3GPP TSG-RAN WG3 #114bis-e draft R3-221082

Nov. 1~11, 2021

**Online**

**Agenda item: 23.3 (Specification of Control Plane procedures)**

**Source: Samsung (moderator)**

**Title: Summary of offline discussion on CB # SLRelay2\_ControlPlane**

**Document for: Approval**

# Introduction

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| **CB: # SLRelay2\_ControlPlane****- Architecture related open issues, i.e. termination points as well as related functionalities, local ID allocation.****- Procedure related open issues, i.e. remote/relay UE identification during initial access procedure, baseline flow chart for RRC establishment/resume/reestablishment.****- F1AP signalling design, i.e. F1AP signalling to configure remote UE, Uu/PC5 RLC channel configuration, mapping configuration.****- Capture agreements and open issues, provide CRs/TPs, if agreeable**(Samsung - moderator)Summary of offline disc [R3-221082](Inbox%5CR3-221082.zip) |

This e-mail discussion is divided into two phases:

* Phase I: View collection

Deadline: Wednesday, Jan. 19th, 2022, 11:00 UTC.

* Phase II:

Deadline: TBD

# For the Chairman’s Notes

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# Discussions

In this meeting, contributions are mainly discussing the open issues listed in last meeting. Companies seem to have consensus to the following open issues:

**Open issue 1: the termination point of Uu adaptation layer from protocol stack point of view (CU vs. DU)**

**Open issue 3: local ID allocation (CU vs. DU)**

**Open issue 6: F1AP signalling to configure remote UE with following options**

* **Option 1: via the UE-associated F1AP messages for remote UE**
* **Option 2: via the UE-associated F1AP message for relay UE**

Thus, the moderator gives the following set of proposals for agreements:

*Potential proposal 1: RAN3 can take the following as agreements:*

* *From protocol stack point of view, the termination point of Uu adaptation layer is located at gNB-DU*
* *gNB-CU is responsible for the allocation of local ID of remote UE*
* *Over F1, the remote UE is configured via the UE-associated F1AP messages for itself*

##### **Q1: Can companies agree the potential proposal 1? If better rewording is foreseen, please spell it out.**

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| Samsung | Yes |  |
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**Open issue 4: remote/relay UE identification during initial access procedure**

* Remote UE identification: the following proposals are given in this meeting:
	+ include local ID of remote UE from CU to DU via DL RRC Message [4,E///]
	+ include local ID from DU to CU via INITIAL UL RRC MESSAGE [5, ZTE] [10, Samsung]
	+ include the allocated local ID of remote UE to gNB-DU before initial access (e.g., when receiving SUI from the relay UE, the gNB-CU sends the allocated local ID to gNB-DU via UE CONTEXT MODIFICATION REQUEST message) [3, HW]
	+ include the updated local ID of remote UE from gNB-CU to gNB-DU [10, Samsung]
* Relay UE identification: the following proposal are given in this meeting:
	+ include the relay UE ID in the INITIAL UL RRC MESSAEG [1, CATT][3, HW][4, E///][8, ChinaTelecom][10, Samsung], the discussion point is which relay UE ID is included, i.e., C-RNTI vs relay UE gNB-DU F1AP UE ID
	+ no need to include relay UE ID in the INITIAL UL RRC MESSAGE [5, ZTE].

To summarize the above proposals, four aspects are addressed:

* identification of relay UE during initial access procedure

Should the gNB-CU be informed the associated relay UE via INITIAL UL RRC MESSAGE? Which ID is used (C-RNTI vs. F1AP UE ID)?

* identification of remote UE during initial access procedure

Whether the notification of local ID of remote UE (from CU to DU, or from DU to CU) is needed or not?

* identification of remote UE before initial access (e.g., during local ID allocation)

Should the gNB-DU be informed the local ID of remote UEs after gNB-CU allocates it according to the received SUI?

* identification of remote UE after initial access (e.g., update of local ID of remote UE)

Should the gNB-DU be informed the updated local ID of remote UE?

##### **Q2: please provide your view for the identification of relay/remote UE by considering the following aspects at least:**

* + - * 1. relay UE ID (C-RNTI vs. F1AP UE ID) notification via INITIAL UL RRC MESSAGE
				2. notification of local ID of remote UE (“from CU to DU”, or “from DU to CU”, or “not needed”) during initial access procedure
				3. notification of local ID of remote UE to the gNB-DU before initial access, e.g., after gNB-CU allocates it according to the received SUI
				4. notification of the updated local ID of remote UE to gNB-DU after initial access

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| Company | Comments |
| Samsung | a. yes. Either C-RNTI or F1AP UE ID is fine to usb. notification of local ID from DU to CU is needed to help the gNB-CU identify the remote UE, which has been allocated local ID before. c. no d. yes  |
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**Open issue 5: baseline flow chart for RRC establishment/resume/reestablishment for sidelink relay by considering CU-DU split**

In this meeting, [2, QC][3, HW][4, E///][5, ZTE][9, Lenovo][10,11, Samsung][12, CMCC]. Among those contributions, the following sidelink relay dedicated aspects are addressed for the RRC establishment/resume/reestablishment:

* + Local ID allocation for remote UE via SUI of relay UE
	+ Configuration of relay UE Uu RLC CH for relaying remote UE’s SRB message before remote UE initial access
	+ INITIAL UL RRC MESSAGE & DL RRC MESSAGE enhancement (if any, related to Open issue 4)
	+ Remote UE context setup, including PC5 RLC channel related configuration, mapping configuration
	+ Relay UE context modification, including Uu/PC5 RLC channel related configuration
	+ SRAP related operation at the gNB-DU side, e.g., add/remove SRAP subheader, mapping

Before developing stage-2 TP, it is better to have a common understanding on which aspects should be reflected in the procedures. In addition, the moderator would like also to collect views on how to develop the stage-2 procedures. In this meeting, majority companies draw new figures for the procedures, while [11, Samsung] propose to add sidelink relay dedicated aspects on top of the existing procedures in 38.401 since most of the steps in the current specification can be reused for sidelink relay.

##### **Q3:Please provide your views on baseline flow chart for RRC establishment/resume/reestablishment for sidelink relay by considering the following aspects at least:**

* The sidelink relay dedicated aspects reflected in the flow chart include the following:
	+ Local ID allocation for remote UE via SUI of relay UE
	+ Configuration of relay UE Uu RLC CH for relaying remote UE’s SRB message before remote UE initial access
	+ INITIAL UL RRC MESSAGE & DL RRC MESSAGE enhancement (if any, related to Open issue 4)
	+ Remote UE context setup, including PC5 RLC channel related configuration, mapping configuration
	+ Relay UE context modification, including Uu/PC5 RLC channel related configuration
	+ SRAP related operation at the gNB-DU side, e.g., add/remove SRAP subheader, mapping
* The flow chart is developed on top of existing ones or by drawing new ones

NOTE: the details stage-2 TP for the flow chart can be discussed in Phase 2.

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| Company | Comments |
| Samsung  | We are fine to include the aspects list above. We prefer to develop stage-2 text on top of existing ones.  |
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**Open issue 7: Uu/PC5 RLC channel configuration via F1AP**

[2, QC][3, HW] [6, ZTE][10, Samsung] address this issue in details for stage-3 signaling. The moderator gives the following proposal for discussion:

*Potential proposal 2: the UE context management procedures should be enhanced to include the Uu RLC channel and PC5 RLC channel related information, i.e.,*

* *UE CONTEXT SETUP REQUEST message: Uu RLC channel to be setup list (for relay UE), PC5 RLC channel to be setup list (for relay UE and remote UE)*
* *UE CONTEXT SETUP RESPONSE message: Uu RLC channel setup list (for relay UE), Uu RLC channel failed to setup list (for relay UE), PC5 RLC channel setup list (for relay UE and remote UE), PC5 RLC channel failed to setup list (for relay UE and remote UE)*
* *UE CONTEXT MODIFICATION REQUEST message: Uu RLC channel to be setup/modified/release list (for relay UE), PC5 RLC channel to be setup/modified/release list (for relay UE and remote UE)*
* *UE CONTEXT MODIFICATION RESPONSE message: Uu RLC channel setup/modified list (for relay UE), Uu RLC channel failed to setup/modified list (for relay UE), PC5 RLC channel setup/modified list (for relay UE and remote UE), PC5 RLC channel failed to setup/modified list (for relay UE and remote UE)*
* *UE CONTEXT MODIFICATION REQUIRED message: Uu RLC channel required to be modified/release list (for relay UE), PC5 RLC channel required to be modified/release list (for relay UE and remote UE)*
* *UE CONTEXT MODIFICATION CONFIRM message: Uu RLC channel modified list (for relay UE), PC5 RLC channel modified list (for relay UE and remote UE)*

##### **Q4: Can companies agree the potential proposal 2? If better rewording is foreseen, please spell it out.**

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| Samsung | Yes |  |
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In addition, some additional information has been proposed for PC5/Uu RLC CH, which include:

* QoS profile info (e.g., 5QI, priority, PDB, PER, etc)
* RLC mode
* Control plane traffic type (e.g., SRB ID or priority)

##### **Q5: Can companies agree to include QoS profile info., RLC mode, control plane traffic type for PC5/Uu RLC CH from gNB-CU to gNB-DU?**

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| Company | Yes/No | Comments |
| Samsung  | Yes  |  |
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**Open issue 8: mapping configuration via F1AP**

According to the contributions in this meeting, the following aspects are address

Determination of the mapping configuration

An intuitive thought is gNB-CU, which seems to be majority view. While, [9, Lenovo] has proposals for letting gNB-DU generating the mapping configuration. To have a clear discussion basis, it is better to have a common understanding on this.

Mapping configured via F1AP

For sidelink relay, the following types of mapping is needed for configuration:

* Type 1: mapping between DRB/SRB and Uu RLC CH at gNB-DU side
* Type 2: mapping between DRB/SRB and PC5 RLC CH at relay UE side
* Type 3: mapping between DRB/SRB and PC5 RLC CH at remote UE side

However, which configuration should be performed at the gNB-DU side is not decided yet.

Procedures for configuring the mapping

Two options are given in this meeting:

* Option 1 (relay UE’s F1AP message): for each Uu RLC Channel, the gNB-CU should indicate the DRB(s)/SRB(s) and the corresponding remote UE local ID, which are mapped to it
* Option 2 (remote UE’s F1AP message): for each SRB/DRB, the gNB-DU should indicate the mapped Uu RLC CH

Granularity to indicate the mapping between DRB and Uu RLC channel

Two options are given in this meeting:

* Option 1 (per DRB): each DRB can be indicated the mapped Uu RLC CH
* Option 2 (per tunnel): each tunnel can be indicated the mapped Uu RLC CH

##### **Q6:Please provide your views on mapping configuration via F1AP by considering the following aspects at least:**

* 1. Determination of the mapping configuration (gNB-CU vs. gNB-DU)
	2. Mapping configured via F1AP (type 1, type 2, type 3)
	3. Procedures for configuration the mapping (relay UE associated F1AP vs. remote UE associated F1AP)
	4. Granularity to indicate the mapping between DRB and Uu RLC channel (per DRB vs. per GTP-U tunnel)

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| Company | Comments |
| Samsung  | * + - * 1. gNB-CU determines mapping
				2. Only type 1 is needed when configuring the mapping via F1AP. Type 2&3 can be configured via RRC message
				3. Remote UE associated F1AP

This method can reduce the specification impact since it only needs to add the mapped Uu RLC CH for each SRB/DRB. In addition, this method may save the signaling overhead. Specifically, the Uu RLC CH may be established to aggregate multiple DRBs/SRBs. After setting up Uu RLC CH, once a new DRB/SRB is setup for remote UE, only the remote UE F1AP signaling is needed. However, if using relay UE F1AP, the remote UE F1AP signaling should be used first to set up DRB/SRB, and then the relay UE F1AP signaling should be used to configure the mapping. * + - * 1. The granularity is per GTP-U tunnel

This is more future-proof if the PDCP duplication/multiple path is supported in the future.  |
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**Open issue 2: responsibilities for sidelink relay related functionalities between gNB-CU and gNB-DU**

With the above discussion, this issue seems to be clear. To check companies view, the moderator use QC’s paper as the baseline for the responsibility of gNB-CU and gNB-DU by additionally including some proposals from HW’s paper. Then, the following potential proposal is given:

*Potential proposal 3: the following responsibility are defined for gNB-CU and gNB-DU, respectively, for sidelink relay:*

*gNB-CU’s responsibility:*

* *Local Remote UE ID allocation*
* *Remote UE and relay UE association and context maintenance*
* *Remote UE bearer mapping and multiplexing*
* *Relaying Uu/PC5 RLC channel management*
* *E2E QoS split management for relaying*
* *Dedicated thresholds for relay discovery*

*gNB-DU’s responsibility*

* *Uu adaptation layer (AL) support for CP/UP data*
* *Determine the RLC/MAC/PHY Configuration for the relaying Uu/PC5 RLC CHs of relay UE*
* *Dedicated resource pool for NR ProSe service (same as legacy)*

In addition, after determining the responsibility, the moderator wants to check companies view on if any stage-2 text should be added.

##### **Q7: Can companies agree the potential proposal 3? If company believe some stage-2 text is needed to clearly indicate the responsibility of gNB-CU and gNB-DU, please raise it out here.**

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| Company | Yes/No | Comments |
| Samsung | Yes | However, it seems to no need to have stage-2 text to reflect this since the stage-3 can reflect it clearly.  |
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**Other issues**

In this meeting, some additional issues are raised, which include:

* Inter-gNB-DU mobility ([3, HW])

The following proposal is given:

**Proposal 9: During Inter-DU Mobility procedure, local ID are allocated by the gNB-CU during the Remote UE context setup procedure, and gNB-CU/Target-DU shall associate the local ID with the F1AP UE ID of Remote UE.**

According to [3], the specification impact for the above proposal is to include the local ID in UE CONTEXT SETUP REQUEST message (i.e., step 3 in Fig. 5). Meanwhile, the contribution indicates that the RRCReconfiguration message to relay UE should include the new local ID of remote UE, which has been agreed in RAN2.

* Admission control at gNB-DU side for remote UE ([10, Samsung])

In legacy, the inclusion of DU to CU RRC Container IE is to indicate the admission at the gNB-DU side. However, for sidelink relay case, such IE may not be needed since the remote UE does not need Uu interface configuration. Thus, the presence of the *DU to CU RRC Container* IE cannot be used to indicate the admission result of gNB-DU for remote UE. In other words, the gNB-DU should provide an explicit indication in INITIAL RRC MESSAGE TRANSFER message to indicate the admission result of remote UE at gNB-DU, i.e.,

**Proposal 6-3: gNB-DU provides an explicit indication in INITIAL UL RRC MESSAGE TRANSFER to reflect the admission result of the remote UE.**

* Mapping configuration at the relay UE ([10, Samsung])

According to the running RRC CR, the mapping configuration at Relay UE contains the LCID of the egress Uu RLC channel, which aims at configuring UL mapping from E2E RB to Uu RLC bearer. Thus, the gNB-CU should be aware of the logical channel of Uu RLC bearer. Based on the legacy F1 signaling design, the logical channel assignment for Uu RLC channel is performed at the gNB-DU side, and then provided to the gNB-CU via RRC container when configuring the Uu RLC channel for the relay UE. In other words, the gNB-CU does not know the logical channel for Uu RLC channel so that the above “sl-Egress-RLC-Channel-Uu-r17” cannot be generated by the gNB-CU. To resolve this issue, the following options can be considered:

* Option 1: the gNB-CU provides LCID of the Uu RLC channel
* Option 2: the gNB-DU provides LCID of the Uu RLC channel along with the lower layer configuration for sidelink
* Option 3: change the RAN2 CR by indicating the Uu RLC channel ID instead of LCID

##### **Q8: Please provide your views on the following additional issues:**

Inter-gNB-DU mobility: the UE CONTEXT SETUP REQUEST message is enhanced to include local ID of remote UE

Admission control at gNB-DU side for remote UE: an explicit indication is added to INITIAL UL RRC MESSAGE TRANSFER to indicate the admission result of remote UE

Mapping configuration at the relay UE: select one option among Option 1/2/3

NOTE: if any other issues are missing, please raise it out here.

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| Company | Comments |
| Samsung  | 1. Agree
2. Agree
3. Option 2
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# Conclusion, Recommendations [if needed]

If needed

# References

[1] R3-220237 Discussion on the Open Issues of Control Plane Procedures (CATT)

[2] R3-220276 Control Plane procedures for U2N L2 relays (Qualcomm Incorporated)

[3] R3-220325 (TP for SLrelay BLCR for 38.473) Support of Uu adaptation layer for U2N relay (Huawei)

[4] R3-220350 Network signaling for NR SL Relay (Ericsson)

[5] R3-220375 Discussion on SL relay architecture and RRC connection management of remote UE (ZTE)

[6] R3-220376 Discussion on F1 signalling design for the PC5&Uu RLC channel and bearer mapping configuration (ZTE)

[7] R3-220377 (F1AP CR) Support of NR SL relay (ZTE)

[8] R3-220396 Discussion on control plane procedures for SL Relay (China Telecommunication)

[9] R3-220496 (TP for TS 38.401) Control plane issues on SL relay (Lenovo, Motorola Mobility)

[10] R3-220569 (TP to TS38.473 on sidelink relay) Discussion on open issues for sidelink relay (Samsung)

[11] R3-220570 CR to TS38.401 on Rel-17 Sidelink Relay (Samsung)

[12] R3-220867 Discussion on CP issue for SL relay (CMCC)