3GPP TSG-RAN WG3 #114-e draft R3-215913

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**  **- Impact on dis-aggregated gNB and split gNB architectures, e.g. RRC mngm, channel mapping?**  **- Wakes-up Relay UE in RRC\_IDLE/INACTIVE state for path switch, impact on NG and RAN2?**  **- Capture agreements and open issues.**  (Samsung - moderator)  Summary of offline disc |

Note: contribution [2] can be addressed in “**CB: # SLRelay1\_Authorization**”.

This e-mail discussion is divided into two phases:

* Phase I: View collection

Deadline: Wednesday, Nov. 3rd, 2021, 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 L2 U2N relay, which is the main focus of this CB.

## Aggregated gNB aspects

Among contributions in this meeting, [6, ZTE][7, Ericsson][9, CMCC][10, Samsung] address the discussion for sidelink relay under aggregated gNB. It seems that no impact is identified for aggregated gNB for system information, paging, and UE context retrieve for relay UE/remote UE. [7] raises an issue for direct to indirect path switch, i.e., “if the relay UE selected for path switching is in idle or inactive state, in that case the paging must come from the CN to wake up the relay UE. Therefore, some coordination between gNB and AMF would be expected to trigger the CN paging”, and [7] considers that some NG impacts may be needed. So, the issue can be summarized as “how to wake-up the candidate Relay UE in RRC\_IDLE/INACTIVE state for path switch”, which deserves some discussions in RAN3.

##### **Q1: Can companies acknowledge the issue, i.e., how to wake-up the candidate Relay UE in RRC\_IDLE/INACTIVE state for direct-to-indirect path switch? If the issue is acknowledged, please provide the potential solution. If additional issue is also identified, please raise it up here.**

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| Company | Yes/No | Comments |
| Samsung | Yes | We are not sure the solution via NG enhancement. In our mind, another option can be:   * relay UE can trigger the RRC establishment/resume procedure when receiving RRCReconfigurationComplete message (1st UL SRB1 message) from remote UE |
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## Split gNB aspects (L2 U2N relay)

In this meeting, several contributions address F1 impact in case of split gNB. It can be foreseen that if CU-DU split is in the scope of Rel-17 sidelink relay, RAN3 is responsible for the F1 enhancement in Rel-17 timeline. However, WI Rapp. indicates in [9] that “CU/DU architecture has not been identified in objectives of sidelink relay WI for L2 UE to network relay. The workload that may bring with F1AP should be evaluated in RAN3 and confirmed by RAN plenary.” Apparently, companies who discuss F1 impacts [3][4][5][8][10][12] may have different understandings. In moderator’s understanding, on one hand, RAN3 should be able to identify the potential F1 impacts; on the other hand, RAN3 should evaluate the workload caused by F1 impacts in order to ensure the timely completion of the WI. Thus, the following discussions are organized to address: 1) common understandings within RAN3 scope, 2) identified issues needing RAN3 discussion and/or RAN2 progress, 3) workload evaluation and the following actions due to F1 impact.

* Common understandings

According to the contributions in this meeting, the moderator list the following common understandings:

* + **Understanding 1**: F1 enhancement is needed to support L2 U2N relay
  + **Understanding 2**: over F1 interface, the remote UE is managed via the UE-associated F1AP messages for remote UE

This understanding indicates that the remote UE is not configured via the UE-associated F1AP messages for relay UE.

* + **Understanding 3**: Uu adaptation layer is located at the gNB-DU side [3, Huawei], [4, ZTE], [8, CATT], [10, Samsung]
  + **Understanding 4**: F1AP enhancements are needed to cover the PC5/Uu RLC channel configuration, and mapping configuration [3, Huawei][5, ZTE] [8, CATT] [12, Samsung]

In [3][8], the terminology of “adaptation layer configuration” is used. The moderator considers it is equivalent to PC5/Uu RLC channel configuration and mapping configuration.

##### **Q2: Can companies agree the above four understandings?**

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| Company | Yes/No | Comments |
| Samsung | Yes |  |
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* Identified issues

In the following, the issues identified by the contributions in this meeting are listed. To help the evaluation of work load in RAN3, the moderator gives the views from the following three aspects:

* **RAN3 work**: aiming at indicating the issues needing RAN3 discussion
* **RAN3 solution**: aiming at providing the potential solutions for the identified issue
* **RAN2 involvement**: aiming at analysing whether the above RAN3 work/solution can be discussed now, or should wait for RAN2 progress first.

NOTE: to stay focus of our discussion, the issues identified by only one company is not addressed here.

* + Issue 1: RRC establishment/resume/reestablishment procedure [3, Huawei][4, ZTE][10, Samsung]

For RRC establishment procedure, [3][4][10] gives the similar flow chart, i.e., the legacy UE initial access flow chart in TS38.401 is reused with the only exception that the RRC message transfer between gNB-DU and remote UE is relayed by the relay UE, and the moderator assumes one flow chart among [3][4][10] can be used as the starting point for RRC establishment procedure, which can be decided in RAN3 now. However, there are some open points needing further discussion, e.g., when local ID remote UE is allocated, when the step for preparing PC5 and Uu RLC channel for SRB1 of remote UE is performed, when the step for preparing PC5 and Uu RLC channel for SRB2/DRB of remote UE is performed, etc. Similarly, those open points are also applicable for RRC resume/ reestablishment procedure [10]. Moreover, these points rely on RAN2 progress.

*RAN3 work: RAN3 discusses baseline flow chart for RRC establishment/resume/reestablishment for sidelink relay by considering CU-DU split.*

*RAN3 solution: one of the flow charts in [3][4][10]can be considered as the starting point for RRC establishment procedure of remote UE*

*RAN2 involvement: RAN3 can make decision on the baseline flow chart based on those in [3][4][10]. While further details need wait for RAN2 progress, e.g., when local ID remote UE is allocated, when the step for preparing PC5 and Uu RLC channel for SRB1 of remote UE is performed, when the step for preparing PC5 and Uu RLC channel for SRB2/DRB of remote UE is performed, etc.*

##### **Q3: Can companies agree the above assessments for issue 1 (i.e., RRC establishment/resume/reestablishment procedure), including** *RAN3 work***,** *RAN3 solution***, and** *RAN2 involvement***?**

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| Company | Yes/No | Comments |
| Samsung | Yes | **RAN3 work**: agree  **RAN3 solution**: we are fine for either flow chart in [3][4][10].  **RAN2 involvement**: RAN3 can determine the baseline procedure for RRC establishment in this meeting. While other details can be discussed in next meeting based on RAN2 progress.  In addition, for the implementation timing on “*preparing PC5 and Uu RLC channel for SRB1 of remote UE”* and on *“preparing PC5 and Uu RLC channel for SRB2/DRB of remote UE”,* RAN3 can send LS to RAN2 for clarification |
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* + Issue 2: allocation of local ID of remote UE [3, Huawei][4, ZTE][10, Samsung]

This issue aims at discussing which node (gNB-CU and gNB-DU) assign the local ID of remote UE. [3] indicates that the responsible node of allocating local ID determines the scope of local ID so that this issue depends on RAN2 progress. On the other hand, as discussed in [10], if this local ID is gNB-CU specific, it can be only assigned by gNB-CU; otherwise (being gNB-DU specific, or cell-specific, or relay UE specific), it can be assigned either by gNB-CU or gNB-DU. It seems that allocation via gNB-CU is a feasible solution regardless of the detailed design in RAN2. Thus, the moderator considers that such issue can be discussed in RAN3 without RAN2 involvement.

*RAN3 work: RAN3 discusses local ID allocation via CU or DU.*

*RAN3 solution: gNB-CU allocates local ID of remote UE.*

*RAN2 involvement: RAN3 can make decision.*

##### **Q4: Can companies agree the above assessments for issue 2 (i.e., allocation of local ID of remote UE), including** *RAN3 work***,** *RAN3 solution***, and** *RAN2 involvement***?**

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| Company | Yes/No | Comments |
| Samsung | Yes | **RAN3 work**: agree  **RAN3 solution**: agree. Regardless of detailed design of local ID (e.g., CU-specific, DU-specific, Cell-specific, relay UE specific), gNB-CU can assign the local ID  **RAN2 involvement**: agree. It is pure RAN3 issue. |
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* + Issue 3: RLC channel configuration [3, Huawei][5, ZTE][12, Samsung]

This issue aims at discussing how to configure Uu RLC channel (for relay UE) and PC5 RLC Channel (for relay/remote UE). [3, Huawei] indicates that gNB-DU configures Uu RLC channel for relaying remote UE’s SRB message. [5, ZTE][12, Samsung] propose to use F1AP to configure the RLC channel, i.e., from CU to DU, the RLC channel to be added/modified/released list is included, while gNB-DU is responsible for the configuration generation. This issue is related to the following RAN2 agreements:

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| SRB0 (NW configures Uu RLC channel for SRB0, while fixed configuration is used for PC5 RLC CH for SRB0)  Proposal 6-1: [20/23] [Easy] For the delivery of remote UE’s SRB0 RRC message, specified (fixed) configuration is used for the configuration of PC5 RLC channel. FFS for the Uu RLC channel.  [Easy]Proposal 1: Uu RLC configuration for remote UE’s SRB0 message could be (re)configured by NW. FFS whether default configuration is supported. (17/20)  SRB1 for RRCResume and RRCReestablishment (NW configures PC5 RLC CH for SRB1 for RRCResume and RRCReestablishment)  Proposal 6-3: [23/23] [Easy] For the delivery of remote UE’s SRB1 RRC message such as RRCResume and RRCReestablishment message, default configuration is used for the configuration of PC5 RLC channel which can be reconfigured by network. FFS for Uu RLC channel.  SRB1 other than RRCResume and RRCReestablishment (NW configures PC5/Uu RLC CH for SRB1 other than RRCResume and RRCReestablishment)  Proposal 6-2: [21/23, 22/23] [Easy] For the delivery of remote UE’s SRB1 RRC message other than RRCResume and RRCReestablishment message, network configuration via dedicated signalling is used for the configuration of PC5 RLC channel and Uu RLC channel.  SRB2&DRB (NW configures PC5/Uu RLC CH for SRB2/DRB)  Proposal 6-4: [21/23, 22/23] [Easy] For the delivery of remote UE’s SRB2 RRC message, network configuration via dedicated signalling is used for the configuration of PC5 RLC channel and Uu RLC channel.  Proposal 6-5: [23/23, 23/23] [Easy] For the delivery of remote UE’s Uu DRB packet, network configuration via dedicated signalling is used for the configuration of PC5 RLC channel and Uu RLC channel. |

The above agreements can be summarized via the following table.

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|  | **SRB0** | **SRB1 for RRCResume/RRCRestablishment** | **Other SRB1** | **SRB2&DRB** |
| **PC5 RLC CH** | Fixed config. | NW configs. | NW configs. | NW configs. |
| **Uu RLC CH** | NW configs.  FFS default | FFS | NW configs. | NW configs. |

In case of CU-DU split, F1AP should support PC5 RLC CH configuration for SRB1/SRB2/DRB, and Uu RLC CH configuration for SRB0/other SRB1/SRB2/DRB. Thus, RAN3 can make decision for those configurations. In addition, in existing F1AP, the SL DRB to be Setup/Modified/Released list is included, and RAN3 can also discuss whether those existing IEs can be reused for PC5 RLC CH configurations for relay/remote UE. On the other hand, some discussions need RAN2 progress, e.g., the Uu RLC CH configuration for SRB1 for RRCResume/RRCReestablishment, whether SRB and DRB can share the same RLC CH, etc.

*RAN3 work: RAN3 can discuss Uu/PC5 context management via F1AP, and whether existing IEs can be reused or not*

*RAN3 solution: for relay/remote UE, F1AP signlaing introduces the Uu/PC5 RLC channel to be setup/modified/released list from CU to DU for SRB0 over Uu/SRB1(other than RRCResume/RRCReestablishment over Uu)/SRB2/DRB , and the admission result/DU side configurations from DU to CU*

*RAN2 involvement: RAN3 can make decision on the above solution. Further RAN2 progress is needed for detailed stage-3 signaling design, e.g., the Uu RLC CH configuration for SRB1 for RRCResume/RRCReestablishment, whether SRB and DRB can share the same RLC CH, etc*

##### **Q5: Can companies agree the above assessments for issue 3 (i.e., RLC channel configuration), including** *RAN3 work***,** *RAN3 solution***, and** *RAN2 involvement***?**

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| Company | Yes/No | Comments |
| Samsung | Yes | **RAN3 work**: agree  **RAN3 solution**: agree.  **RAN2 involvement**: agree. F1AP signaling design can be decided in RAN3. Stage-3 design detailed can wait for RAN2 progress. |
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* + Issue 4: mapping configuration [3, Huawei][5, ZTE][12, Samsung]

This issue aims at discussing how to configure the mapping at the gNB-DU, relay UE, and remote UE. According to the contributions, the following discussion points can be addressed:

- Responsibility of configuring mapping (CU vs. DU): [3] indicates that DU is responsible for this. While [5][12] indicates that gNB-CU should take the control.

- DL mapping configuration at gNB-DU: [5][12] indicates that gNB-CU can configure gNB-DU with DL mapping between remote UE’s RB/GTP-U tunnel and Uu RLC CH.

- Configuration signalling: [12] discusses two options for mapping configurations, i.e., option 1 – via remote UE F1AP message, and option 2 – via relay UE F1AP message, and [12] proposes to use option 1 for less specification impact.

On the other hand, the mapping configurations for relay UE and remote UE may need RAN2 further progress.

*RAN3 work: RAN3 can discuss the responsibility of configuring mapping (CU vs. DU), DL mapping configuration at the gNB-DU, and configuration signalling (remote UE F1AP vs. relay UE F1AP)*

*RAN3 solution: gNB-CU determines the mapping at gNB-DU/relay UE/remote UE, and gNB-CU configures the DL mapping between remote UE’s RB/GTP-U tunnel and Uu RLC CH at the gNB-DU side via remote UE F1AP messages.*

*RAN2 involvement: RAN3 can make decision on the above solution. Further RAN2 progress is needed for mapping configuration at relay/remote UE side.*

##### **Q6: Can companies agree the above assessments for issue 4 (i.e., mapping configuration), including** *RAN3 work***,** *RAN3 solution***, and** *RAN2 involvement***?**

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| Company | Yes/No | Comments |
| Samsung | Yes | **RAN3 work**: agree  **RAN3 solution**: agree. The mapping can be configured between GTP-U tunnel and Uu RLC CH, which is future-proof solution if the PDCP duplication is supported for slidelink relay.  **RAN2 involvement**: agree. The mapping configuration at relay/remote UE needs RAN2 progress. |
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* + Issue 5: UE identification [3, Huawei][4, ZTE][10, Samsung]

This issue includes two aspects:

- Identification of remote UE at gNB-CU side: this aspect is raised in [4], i.e., how to identify a remote UE based on the received INITIAL UL RRC MESSAGE TRANSFER message

- Identification of the associated relay UE at gNB-CU side: this aspect is raised in [3][10], i.e., how to identify the associated relay UE when receiving the INITIAL UL RRC MESSAGE TRANSFER message, and [3][10] propose to include ID of relay UE in such message.

In moderator understanding, some enhancements are needed for INITIAL UL RRC MESSAGE TRANSFER message since the existing message does not provide any information identifying remote UE/associated UE. There are some candidate options: 1) include ID of relay UE as proposed in [3][10], 2) include the local ID of remote UE, 3) include ID of relay UE and local ID of remote UE. Option 2)&3) needs RAN2 progress since it is related to when the local ID is assigned (before or after sending INITIAL UL RRC MESSAGE TRANSFER message).

*RAN3 work: RAN3 can discuss identification of remote UE and associated relay UE at gNB-CU side via INITIAL UL RRC MESSAGE TRANSFER message*

*RAN3 solution: three options can be considered to enhance INITIAL UL RRC MESSAGE TRANSFER message: 1) include ID of relay UE, 2) include local ID of remote UE, and 3) include ID of relay UE and local ID of remote UE.*

*RAN2 involvement: RAN3 can make decision on option 1) while option 2)&3) may need RAN2 progress on local ID allocation.*

##### **Q7: Can companies agree the above assessments for issue 5 (i.e., UE identification), including** *RAN3 work***,** *RAN3 solution***, and** *RAN2 involvement***?**

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| Company | Yes/No | Comments |
| Samsung | Yes | **RAN3 work**: agree  **RAN3 solution**: prefer to option 1, whether including local UE ID or not needs RAN2 progress  **RAN2 involvement**: the inclusion of local UE ID needs wait for RAN2 progress. Thus, RAN3 can decide to include relay UE ID first in this meeting. |
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* RAN3 workload evaluation and following-up actions

The above discussions have listed potential issues for sidelink relay when considering CU-DU split. To ensure the timely completion of WI, the workload introduced by F1 impact discussion should be evaluated in RAN3. The above identified issues can be the starting point for assessment. In addition, RAN3 should also discuss the follow-up actions in case that F1 impact should be discussed in Rel-17, which can be:

* Prepare an LS to RAN/RAN2 to inform RAN3’s intention on discussing F1 impact for Rel-17 sidelink relay, and indicate the additional workload is acceptable
* In the LS, some questions, if any, can be listed for RAN2 progress check and clarification.

##### **Q8: Can companies agree to consider F1 impact in Rel-17 sidelink relay? If yes, please also indicate the follow-up actions in RAN3 in this meeting (the above two actions can be potential candidates).**

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| Company | Yes/No | Comments |
| Samsung | Yes | According to the issues identified by companies in this meeting, the F1 impact is clear, and most of decisions can be made in RAN3, although some needs RAN2 progress for the detailed stage-3 design. Thus, **we agree to take F1 impact discussion in Rel-17**.  **We agree to take the above two following-up actions**. The first action can help RAN make update to the WID, and help RAN2 provide related agreements to RAN3. The second actions depend on the discussion in this meeting, if some questions are identified for RAN2 clarification, we can list those questions in the LS. |
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# Conclusion, Recommendations [if needed]

If needed

# References

[1] [R3-214914](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214914.zip) Control Plane procedures and Adaptation layer design for U2N relays (Qualcomm Incorporated)

[2] [R3-214964](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214964.zip) Support of NR ProSe authorization (Huawei)

[3] [R3-214965](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214965.zip) Discussion on the support of ProSe service (Huawei)

[4] [R3-214974](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214974.zip) RRC connection management of remote UE in CU/DU split scenario (ZTE, Sanechips)

[5] [R3-214975](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214975.zip) F1 impacts for the PC5/Uu RLC channel and bearer mapping configuration (ZTE, Sanechips)

[6] [R3-214976](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214976.zip) Discussion on the system information delivery and paging (ZTE, Sanechips)

[7] [R3-215286](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215286.zip) Path Switch in NR SL Relay (Ericsson)

[8] [R3-215598](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215598.zip) Discussion on RAN3 impact to support L2 SL Relaying (CATT)

[9] [R3-215702](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215702.zip) Discussion on CP issue for SL relay (CMCC)

[10] [R3-214879](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214879.zip) Discussion on RRC Connection Management for sidelink relay (Samsung)

[11] [R3-214880](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214880.zip) CR to TS38.401 on Sidelink Relay (Samsung)

[12] [R3-214881](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214881.zip) Discussion on PC5/Uu link and mapping configuration for sidelink relay (Samsung)