: RAN2 is proposed to agree remote UE’s RRC connection establishment signalling messages are relayed via CCCH/SRB0 when relay UE is in RRC\_CONNECTED state. |
| [36] R2-2108250  Xiaomi | Proposal 1: The delivery of the Remote UE SRB0 RRC message shall use a fixed configuration for the Uu RLC configuration.  Proposal 2: the delivery of Remote UE’s SRB1 RRC message such as RRCResume and RRCReestablishment message can reuse the same rule of legacy SRB1, i.e.  Introduce default configuration of Uu RLC channel for relaying, which can be reconfigured to dedicated signalling by the Network  Network configuration via dedicated signaling is used for the configuration of Uu RLC channel if available in Relay UE. Otherwise, default configuration is used |

Regarding Uu RLC configuration for remote UE’s SRB0 message, companies’ views are observed as following,

Option 1, Fixed/specified [1], [6], [33], [36]

Option 2, Default [7], [9], [13]

Option 3, NW configured [4], [7], [9], [13], [15], [20], [26]

Proponents of option 1 prefer the same principle as PC-5 RLC configuration should be reused for Uu. Proponents of option 3 believes the NW is able to provide Uu RLC configuration since relay UE shall enter CONNECTED to relay remote UE’s SRB0 message. Meanwhile, [7], [9] and [13] also supports default configuration in case NW doesn’t provide dedicated configuration. There is no clear majority view, so rapporteur propose,

**Proposal 1: RAN2 to discuss which Uu RLC configuration is used for remote UE’s SRB0 message.**

**Option 1, Fixed/specified.**

**Option 2, Default,**

**Option 3, NW configured.**

Regarding Uu RLC configuration for remote UE’s SRB1 message, companies’ views are observed as following,

Option 1, Fixed/specified [33]

Option 2, Default [1], [6], [7], [9], [13], [36]

Option 3, NW configured [4], [7], [9], [13], [15], [20], [26], [36]

Only one company prefers fixed/specified configuration. 6 companies prefer to use default configuration. 8 companies prefer to use NW configured configuration. Rapporteur understands the default configuration is also reconfigurable by NW in current Uu design. With this observation, there is clear majority to support the Uu RLC configuration for remote UE’s SRB1 message could be configured by NW. RAN2 could further discuss whether default configuration is supported.

**[Easy]Proposal 2: Fixed/specified Uu RLC configuration for remote UE’s SRB1 message is not pursued.**

**[Easy]Proposal 3: Uu RLC configuration for remote UE’s SRB1 message such as RRCResume and RRCReestablishment message could be (re-)configured by NW via dedicated signalling.**

**Proposal 4: RAN2 to discuss whether default Uu RLC configuration for remote UE’s SRB1 message is supported.**

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| Tdoc | Proposal |
| [7] R2-2107231  Huawei | Proposal 5: The dedicated signaling (with default value) is used for the PC5 RLC and Uu RLC configuration of remote UE SRB1 for RRCReconfigurationComplete in path switch to indirect path. |

[7] further discuss which RLC configuration is used for RRCReconfigurationComplete in path switch to indirect path.

**Proposal 5: RAN2 to discuss whether dedicated signalling is used for the PC5 RLC and Uu RLC configuration of remote UE SRB1 for RRCReconfigurationComplete in path switch to indirect path.**

## 2.2 C-RNTI allocation

C-RNTI is allocated during RACH procedure for the initial access. However, remote UE would not perform RACH via relay UE. It’s unclear how C-RNTI is allocated to remote UE.

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| Tdoc | Proposal |
| [4] R2-2107103  Qualcomm | Proposal 2: Due to no RACH procedure in RRC establishment/resume/re-establishment procedure, gNB assigns remote UE’s C-RNTI in RRCSetup/RRCResume/RRCReestablishment message in L2 U2N relay |
| [7] R2-2107231  Huawei | Proposal 3: To configure C-RNTI for remote UE, C-RNTI is introduced in the RRCSetup message for remote UE. |
| [33] R2-2108458  Nokia | Proposal 2: RAN2 is proposed to agree the allocated C-RNTI of remote UE is included in the relevant RRC signaling (e.g. RRCSetup) message transmitted from gNB to the remote UE via relay UE during RRC connection establishment procedure of remote UE. |

3 contributions discuss this issue and the solution is similar. Therefore, rapporteur propose to follow companies’ view,

**[Easy]Proposal 6: During remote UE’s initial access, C-RNTI is included in the relevant RRC message, e.g. RRCSetup/RRCResume/RRCReestablishment.**

In addition, [4] also propose to confirm that remote UE’s C-RNTI in target cell is included in ReconfigurationWithSync message during path switch from direct to indirect path in L2 U2N relay. Rapporteur understands this is legacy procedure. It’s straightforward to following legacy procedure. However, which IE to use may be a stage 3 discussion.

**[Easy]Proposal 7: During remote UE’s path switch, C-RNTI of remote UE in target cell is included in the relevant RRC message, e.g. RRCReconfiguration.**

## 2.3 Paging for IDLE/INACTIVE remote UE

In RAN2 114 meeting, it’s agreed that When Relay UE in RRC IDLE/RRC INACTVE and Remote UE in RRC IDLE/RRC INACTIVE, the Relay UE monitors paging occasions of its PC5-RRC connected Remote UE(s). However, it’s FFS how relay UE obtain remote UE’s paging occasions. Following contributions discuss this issue,

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| Tdoc | Proposal |
| [2] R2-2107039  OPPO | Proposal 4 Remote UE shares part of the information of 5G-S-TMSI / I-RNTI and DRX configuration to relay UE for paging monitoring. |
| [5] R2-2107104  Qualcom | Proposal 1: Remote UE shares its UE-ID (5G-S-TMSI/I-RNTI) with relay UE. And relay UE accordingly derives remote UE’s paging occasions, and forwards paging to one specific remote UE via unicast PC5-RRC transmission. |
| [8] R2-2107232  Huawei | Proposal 4: Remote UE forwards its DRX cycle T and UE ID (i.e. 5G-STMIS/I-RNTI) to relay UE for paging monitoring. |
| [10] R2-2107274  InterDigital | Proposal 1: A remote UE sends it applicable UE ID(s) (i.e., 5G-S-TMSI, I-RNTI) to the relay UE in a PC5-RRC message. |
| [12] R2-2107304  Sharp | Proposal 1: a remote UE provides its 5G-S-TMSI/I-RNTI and UE specific DRX cycle T if any to relay UE for paging monitoring. And it could be FFS on how to deliver the information.  Proposal 2: relay UE checks PAGING message for remote UE based on its 5G-S-TMSI/I-RNTI and informs remote UE once it is paged. |
| [21] R2-2107966  Xiaomi | Proposal 1: Remote UE reports its Paging Occasion(s) to relay UE. Relay UE delivers any paging messages received in these PO(s) to corresponding remote UE. |
| [27] R2-2108146  ZTE | Proposal 7: In order for the relay UE to monitor the remote UE’s paging, remote UE may send the UE specific DRX cycle, 5G-S-TMSI and I-RNTI to relay UE via PC5 signalling. |
| [30] R2-2108192  Ericsson | Proposal 1: The POs of the remote and relay UE are configured via system information (SIB). |
| [32] R2-2108414  ETRI | Proposal 4) The relay UE acquires monitored POs for remote UE’s paging. RAN2 is recommended to discuss how the relay UE obtains POs for the remote UE.  Proposal 5) When receiving a paging message, the relay UE filters the paging message for remote UE. |

Majority companies support remote UE provides UE ID, i.e. 5G-S-TMSI/I-RNTI to relay UE, since there is no security issue according to SA3’s response. Relay UE could decode paging message to derive the UE ID and forward the paging message accordingly.

**Proposal 8: RAN2 to discuss whether IDLE/INACTIVE remote UE provides 5G-S-TMSI/I-RNTI to IDLE/INACTIVE relay UE.**

**Proposal 9: RAN2 to discuss whether IDLE/INACTIVE Relay UE decodes received paging message to derive the 5G-S-TSMI/I-RNTI and forward the paging message accordingly.**

Relay UE shall be aware of remote UE’s PO to perform monitoring. [2], [8], [12], [27] propose to provide remote UE’s DRX cycle to relay UE. [21] propose to provide remote UE’s PO to relay UE. [30] believes the PO of remote UE is configured via SIB. However, according to 38.304 specification, the PO is calculated in MAC and the essential parameters, e.g. DRX cycle, may come from SIB or upper layer. It’s unclear how SIB could configure remote UE’s PO. To follow the majority view, rapporteur propose,

**Proposal 10: RAN2 to discuss whether IDLE/INACTIVE remote UE provides its Uu DRX cycle T to IDLE/INACTIVE relay UE.**

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| Tdoc | Proposal |
| [5] R2-2107104  Qualcom | Proposal 2: INACTIVE relay UE can monitor and forward CN paging for an IDLE remote UE, without transition to IDLE state due to CN paging for remote UE.  Proposal 3: IDLE relay UE can monitor and forward RAN paging for an INACTIVE remote UE. |

The remote and relay UE may be in different RRC states, e.g. remote UE in IDLE and relay UE in INACTIVE or vice versa. If INACTIVE relay receives CN paging, it shall perform NAS recovery and enter IDLE state according to TS 38.304. [5] propose to prevent INACTIVE relay UE entering IDLE in this case. Rapporteur suggest RAN2 to agree the proposal. Otherwise, relay would enter IDLE unnecessarily. Regarding the IDLE relay monitoring INACTIVE remote UE’s PO, rapporteur understands this was already covered by the agreement that when Relay UE in RRC IDLE/RRC INACTVE and Remote UE in RRC IDLE/RRC INACTIVE, the Relay UE monitors paging occasions of its PC5-RRC connected Remote UE(s).

**[Easy]Proposal 11: INACTIVE relay UE doesn’t enter IDLE state upon receiving CN initiated paging for remote UE.**

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| Tdoc | Proposal |
| [10] R2-2107274  InterDigital | Proposal 4: A relay UE can skip monitoring of POs of one or more remote UEs based on network indication.  Proposal 6: RAN2 to discuss how to define a minimum set of SL monitoring slots for a remote UE in RRC\_IDLE/RRC\_INACTIVE and PC5-RRC connected to a relay UE. |
| [24] R2-2108008  Lenovo | Proposal 4: RAN2 discuss the necessity of some handshaking procedure to explicitly signal if and when a remote UE needs its linked U2N relay UE to monitor its paging and if and when the paging for the remote UE can really be monitored by the linked relay. |
| [32] R2-2108414  ETRI | Proposal 7) It is suggested to discuss the enhancement of the baseline paging relay solution for power saving of the relay UE.  Proposal 8) The relay UE may not monitor the PO for paging Remote UE if it is informed that a paging message to Remote UE is not transmitted in the PO. |
| [35] R2-2108510  CMCC | Proposal 5: Power saving for paging of remote UE should be considered.  Proposal 6: Down-select solution from network controlled or Remote UE triggered for power saving. |

[10], [24], [32], [35] discuss solutions to reduce relay UE’s PO monitoring to improve power saving. Before discussing the detail solution, rapporteur suggests RAN2 first decide whether to consider power saving for relay UE.

**[Low priority]Proposal 12: RAN2 to discuss whether PO monitoring reduction for relay UE is considered in R17.**

## 2.4 Stage 2 level description

[3] propose to capture the following flow chart and step descriptions into TS 38.300.

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| In L2 UE-to-Network Relay, a Relay UE only forwards the traffic, and before data traffic forwarding, a Remote UE needs to establish an end-to-end connection with the base station via SL Relay to create the corresponding end-to-end Uu SDAP/PDCP layer for QoS flow/bearer handling and RRC layer for control plane.  During the study phase for SL relay, the high level connection establishment procedure of L2 UE-to-Network Relay was studied and captured in TR38.836. We think that the general procedure on connection establishment should be captured at Stage 2 specification TS38.300 with necessary rewording based on the agreements we made at last RAN2 meeting (e.g. For the delivery of remote UE’s SRB0 RRC message, specified configuration is used for the configuration of PC5 RLC channel.). It is proposed to capture the following flow chart and step descriptions into TS38.300:  *Step 1. The Remote and Relay UE perform discovery procedure, and establish PC5-RRC connection using the legacy Rel-16 procedure.*  *Step 2. The Remote UE sends the first RRC message (i.e., RRCSetupRequest) for its connection establishment with gNB via the Relay UE, using a specified L2 configuration on PC5. The gNB responds with an RRCSetup message to Remote UE. The RRCSetup delivery to the Remote UE uses the specified configuration on PC5. If the relay UE had not started in RRC\_CONNECTED, it would need to do its own connection establishment as part of this step.*  *Step 3. The gNB and Relay UE perform relaying channel setup procedure over Uu. According to the configuration from gNB, the Relay/Remote UE establishes an RLC channel for relaying of SRB1 towards the Remote UE over PC5. This step prepares the relaying channel for SRB1.*  *Step 4. Remote UE SRB1 message (e.g. an RRCSetupComplete message) is sent to the gNB via the Relay UE using SRB1 relaying channel over PC5. Then the Remote UE is RRC connected over Uu.*  *Step 5. The Remote UE and gNB establish security following legacy procedure and the security messages are forwarded through the Relay UE.*  *Step 6. The gNB sets up additional RLC channels between the gNB and Relay UE for traffic relaying. According to the configuration from gNB, the Relay/Remote UE sets up additional RLC channels between the Remote UE and Relay UE for traffic relaying. The gNB sends an RRCReconfiguration to the Remote UE via the Relay UE, to set up the relaying SRB2/DRBs. The Remote UE sends an RRCReconfigurationComplete to the gNB via the Relay UE as a response.*    *Figure X.X: Procedure for remote UE connection establishment* |

Rapporteur thinks it could be a starting point for running CR.

**[Easy]Proposal 13: capture the flow chart and step description in [3] into 38.300 running CR.**

## 2.5 SI delivery and request on PC-5 after PC-5 connection establishment

In RAN2 114 meeting, it’s agreed that the Remote UE can receive the system information via PC5 after PC5 connection establishment with Relay UE. Following contribution discuss how SI is delivered on PC-5.

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| Tdoc | Proposal |
| [8] R2-2107232  Huawei | Proposal 1: Introduce two PC5 RRC procedures for SI request and delivery respectively, which are one-way procedures. |
| [16] R2-2107622  Apple | Proposal 5 Support a unified PC5-RRC message for both Paging and SI forwarding. |
| [21] R2-2107966  Xiaomi | Proposal 4: SI could be delivered by broadcast/groupcast to reduce signaling. |
| [23] R2-2108007  Lenovo | Proposal 5: A groupcast destination ID can be used to distribute SIs and the updated SIs to the linked remote UEs by a U2N relay. |
| [27] R2-2108146  ZTE | Proposal 4: RAN2 is suggested to consider whether the groupcast PC5 signalling, dedicated PC5-RRC signalling, or both should be supported for system information forwarding. |
| [28] R2-2108153  LG | Proposal 3: After Remote UE establishes PC5 connection with Relay UE, when the Relay UE initiates the first system information transmission.  (Option 1) ‘RRCReconfigurationCompleteSidelink’ message including system information is transmitted.  (Option 2) After completing the transmission of ‘RRCReconfigurationCompleteSidelink’ message, system information is transmitted as a separate new PC5-RRC message.  (Option 3) ‘UECapabilityEnquirySidelink’ or ‘UECapabilityInformationSidelink’ message including system information is transmitted.  (Option 4) After completing the transmission of ‘UECapabilityEnquirySidelink’ or ‘UECapabilityInformationSidelink’ message, system information is transmitted as a separate new PC5-RRC message. |

All companies agree to use PC-5 RRC message to deliver SI. [8], [21], [23] propose to introduce new RRC message for SI delivery on PC5. [27] doesn’t explicitly discuss to use new or existing RRC message. But new RRC message is needed if group PC5 signalling is supported. [28] provides options including using new or existing RRC message. From rapporteur’s point of view, existing RRC message is used to provide sidelink configuration and capability, which were not designed for SI delivery. New RRC message is a cleaner approach. Therefore, rapporteur propose,

**[Easy]Proposal 14: PC5-RRC message is used to deliver SI to remote UE after PC-5 connection establishment. FFS whether to use new or existing PC5-RRC message.**

A further question is the cast type of PC5-RRC message carrying SI. [21], [23], [27] propose to use groupcast to reduce signalling. Rapporteur suggest RAN2 to discuss which cast type is used for the PC5-RRC message.

**Proposal 15: RAN2 to discuss which cast type is used for the PC5-RRC message delivering SI.**

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| Tdoc | Proposal |
| [14] R2-2107367  Spredtrum | Proposal 3: Relay UE only forwards the system information when it does not detect the same system information from other Relay UEs. |

[14] intends to avoid duplicated system information and propose relay UE to check whether there is other relay UE transmitting the same SI. However, rapporteur understands there may be hidden terminal problem in this solution. The remote UE may not be able to receive other relay UE’s signal. Therefore, this discussion may be postponed.

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| Tdoc | Proposal |
| [14] R2-2108153  LG | Proposal 4: When remote UE requests the relay UE on-demand SIB that relay UE cannot decoding the requested SIB due to capability difference. In this case,   * Relay UE‘s operation: As the response on the on-demand SIB request from remote UE, its relay UE can transmit ‘SIB type reject’ message. The 'SIB type reject' message means that the on-demanded SIB type cannot be decoded on the relay UE. * Remote UE’s operation: when remote UE receives ‘SIB type reject’ message from relay UE,   (Option 1) Remote UE can trigger relay reselection.  (Option 2) Remote UE can trigger direct on-demand SIB requests to the relay UE's serving cell. |

[14] identifies a scenario that relay UE may not be able to forward SIB requested by remote UE, due to capability mismatch, e.g. positioning SIBs. Rapporteur understands this is related to which SIB is allowed to be requested and suggest postpone this discussion after on-demand positioning SIB is agreed.

## 2.6 RNAU/TAU for remote UE

In RAN2 114 meeting, it’s agreed, for IC Remote UE case, Remote UE performs TAU/RNAU based on its own serving cell information (i.e., as legacy) if it is NOT PC5-connected with Relay UE. However, it’s FFS how remote UE performs RANU in other cases.

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| Tdoc | Proposal |
| [27] R2-2108146  ZTE | Proposal 10: In coverage remote UE should performs TAU/RNAU based on Relay UE’s serving cell information after it is PC5-connected with Relay UE. |

[27] propose remote UE to perform the TAU/RNAU based on the relay UE’s serving cell information, since the remote UE is connected with relay UE and the remote UE is now reachable via the relay UE. Rapporteur thinks the proposal make sense since dual connectivity is not supported in R17. Remote UE could only perform TAU/RNAU via relay UE after it its PC5-connected with Relay UE. Therefore, rapporteur propose,

**Proposal 16: In coverage remote UE should performs TAU/RNAU based on Relay UE’s serving cell information after it is PC5-connected with Relay UE.**

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| Tdoc | Proposal |
| [18] R2-2107625  Apple | Proposal 1 When out-of-coverage RRC\_INACTIVE remote UE is connected to a L2 U2N relay UE via PC5, the remote UE shares the same configured RNA as the relay UE.  Proposal 4 In this release, only consider periodic RNA update if remote UE is connected to the same L2 relay UE via PC5.  Proposal 5 After relay reselection, if RRC\_INACTIVE remote UE reselects a relay UE whose serving cell is not belong to remote UE’s configured RNA, RNA update procedure is triggered.  Proposal 7 When RRC\_INACIVE relay UE conducts RNA update, relay UE report its associated remote UEs (with I-RNTI) to the gNB; gNB performs RNA updates for both relay UE and remote UE(s) altogether. |
| [23] R2-2108007  Lenovo | Proposal 8: The RRC\_Connected relay UE can indicate the list of the served idle-mode remote UE(s) to network for the CN registration of the served remote UE(s) purpose.  Proposal 9: The RRC\_Connected relay UE can indicate the list of the served inactive-mode remote UE(s) to network for the RNAU of the served remote UE(s) purpose. |
| [25] R2-2108060  Sony | Proposal 1: RAN2 to discuss whether there is a need for a remote UE to perform RNA update if its relay UE’s serving cell belongs to the RNA of the remote UE. |
| [31] R2-2108195  Ericsson | Proposal 1: If the remote UE is out-of-coverage, the relay UE may perform RNAU and TAU procedure for itself and on behalf of the remote UE.  Proposal 2: If the remote UE is out-of-coverage, the relay UE may forward the messages related to RNAU and TAU procedure without triggering such procedure for itself.  Proposal 3: When the relay UE performs RNAU and TAU procedure for itself and on behalf of the remote UE, the new gNB/AMF should retrieve both the remote and relay UE context.  Proposal 4: RAN2 to send an LS to RAN3 to inform that when the relay UE performs RNAU and TAU procedure for itself and on behalf of the remote UE, the new gNB/AMF should retrieve both the remote and relay UE context.  Proposal 6: When performing the RNAU/TAU procedure and selecting a new gNB, the remote UE/relay UE releases the existing PC5 connection. |

[18], [23], [25], [31] discuss about how OOC remote UE perform RANU/TAU. [18] and [25] assumes the remote UE perform RNAU based on relay UE’s serving cell information. [23] and [31] propose relay UE could perform RNAU/TAU on behalf of remote UE. Since RAN2 had agreed for the OOC case, Remote UE with the RRC state of IDLE or INACTIVE should perform TAU/RNAU procedure. Rapporteur suggests RAN2 to confirm assumption from [18] and [25] and further discuss whether relay could perform RNAU/TAU on behalf remote UE.

**P17a: After PC5-RRC establishment, OOC remote UE performs RNAU/TAU based on relay UE’s serving cell information.**

**P17b: After PC5-RRC establishment, RAN2 to discuss whether relay UE could perform RNAU/TAU on behalf of OOC remote UE.**

## 2.7 Connection establishment

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| Tdoc | Proposal |
| [9] R2-2107273  InterDigital | Proposal 2: The relay UE in RRC\_IDLE buffers the remote UE’s first RRC message until reception of the RRCSetup message.  Proposal 3: The relay UE in RRC\_INACTIVE buffers the remote UE’s first RRC message until reception of the RRCResume message. |
| [33] R2-2108458  Nokia | Proposal 3: RAN2 is proposed to discuss whether to support the simple approach that relay UE goes to RRC\_CONNECTED mode first and then request remote UE’s RRC connection or support the combined relay UE and remote UE’s RRC connection establishment/assumption if relay UE is in RRC\_IDLE/INACTIVE state while remote UE initiates the RRC connection establishment via the relay UE. |

If both remote UE and relay UE are not in CONNECTED, both UEs need to enter CONNECTED for service transmission. [9] assumes remote UE and relay UE performs connection establishment/resume independently. [33] propose to discuss combined relay UE and remote UE’s RRC connection establishment/assumption. Rapporteur understands second option may require additional impact in RAN1, since current msg3 is not enough for two RRC messages. Therefore, option 1 should be the baseline.

**[Easy]Proposal 18: As baseline, Remote UE and relay UE performs connection establishment/resume independently, i.e. relay UE shall enter CONNECTED to be able to forward remote UE’s initial RRC messages.**

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| Tdoc | Proposal |
| [3] R2-2107044  MedaiTek | Proposal-2: The initial message (i.e. RRCSetupRequest) from Remote UE to gNB does not go through PC5 adaptation layer if PC5 adaptation layer is supported  Proposal-3: The Remote UE explicitly indicates its Remote UE ID to Relay UE when sending the initial RRC message (i.e. RRCSetupRequest) from Remote UE to gNB via Relay UE  Proposal-4b: Remote UE ID is put outside of the contained Uu RRCSetupRequest message within the PC5-RRC message that contains Uu RRCSetupRequest message from Remote UE.  Proposal-5a: The Relay UE explicitly indicates its Remote UE ID to gNB when forwarding the RRCSetupRequest from Relay UE to gNB.  Proposal-6b: Remote UE ID is put outside of the RRC message container (e.g. RRCReconfiguration message from gNB to Relay UE) that contains RRCSetup message going to Remote UE. |
| [13] R2-2107306  Intel | Proposal 2: Uu Adaptation is supported for relaying the first RRC message from the Remote UE via Relay UE.  Proposal 3: Agree that Relay UE informs the gNB of a new relaying connection request from the Remote UE upon receiving the first message from the Remote UE over PC5 RLC channel. |

Regarding the adaptation design for initial RRC message, [3] propose the initial RRC messages would not go through adaptation layer on PC5 and Uu. [13] support to have Uu adaptation layer for the initial RRC messages. Since adaptation layer on PC5 is not agreed yet, rapporteur suggest postpone whether PC5 adaptation layer is applied for initial RRC messages. [3] and [13] both support relay UE should inform gNB upon new connection request from remote UE.

**Proposal 19: Relay UE should inform gNB upon new connection request from remote UE.**

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| Tdoc | Proposal |
| [34] R2-2108462  Nokia | Proposal 1: Remote UE is (pre-)configured whether to establish and maintain U2N relay connection to NW via relay UE or not when it enters OoC in RRC\_IDLE state.  Proposal 2: Remote UE in idle state is configured to establish SL based U2N relay connection on the need basis, e.g. triggered by configured conditions related to, e.g., registration area update, paging monitoring or for period traffic transmission. |

[34] propose to consider conditional relay connection establishment. Rapporteur understands this is not urgent issue and could be postponed after basic relay connection establishment procedure is clear.

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| --- | --- |
| Tdoc | Proposal |
| [14] R2-2107367  Spredtrum | Proposal 5：Relay UE rejects Remote UE access request if it has running T302. |
| [22] R2-2107967  Xiaomi | Proposal 1: Relay UE releases remote UE if its connection establish/resume request triggered by remote UE is rejected by gNB.  Proposal 2: Relay UE indicates the wait time to remote UE, if wait time is configured in RRCReject or RRCRelease.  Proposal 3: Remote UE doesn’t select this relay UE during wait time. |

Relay UE’s connection establish/resume request may be rejected by gNB, due to congestion control. Relay UE couldn’t enter CONNECTED during T302 running. [14], [22] propose relay UE should indicate remote UE, which sent SRB0 message, after rejected by gNB, since it’s not able to serve during T302 running. However, it’s FFS what is the remote UE’s behaviour after reception of the indication.

**Proposal 20: RAN2 to discuss whether Relay UE indicates remote UE, which sent SRB0 message, during T302 running. FFS whether this indication triggers relay reselection.**

Furthermore, [22] propose to send wait time to remote UE, since relay UE would not be able to serve during T302 running. This timer could be used to prevent remote UE repeat request or select the same relay UE during relay reselection.

**Proposal 21: RAN2 to discuss whether relay UE sends wait time to remote UE and the remote UE’s behaviour during wait time.**

|  |  |
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| Tdoc | Proposal |
| [29] R2-2108154  LG | Proposal 4: To reduce T300 timer ambiguity between remote UE and gNB, when remote UE triggers the ‘RRCSetupRequest’ message, the timestamp can be included in the ‘RRCSetupRequest’ message.  Proposal 6: When gNB transmits the ‘RRCSetup’ message to remote UE, gNB can configure the margin time to the relay UE. The ‘RRCSetup’ message has to be transmitted within the margin time from relay UE to remote UE.  Proposal 7: When relay UE transmits the ‘RRCSetup’ message to remote UE, the relay UE should select SL transmission resource within the margin time configured by gNB.  Proposal 9: When remote UE performs connection establishment via relay UE in RRC IDLC/INACTIVE, the remote UE needs a new T300 timer. The new T300 timer has a longer time value than the legacy T300 value.  Proposal 10: In order for remote UE to decide whether to use the existing T300 timer or the new T300 timer, the remote UE needs to know the RRC state of relay UE.  Proposal 11: Discovery message can deliver RRC state of relay UE. |

[29] thinks in the case of using legacy T300 timer for RRC connection establishment of remote UE, gNB cannot know when the T300 timer starts exactly. So, the connection establishment failure can frequently happen due to time ambiguity between remote UE and gNB. For reducing connection establishment failure between remote UE and gNB, [29] propose to discuss the operation to reduce T300 timer ambiguity between remote UE and gNB. Also there may be a need to introduce longer T300 since the transmission delay is larger via relay.

**Proposal 22: RAN2 discuss how to handle T300 timer between remote UE and gNB, considering different RRC states of the relay UE.**

## 2.8 Uu RLF handling

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| Tdoc | Proposal |
| [7] R2-2107231  Huawei | Proposal 6: Upon Uu RLF, relay UE informs remote UE via a new PC5 RRC message. |
| [22] R2-2107967  Xiaomi | Proposal 5: If relay UE selects the same cell to re-establish RRC connection after RLF, relay UE may not release remote UE.  Proposal 6: If remote UE is not release after relay UE’s RLF, Relay UE indicates remote UE upon RRC re-establishment failure. FFS reuse release message or use new indication.  Proposal 7: Whether relay UE releases remote UE upon its RLF can be configured by gNB. |

In RAN2 113b meeting, it’s agreed When Uu RLF is detected by relay UE, relay UE may send PC5-S message (similar to LTE) to its connected remote UE(s) and this message may trigger relay reselection. However, it’s still FFS other indication/message can also be used for notification.

[7] propose to use PC5 RRC message to inform relay UE Uu RLF, since the PC5 connection may still be needed for V2X purpose.

**Proposal 23: RAN2 to discuss whether relay UE could inform Uu RLF to remote UE via PC5 RRC message.**

[22] thinks the relay UE may re-establish connection with the same cell successfully after Uu RLF. In this case, remote UE doesn’t need to be released.

**Proposal 24: RAN2 to discuss whether relay UE could choose not to release remote UE after Uu RLF in certain condition, e.g. relay UE selects the same cell to perform RRC re-establishment.**

## 2.9 Relay UE handover handling

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| Tdoc | Proposal |
| [22] R2-2107967  Xiaomi | Proposal 8: Relay UE releases remote UE upon legacy and CHO handover.  Proposal 9: Relay UE releases remote UE upon reception of source cell release indication in DAPS handover. |
| [37] R2-2108156  LG | Proposal 1: When relay UE receives ‘RRCReconfiguration’ including HO information from gNB, the relay UE sends PC5-S/PC5-RRC message to make suspend UL/DL data transmission/reception from its remote UE.  Proposal 2: After relay UE sends ‘RRCReconfigurationComplete’ to the gNB, the relay UE sends PC5-S/PC5-RRC message to its remote UE to inform HO completion.  Proposal 3: When remote UE receives PC5-S/PC5-RRC message informing HO completion from Relay UE, the remote UE can perform relay re-selection or send RRC re-establishment message to the relay UE’s new serving cell.  Proposal 4: When relay UE fails the HO procedure, the relay UE informs the HO failure to its remote UE.  Proposal 5: The remote UE receiving HO failure from its relay UE can trigger relay re-selection or maintain the current SL link based on its UE implementation.  Proposal 6: When the relay UE that has failed the HO completion with a new cell, the relay UE transmits PC5-S/PC5-RRC messages to the Remote UE for resuming UL/DL data transmission/reception. |

Since group mobility is not supported in R17, remote UE should release the indirect connection between NW upon relay UE’s handover. In RAN2 113b meeting, it’s agreed when relay performs HO to another gNB, relay UE may send a PC5-S message (similar to LTE) to its connected remote UE(s) and this message may trigger relay reselection. FFS other indication/message can also be used for notification.

During legacy handover, [22] propose to release remote UE upon handover initiation, i.e. reception of handover command. [37] propose to release remote UE upon HO completion. Before HO completion, the UL/DL data transmission is suspended. [22] further discuss how to release remote UE upon relay UE’s CHO, since relay UE may be configured with CHO. In CHO handover, same handling could be reused as legacy handover.

**Proposal 25: RAN2 to discuss when to release remote UE upon relay UE’s legacy or CHO handover.**

**Option 1: upon handover initiation,**

**Option 2: upon handover completion.**

[22] thinks remote UE doesn’t need to be released until source connection is released, since remote UE could still be served by source cell, during relay UE’s DAPS handover. However, relay UE is not be able to perform sideink transmission during DAPS according to R16 design. But RAN2 still need to decide how to release remote UE during relay UE’s DAPS handover.

**Proposal 26: RAN2 to discuss when to release remote UE during relay UE’s DAPS handover.**

# Others

**Rapporteur view:** proposals in this section are related to other Agenda Item. Rapporteur proposes to List them without proposals and can be further revisited later.

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| Tdoc | Proposal |
| [17] R2-2107623  Apple | Proposal 7 Remote UE triggers relay reselection, if one of the following conditions met: 1) relay UE fails to enter RRC\_CONNECTED within a certain time; 2) the number of failures of remote UE procedure due to relay UAC barring has reached or exceeded the configured threshold.  Proposal 8 RAN2 consider to add RRC state of relay UE as an additional AS layer criterion. |
| [26] R2-2108145  ZTE | Proposal 2: In order to ensure service continuity during RRC re-establishment procedure, it is suggested that RRC\_Connected remote UE prioritize the selection of relay UE served by the same cell or prioritize the selection of cell which serves the previously connected relay UE to initiate the RRC re-establishment. |
| [3] R2-2107044  MedaiTek | Proposal-2: The initial message (i.e. RRCSetupRequest) from Remote UE to gNB does not go through PC5 adaptation layer if PC5 adaptation layer is supported  Proposal-3: The Remote UE explicitly indicates its Remote UE ID to Relay UE when sending the initial RRC message (i.e. RRCSetupRequest) from Remote UE to gNB via Relay UE  Proposal-4b: Remote UE ID is put outside of the contained Uu RRCSetupRequest message within the PC5-RRC message that contains Uu RRCSetupRequest message from Remote UE.  Proposal-5a: The Relay UE explicitly indicates its Remote UE ID to gNB when forwarding the RRCSetupRequest from Relay UE to gNB.  Proposal-6b: Remote UE ID is put outside of the RRC message container (e.g. RRCReconfiguration message from gNB to Relay UE) that contains RRCSetup message going to Remote UE. |
| [13] R2-2107306  Intel | Proposal 2: Uu Adaptation is supported for relaying the first RRC message from the Remote UE via Relay UE.  Proposal 3: Agree that Relay UE informs the gNB of a new relaying connection request from the Remote UE upon receiving the first message from the Remote UE over PC5 RLC channel. |

# Conclusion

Following proposals are made,

**Proposal 1: RAN2 to discuss which Uu RLC configuration is used for remote UE’s SRB0 message.**

**Option 1, Fixed/specified.**

**Option 2, Default,**

**Option 3, NW configured.**

**[Easy]Proposal 2: Fixed/specified Uu RLC configuration for remote UE’s SRB1 message is not pursued.**

**[Easy]Proposal 3: Uu RLC configuration for remote UE’s SRB1 message such as RRCResume and RRCReestablishment message could be (re-)configured by NW via dedicated signalling.**

**Proposal 4: RAN2 to discuss whether default Uu RLC configuration for remote UE’s SRB1 message is supported.**

**Proposal 5: RAN2 to discuss whether dedicated signalling is used for the PC5 RLC and Uu RLC configuration of remote UE SRB1 for RRCReconfigurationComplete in path switch to indirect path.**

**[Easy]Proposal 6: During remote UE’s initial access, C-RNTI is included in the relevant RRC message, e.g. RRCSetup/RRCResume/RRCReestablishment.**

**[Easy]Proposal 7: During remote UE’s path switch, C-RNTI of remote UE in target cell is included in the relevant RRC message, e.g. RRCReconfiguration.**

**Proposal 8: RAN2 to discuss whether IDLE/INACTIVE remote UE provides 5G-S-TMSI/I-RNTI to IDLE/INACTIVE relay UE.**

**Proposal 9: RAN2 to discuss whether IDLE/INACTIVE Relay UE decodes received paging message to derive the 5G-S-TSMI/I-RNTI and forward the paging message accordingly.**

**Proposal 10: RAN2 to discuss whether IDLE/INACTIVE remote UE provides its Uu DRX cycle T to IDLE/INACTIVE relay UE.**

**[Easy]Proposal 11: INACTIVE relay UE doesn’t enter IDLE state upon receiving CN initiated paging for remote UE.**

**[Low priority]Proposal 12: RAN2 to discuss whether PO monitoring reduction for relay UE is considered in R17.**

**[Easy]Proposal 13: capture the flow chart and step description in [3] into 38.300 running CR.**

**[Easy]Proposal 14: PC5-RRC message is used to deliver SI to remote UE after PC-5 connection establishment. FFS whether to use new or existing PC5-RRC message.**

**Proposal 15: RAN2 to discuss which cast type is used for the PC5-RRC message delivering SI.**

**Proposal 16: In coverage remote UE should performs TAU/RNAU based on Relay UE’s serving cell information after it is PC5-connected with Relay UE.**

**P17a: After PC5-RRC establishment, OOC remote UE performs RNAU/TAU based on relay UE’s serving cell information.**

**P17b: After PC5-RRC establishment, RAN2 to discuss whether relay UE could perform RNAU/TAU on behalf of OOC remote UE.**

**[Easy]Proposal 18: As baseline, Remote UE and relay UE performs connection establishment/resume independently, i.e. relay UE shall enter CONNECTED to be able to forward remote UE’s initial RRC messages.**

**Proposal 19: Relay UE should inform gNB upon new connection request from remote UE.**

**Proposal 20: RAN2 to discuss whether Relay UE indicates remote UE, which sent SRB0 message, during T302 running. FFS whether this indication triggers relay reselection.**

**Proposal 21: RAN2 to discuss whether relay UE sends wait time to remote UE and the remote UE’s behaviour during wait time.**

**Proposal 22: RAN2 discuss how to handle T300 timer between remote UE and gNB, considering different RRC states of the relay UE.**

**Proposal 23: RAN2 to discuss whether relay UE could inform Uu RLF to remote UE via PC5 RRC message.**

**Proposal 24: RAN2 to discuss whether relay UE could choose not to release remote UE after Uu RLF in certain condition, e.g. relay UE selects the same cell to perform RRC re-establishment.**

**Proposal 25: RAN2 to discuss when to release remote UE upon relay UE’s legacy or CHO handover.**

**Option 1: upon handover initiation,**

**Option 2: upon handover completion.**

**Proposal 26: RAN2 to discuss when to release remote UE during relay UE’s DAPS handover.**

# Reference

[1] R2-2106989 Control Plane Procedures of L2 Relay CATT

[2] R2-2107039 Discussion on Control Plane Aspects for L2 Relay OPPO

[3] R2-2107044 Stage 2 level procedure for Connection Establishment MediaTek Inc.

[4] R2-2107103 Further discussion on RRC connection management of L2 U2N relay Qualcomm Incorporated

[5] R2-2107104 Further discussion on paging and SIB forwarding in L2 U2N relay Qualcomm Incorporated

[6] R2-2107176 Remaining issues on RRC connection management Samsung Electronics GmbH

[7] R2-2107231 Discussion on RRC connection management for L2 sidelink relay Huawei, HiSilicon

[8] R2-2107232 SI forwarding and paging for L2 sidelink relay Huawei, HiSilicon discussion

[9] R2-2107273 Connection Establishment Procedure for L2 UE to NW Relays InterDigital

[10] R2-2107274 Paging Procedures for L2 UE to NW Relays InterDigital discussion

[11] R2-2107275 SI Forwarding for L2 UE to NW Relays InterDigital discussion

[12] R2-2107304 Discussion on paging forwarding for a remote UE SHARP Corporation discussion

[13] R2-2107306 Remaining issues of L2 Relay connection management Intel Corporation

[14] R2-2107367 Discussion on control plane procedures for L2 U2N relay Spreadtrum Communications

[15] R2-2107541 Configuration of Uu Interface for Sidelink Relay Futurewei

[16] R2-2107622 Remaining issues on SIB forwarding for IDLE/INACTIVE remote UE Apple

[17] R2-2107623 Unified Access Control on Relay UE Apple

[18] R2-2107625 RNA Update via L2 UE-to-NW relay Apple

[19] R2-2107709 Paging delivery via L2 Relay in RRC\_CONNECTED Samsung

[20] R2-2107757 Way forward for L2 U2N Remote UE SRB0 SRB1 configuration vivo

[21] R2-2107966 Discussion on SI and paging delivery Xiaomi communications

[22] R2-2107967 Discussion on connection control Xiaomi communications

[23] R2-2108007 SI acquisition, CN Registration and RNAU Lenovo Mobile Com. Technology

[24] R2-2108008 Monitoring Paging by a U2N Relay Lenovo Mobile Com. Technology

[25] R2-2108060 L2 relay control plane procedures Sony discussion

[26] R2-2108145 Consideration on the connection management of SL relay ZTE, Sanechips

[27] R2-2108146 Consideration on the system information acquisition and paging in SL relay ZTE, Sanechips

[28] R2-2108153 SIB Delivery & Paging for Remote UE LG Electronics Inc

[29] R2-2108154 Connection Establishment LG Electronics Inc

[30] R2-2108192 Discussion on paging and SIB handling for L2 sidelink relay Ericsson

[31] R2-2108195 Discussion on RRC connection management procedures for L2 SL relay Ericsson

[32] R2-2108414 Discussion on SI and paging forwarding

[33] R2-2108458 Discussion on RRC connection establishment of remote UE in L2 U2N relay Nokia, Nokia Shanghai Bell

[34] R2-2108462 Support of idle mode mobility for remote-UE in SL UE-to-Nwk relay Nokia, Nokia Shanghai Bell

[35] R2-2108510 Control plane procedure CMCC

[36] R2-2108250 Sidelink Relay Uu RLC for Remote UE and Adaptation Layer Design Beijing Xiaomi Mobile Software

[37] R2-2108156 Relay reselection when Relay UE performs HO LG Electronics Inc