3GPP TSG-RAN WG3 #114-e Draft R3-215982

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 (Phase-II)

# For the Chairman’s Notes(Phase-I) – discussed online

[Easy agreements]

**Proposal 1: F1 enhancement is needed to support L2 U2N sidelink relay**

**Proposal 2: RAN3 considers the F1 impact in Rel-17 sidelink WI.**

**Proposal 3: the discussion on how to wake-up the candidate relay UE in RRC\_IDLE/INACTIVE state for direct-to-indirect path switch should wait for RAN2 progress first.**

[Open issue lists with potential WAs]

The following open issues are identified for further discussion by considering RAN2 progress.

* **Architecture related**
  + Open issue 1: the location of the Uu adaptation layer from protocol stack point of view (CU vs. DU)
  + Open issue 2: adaptation layer functionalities split between gNB-CU and gNB-DU
  + Open issue 3: local ID allocation
    - WA: gNB-CU allocates the local ID. Details of local ID design needs RAN2 progress
  + Open issue 4: remote/relay UE identification
    - In case that such identification is realized by INITIAL UL RRC MESSAGE TRANSFER message, the following three options can be considered
      * Option 1: include ID of relay UE
      * Option 2: include local ID of remote UE
      * Option 3: include ID of relay UE and local ID of remote UE
* **Procedure related**
  + Open issue 5: baseline flow chart for RRC establishment/resume/reestablishment for sidelink relay by considering CU-DU split
    - The procedures given in [3][4][10] can be taken as a starting point.
* **F1AP signalling design related** 
  + 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
  + Open issue 7: Uu/PC5 RLC channel configuration
    - WA: F1AP signalling is use to configure Uu/PC5 RLC channel, e.g., CU provides Uu/PC5 RLC channel to be setup/modified/release list, while DU responses with admission result and DU side configurations. FFS on stage-3 details.
  + Open issue 8: mapping configuration
    - WA: F1AP signalling should support the configuration of mapping between DL bearer of remote UE and Uu RLC channel

[Suggestion for Phase-II discussion]

Open issue 1/5/6 can be addressed in Phase-II

# Discussions

In this meeting, contributions are mainly discussing the L2 U2N relay, which is the main focus of this CB.

## Open issue refinement (Phase-II discussion)

* **Architecture related**
* Open issue 1: the termination point of Uu adaptation layer from protocol stack point of view (CU vs. DU)
* Open issue 2: responsibilities for sidelink relay related functionalities between gNB-CU and gNB-DU
* Open issue 3: local ID allocation (CU vs. DU)

The above three open issues have been discussed extensively online, and the moderator assumes that those open issues are acknowledged by the groups.

##### Q1: Can companies agree the above open issue 1/2/3?

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Samsung | Yes |  |
| Qualcomm | Yes |  |
| Lenovo, Motorola Mobility | Yes |  |
| CMCC | Yes |  |
| Nokia | Yes |  |
| Huawei | Yes |  |
| E/// | Yes |  |
|  |  |  |

* Open issue 4: remote/relay UE identification during initial access procedure
  + In case that such identification is realized by INITIAL UL RRC MESSAGE TRANSFER message, the following three options can be considered
    - Option 1: include ID of relay UE
    - Option 2: include local ID of remote UE
    - Option 3: include ID of relay UE and local ID of remote UE

The intention of this open issue is to discuss whether there is a need to identify the remote UE and the associated relay UE when sending the first UL SRB0 message from DU to CU. Thus, the above options are provided for further discussion.

##### Q2: Can companies agree the above open issue 4?

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Samsung | Yes |  |
| Qualcomm | Need modifications | Whether and how identification of remote UE is needed/done at CU depends on Open issue 6 i.e., whether there is a separate F1AP for each remote UE context or whether the remote UE RRC messages are forwarded to CU over the relay UEs F1AP  For instance, remote UE ID (listed in Option 2 and Option 3) is not needed over F1 if we select Option 2 (relay UEs F1AP) in Open issue 6. Hence, we propose to not list down any options and just acknowledge the open issue 4 as  Open issue 4: remote/relay UE identification during initial access procedure |
| Lenovo, Motorola Mobility |  | Suggestion from QC looks good, we don’t need to list the options. Alternatively, we can say  Open issue 4: remote/relay UE identification during initial access procedure if the identification is realized by INITIAL UL RRC MESSAGE TRANSFER message |
| CMCC |  | Same view with QC. |
| Nokia |  | Agree with QC’s modification.  It is not correct to say “realized by INITIAL UL RRC MESSAGE TRANSFER message”. The message cannot identify the remote/relay UE, but it is a question on whether need to introduce any addition ID in this message. So prefer QC’s modification. |
| Huawei |  | Prefer QC proposal |
| E/// |  | Share same view as QC |
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* **Procedure related**
* Open issue 5: baseline flow chart for RRC establishment/resume/reestablishment for sidelink relay by considering CU-DU split

In Phase-I summary, the moderator also provides some reference procedure as starting point as “The procedures given in [3][4][10] can be taken as a starting point”. However, some companies may be uncomfortable for this references. So, the reference is removed.

##### Q3: Can companies agree the above open issue 5?

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Samsung | Yes |  |
| Qualcomm | Yes |  |
| Lenovo, Motorola Mobility | Yes |  |
| CMCC | Yes |  |
| Nokia | Yes |  |
| Huawei | Yes |  |
| E/// | Yes | Agree means we will start from here or leave for next meeting? |
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* **F1AP signalling design related**
* 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
* Open issue 7: Uu/PC5 RLC channel configuration via F1AP
* Open issue 8: mapping configuration via F1AP

##### Q4: Can companies agree the above open issue 6/7/8?

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Samsung | Yes |  |
| Qualcomm | Yes |  |
| Lenovo, Motorola Mobility | Yes |  |
| CMCC | Yes |  |
| Nokia | Yes |  |
| Huawei | Yes |  |
| E/// | Yes |  |
|  |  |  |

##### Q5: If any important open issues are missing, please raise it out

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei |  | We note that there may be a logical order to approach this. For example, for us the following order makes sense: 1, 6, 4 |
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## 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.**

|  |  |  |
| --- | --- | --- |
| 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 |
| Qualcomm | Wait for RAN2 | RAN2 is still discussing whether Relay UE in RRC\_IDLE or RRC\_INACTIVE state should be supported for direct to indirect path switching. RAN3 should wait for RAN2 agreements before proceeding with this discussion. |
| CATT | Pending to RAN2 | Share the view with QC, RAN2 discussed whether the Relay UE could be in Inactive state, however there’s no consensus yet. |
| Nokia | Wait for RAN2 | It is premature to discuss it now. Let’s wait for RAN2 progress. |
| E/// | Wait for RAN2 | RAN2 is interacting with SA2 about which states for UE should be supported. Once the states are decided, RAN3 should figure out the solution to support patch switch. |
| Huawei | Wait for RAN2 | Agree to wait for RAN2. The solution from Samsung seems feasible. |
| China Telecom | Wait for RAN2 | Share the view with QC. |
| ZTE | Wait for RAN2 | Whether the RRC\_IDLE/INACTIVE relay UE can be selected for the direct to indirect path switch is still under RAN2 discussion. It is suggested to wait for RAN2’s progress. |
| Lenovo, Motorola Mobility | Wait for RAN2 | Same view as other companies. |
| CMCC | Wait for RAN2 | RRC state of relay UE is under RAN2 discussion, RAN3 can wait for RAN2 agreement. |
|  |  |  |

**Summary:**

9/10 companies prefer to wait for RAN2 progress first.

**Proposal: the discussion on how to wake-up the candidate relay UE in RRC\_IDLE/INACTIVE state for direct-to-indirect path switch should wait for RAN2 progress first.**

## 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?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Samsung | Yes |  |
| Qualcomm | See comments | Understanding 1 – Yes  Understanding 2 – Needs discussion. This is the first meeting we are discussing the sidelink relay architecture for split gNB. We have to evaluate the other option (remote UE is configured via the UE-associated F1AP messages for relay UE) as well along with pros/cons before arriving at such a fundamental agreement.  Understanding 3 – Similar comment as understanding 2. We have to first identify the functions associated with L2 sidelink relay (remote UE ID allocation, remote UE multiplexing, RLC channel assignment etc.) and decide whether all of it can be done by gNB-DU or there is benefit in having some adaptation layer functionalities in gNB-CU  Understanding 4 – Potentially yes, but first we have to decide the architecture. |
| CATT | See Comments | Understanding 1 - Yes  Understanding 2 – further discussion is needed.  Understanding 3 – Yes, RAN2 has decided that the UU adaption layer should be located in gNB.  Understanding 3 – Potential Yes, details should be further discussed. |
| Nokia | See Comments | Understanding 1: Yes  Understanding 2: this needs to be further discussed. Let’s list the options and have further analysis in next meeting.  Understanding 3: related to Understanding 2. Needs to be further discussed.  Understanding 4: Yes. The detail needs to be further discussed.  For this meeting, suggest have some high-level agreements, and options. |
| E/// | See comments | Understanding 1: Yes  Understanding 2, 3, 4: details are related to the functions of adaptation layer also RAN2’s progress. We are open to discuss possibilities, though it is better to list the open points for detailed discussion. |
| Huawei | Yes |  |
| China Telecom | See Comments | Understanding 1: Yes.  Understanding 2, 3: Further discussion is needed.  Understanding 4: Potentially yes, the details should be further discussed. |
| ZTE | See comments | Understanding 1 - Yes  Understanding 2 - Yes  Understanding 3 - Yes  Understanding 4 - we agree that the F1 interface need to consider the Uu/PC5 RLC channel and bearer mapping configuration. However, for the adaptation layer configuration, we think it should focus on the bearer mapping configuration. The PC5/Uu RLC channel configuration should be in RLC/MAC layer configuration scope. |
| Lenovo, Motorola Mobility | Yes with comment | We agree with the principle in general. As other companies commented, may need further discussion. |
| CMCC | See comments | Understanding 1 – Yes  Understanding 2,3,4，we are fine with the approach. These questions are related to the fundamental architecture issues. We should first make decisions on these issues as early as possible, since we only have three meetings cycle. So if not converged, we should at least list the options for further decision. |

**Summary**

* + Understanding 1: all companies agree
  + Understanding 2: (3/10) agrees, (7/10) needs further discussion. There are two options on the table for further discussions.
    - Option 1: remote UE is configured via the UE-associated F1AP messages for remote UE
    - Option 2: remote UE is configured via the UE-associated F1AP messages for relay UE
  + Understanding 3: (4/10) agrees, (6/10) needs further discussion. Based on comments, the moderator feels that there are two aspects needing further discussions:
    - The location of the Uu adaptation layer from protocol stack point of view
    - Adaptation layer functionalities split between gNB-CU and gNB-DU
  + Understanding 4: (4/10) agree, (3/10) potential agree with willing of taking further discussion, (3/10) express that further discussion is needed.

Thus, the moderator make the following proposal:

**Proposal: F1 enhancement is needed to support L2 U2N sidelink relay**

In addition, some open issues are given below with some potential options

* Open issue: F1AP signalling to configure remote UE
  + Option 1: via the UE-associated F1AP messages for remote UE
  + Option 2: via the UE-associated F1AP message for relay UE
* Open issue: protocol architecture with the following two aspects:
  + The location of the Uu adaptation layer from protocol stack point of view
  + Adaptation layer functionalities split between gNB-CU and gNB-DU
* Open issue: F1AP enhancements for PC5/Uu RLC channel configuration and mapping configuration (details are addressed in Q5&Q6)
* 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***?**

|  |  |  |
| --- | --- | --- |
| 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 |
| Qualcomm | See comments | **RAN3 work**: Agree  **RAN3 solution**: Maybe can wait till next meeting as there are too many open issues as highlighted by the moderator and it is not yet clear whether adaptation layer configuration is generated by CU or DU (depends on which entity is handling the multiplexing decision). Moreover, call flows need more work. For example, in the call flow in [3], relay UE is not shown to be configured before remote UE.  **RAN2 involvement:** Same comment as above. |
| CATT | See comments | **RAN3 work**: Agree  **RAN3 Solution:** Share the view with QC, the procedures and details should be further discussed.  **RAN2 involvement**: Yes, some details of the adaption layer are pending to RAN2. |
| Nokia | See comments | **RAN3 work**: ok for high level call flow.  **RAN3 solution**: the proposals can be listed as options to be further analyzed in next meeting.  **RAN2 involvement:** The detail of the flow chart pends on RAN2 progress. Let’s wait for RAN2 discussion. RAN2 discussion does not rely on RAN3 LS. So no need to send the LS. |
| E/// | See comments | **RAN3 work**: Agree  **RAN3 solution**: RAN2 is discussing about procedure for RRC establishment and others. TS 38.300 will be updated accordingly. RAN3’s work should be based on that. No rush to capture something and restructure later.  **RAN2 involvement**: Same comment as above |
| Huawei | Yes | **RAN3 work**: agree  **RAN3 solution**: agree, RAN3 can determine the baseline flow charts for CU-DU split.  **RAN2 involvement**: RAN3 can determine the baseline flow charts for CU-DU split and wait for RAN2 progress. |
| China Telecom | See Comments | **RAN3 work**: Agree  **RAN3 solution**: It is suggested to have some high-level agreements and the details can wait to the next meeting.  **RAN2 involvement**: Yes, the details of the adaption layer are pending to RAN2. |
| ZTE | Yes | **RAN3 work:** Agree  **RAN3 solution:** We may have brief discussion of the flow chart this meeting. The detailed flow chart may be captured in TP for the next meeting.  **RAN2 involvement**: We may wait for RAN2’s progress on these listed issues. |
| Lenovo, Motorola Mobility | Yes | **RAN3 work:** Agree  **RAN3 solution:** RAN3 can try to agree on some general principles first before diving into detailed flowchart**.**  **RAN2 involvement:** RAN2’s progress will definitely impact RAN3 solution. |
| CMCC | Yes | RAN3 work: Agree  RAN3 solution: RAN3 can select one flow charts in [3][4][10] as the starting point for RRC establishment procedure of remote UE  RAN2 involvement: RAN3 can determine the baseline flow charts for CU-DU split, some details may wait RAN2 progress. |

**Summary**

RAN3 work (baseline flow chart for RRC establishment/resume/reestablishment for sidelink relay by considering CU-DU split): All companies acknowledge this work.

RAN3 solution: (4/10) agrees to choose one option among [3][4][10] as a starting point. (3/10) agrees to have some high-level principles. (3/10) proposes to not rush to capture something.

RAN2 involvement: all companies agrees that RAN2 progress is needed.

Open issue: baseline flow chart for RRC establishment/resume/reestablishment for sidelink relay by considering CU-DU split

* + The procedures given in [3][4][10] can be taken as a starting point.
  + RAN2 progress is needed
  + 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. |
| Qualcomm | Yes | **RAN3 work**: Agree  **RAN3 solution:** RAN2 is still discussing how and when the local remote UE ID is assigned, and the size of the fields in the AL header.  Remote UE ID size is most likely going to be 5-8bits range. Also, the remote UE ID is used in relation to remote UE Source L2 ID and relay UE context. So, it probably makes sense to have the local ID as relay UE specific and gNB-CU to assign it.  But we think RAN3 should wait for RAN2 agreements before deciding as the uniqueness of remote UE ID (RAN2 ongoing discussion) should also dictate who assigns this ID.  **RAN2 involvement:** Wait for RAN2 agreements |
| CATT | Yes | **RAN3 work**: Agree  **RAN3** **solution**: Tend to agree.  **RAN2 involvement:** Agree, how to define the ID is pending to RAN2. |
| Nokia | See comments | Agree with QC. Ok for CU to assign the ID. But this is also related to RAN2 progress. Since this is the first RAN3 meeting, let’s wait for RAN2 discussion. |
| E/// | See comments | **RAN3 work**: Agree  **RAN3** **solution**: It is reasonable for CU to allocate the ID.  **RAN2 involvement:** Wait for definition from RAN2.  A possible approach is to make working assumption in RAN3 about possible solution. |
| Huawei | Yes | **RAN3 work**: Agree  **RAN3 solution:** RAN3 could outline the impact from possible solutions and wait for RAN2 to agree  **RAN2 involvement:** Wait for RAN2 agreements |
| China Telecom | Yes | **RAN3 work**: Agree  **RAN3** **solution**: Tend to agree the CU allocates local ID of remote UE.  **RAN2 involvement:** Agree, wait for RAN2 agreements. |
| ZTE | Yes | **RAN3 work**: Agree  **RAN3** **solution**: It is better for CU to the local ID of remote UE.  **RAN2 involvement:** We think RAN3 should make decision. RAN2 only discuss the local remote UE ID assignment from gNB perspective. They does not care about whether CU or DU is reponsible for this. So it is not necessary to wait for RAN2 agreements. |
| Lenovo, Motorola Mobility | Yes with comment | **RAN3 work**: Agree  **RAN3** **solution**: Agree  **RAN2 involvement:** we don’t foresee how it is relevant to RAN2 progress. |
| CMCC | See comments | RAN3 work: Agree  RAN3 solution: Agree with CU to assign the ID, for safety, we could make a working assumption  RAN2 involvement: Wait for definition from RAN2. |
|  |  |  |

**Summary**

RAN3 work (local ID allocation): All companies acknowledge this work.

RAN3 solution (CU vs. DU): (9/10) agree or tend to agree for CU allocation, (1/10) prefer to list possible solutions and wait for RAN2

RAN2 involvement: (3/10) agrees that this is RAN3 issue, while (7/10) thinks RAN2 progress is needed

Open issue: local ID allocation

* + WA: gNB-CU allocates the local ID. Details of local ID design needs RAN2 progress
  + RAN2 progress is needed
  + 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:

|  |
| --- |
| 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.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **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***?**

|  |  |  |
| --- | --- | --- |
| 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. |
| Qualcomm | See comments | RAN3 work: Agree  RAN3 solution: Architecture and function mapping should be finalized before discussing stage 3 details  RAN3 involvement: RAN3 can work on F1AP signaling with appropriate FFS once architecture is finalized. |
| CATT | See comments | RAN3 work: Agree  RAN3 solution: Share the view with QC.  RAN2 involvement: Agree |
| Nokia | Yes | **RAN3 work:** agree  **RAN3 solution**: agree in general.  **RAN2 involvement:** RAN3 can agree the high level aspects, e.g. F1AP procedure, but the detail need to wait for RAN2 progress. |
| E/// | See comments | **RAN3 work:** Agree  **RAN3 solution**: In principle fine, but for details, we would wait for RAN2 to be stable.  **RAN2 involvement**: high level aspects can be considered. |
| Huawei | Yes | **RAN3 work**: agree  **RAN3 solution**: We are open to discuss both solutions but we can compare pros/cons in next meeting.  **RAN2 involvement**: Agree |
| China Telecom | See comments | **RAN3 work**: Agree  **RAN3 solution**: Share the view with QC.  **RAN2 involvement**: Agree |
| ZTE | Agree | **RAN3 work**: Agree  **RAN3 solution**: Agree  **RAN2 involvement**: Agree |
| Lenovo, Motorola Mobility | Yes | **RAN3 work**: Agree  **RAN3 solution**: Agree in principle.  **RAN2 involvement**: Agree |
| CMCC | Yes | RAN3 work: Agree  RAN3 solution: agree in general  RAN2 involvement: RAN3 can agree high level aspects at this meeting, the details that are subject to RAN2 progress can be discussed at next meeting |

**Summary**

RAN3 work (RLC channel configuration): All companies acknowledge this work.

RAN3 solution: (6/10) agree or agree in general/principle, while (4/10) tend to discuss stage 3 details later

RAN2 involvement: all companies agree that stage-3 details can wait for RAN2 progress.

In addition, it seems that majority companies are fine to have some high-level aspects agreed in the meeting. Thus, the moderator gives the following summary.

Open issue: Uu/PC5 RLC channel configuration

* + WA: F1AP signalling is use to configure Uu/PC5 RLC channel, e.g., CU provides Uu/PC5 RLC channel to be setup/modified/release list, while DU responses with admission result and DU side configurations. FFS on stage-3 details.
  + RAN2 progress is needed for stage-3 details.
  + 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***?**

|  |  |  |
| --- | --- | --- |
| 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. |
| Qualcomm | Yes | RAN3 work: Agree  RAN3 solution: Similar comment as other questions. Architecture, adaptation layer location and function mapping have to be finalized first.  We could agree that “F1AP should support the configuration of DL bearer mapping between remote UE and Uu RLC channel.” But whether gNB-CU or gNB-DU determines the mapping and whether it is per GTP-U tunnel level can be discussed next meeting.  RAN2 involvement: Needed for complete design. |
| CATT | Yes | **RAN3 work:** Agree  **RAN3 solution:** Share the view with QC.  **RAN2 involvement:** Agree, further input from RAN2 is needed on mapping configuration. |
| Nokia | Yes | **RAN3 work:** agree  **RAN3 solution:** agree the high level aspects, e.g. F1AP procedure.The mapping based on RB and/or GTP-U need to be further discussed.  **RAN2 involvement**: agree |
| E/// | See comments | **RAN3 work:** Agree  **RAN3 solution:** Share similar view with QC.  **RAN2 involvement**: need to wait. |
| Huawei | Yes | **RAN3 work:** agree  **RAN3 solution:** Share the view with QC.  **RAN2 involvement**: agree |
| China Telecom | See comments | **RAN3 work:** Agree  **RAN3 solution:** Share the view with QC.  **RAN2 involvement**: Agree |
| ZTE | Agree | **RAN3 work:** Agree  **RAN3 solution:** we think it is feasible for gNB to determine the DL bearer mapping and use the remote UE associated F1AP to configure the bearer mapping. Meanwhile, we are open to other solutions at this stage.  **RAN2 involvement**: Agree |
| Lenovo, Motorola Mobility | Yes | **RAN3 work:** Agree  **RAN3 solution:** we can wait until adaptation layer configuration is more clear from RAN2.  **RAN2 involvement**: Agree |
| CMCC | Yes | RAN3 work: Agree  RAN3 solution: Same understanding as QC.  RAN2 involvement: Yes |
|  |  |  |

**Summary**

RAN3 work (mapping configuration): All companies acknowledge this work.

RAN3 solution: (9/10) indicates that F1AP signalling is used for DL mapping configuration. Among them, 6 companies can agree “F1AP should support the configuration of DL bearer mapping between remote UE and Uu RLC channel”

RAN2 involvement: all companies agree that RAN2 progress is needed.

It seems that majority companies are fine to have some high-level aspects agreed in the meeting. Thus, the moderator gives the following summary.

Open issue: mapping configuration

* + WA: F1AP signalling should support the configuration of mapping between DL bearer of remote UE and Uu RLC channel
  + RAN2 progress is needed for stage-3 details.
  + 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***?**

|  |  |  |
| --- | --- | --- |
| 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. |
| Qualcomm | See comments | RAN3 work: Agree  RAN3 solution: This is related to Understanding 2 in Q2. Whether and how identification of remote UE is needed/done at CU depends on whether there is a separate F1AP for each remote UE context or whether the remote UE RRC messages are forwarded to CU over the relay UEs F1AP  It also depends on whether AL is in CU or DU (the remote UE identifier information may or may not be included)  RAN2 involvement: Coordination needed, but RAN3 should focus first on architecture. |
| CATT | Yes | **RAN3 work**: agree  **RAN3 solution**: Share the view with QC, architecture work should be finalized first.  **RAN2 involvement**: Share the view with QC. |
| Nokia | Yes | **RAN3 work:** agree  **RAN3 solution:** Agree to discuss the options.  **RAN2 involvement**: Share the view with QC |
| E/// | See comments | **RAN3 work:** agree  **RAN3 solution:** Share similar view with QC  **RAN2 involvement**: wait patiently to proceed whole package in RAN3 |
| Huawei | Yes | **RAN3 work:** agree  **RAN3 solution:** We agree with QC.  **RAN2 involvement**: We agree with QC |
| China Telecom | See comments | **RAN3 work:** Agree  **RAN3 solution:** Share the view with QC.  **RAN2 involvement**: Wait for RAN2 progress. |
| ZTE | Yes | **RAN3 work:** Agree  **RAN3 solution:** We think the three solutions mentioned by the moderator can be used as a start point for discussion.  **RAN2 involvement**: we may start the discussion for better understanding the issue. However, the final solution selection should be based on the RAN2’s progress. |
| Lenovo, Motorola Mobility | Yes | **RAN3 work:** Agree  **RAN3 solution:** Agree with QC.  **RAN2 involvement**: Agree with QC |
| CMCC | Seen comments | RAN3 work: Agree  RAN3 solution: Same understanding as QC.  RAN2 involvement: Same understanding as QC.  **It seems decisions on the architecture is urgent and should be decided first, before making agreement on these issues** |

**Summary**

RAN3 work (remote/relay UE identification): All companies acknowledge this work.

RAN3 solution: (7/10) companies feel that architecture should be decided first. (2/10) supports the listed options for further discussion.

RAN2 involvement: All companies agree that coordination with RAN2 is needed.

Open issue: remote/relay UE identification

* + In case that such identification is realized by INITIAL UL RRC MESSAGE TRANSFER message, the following three options can be considered
    - Option 1: include ID of relay UE
    - Option 2: include local ID of remote UE
    - Option 3: include ID of relay UE and local ID of remote UE
  + Coordination with RAN2 is needed
* 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).**

|  |  |  |
| --- | --- | --- |
| 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. |
| Qualcomm | Yes | F1 impacts might be needed for split gNB and OK to send LS to RAN for WID update.  Otherwise, I don’t think we can make much progress on the fundamental questions (architecture, function mapping) just over the 2nd phase email discussion. We can come back next meeting with all the RAN3 work identified evaluating the pros/cons with each option. |
| CATT | See comments | Obviously, some F1 impacts are required if considering CU-DU split architecture for SL Relay. Support of the split gNB architecture may require more TU allocation in RAN3.  We are ok to send the LS to RAN and RAN2 to further confirm or update the WID scope. |
| Nokia | Yes | Agree the F1 impact is needed. Ok for LS to RAN to update the WID.  But not sure about the LS to RAN2. Anyway, RAN2 discussion does not rely on RAN3 LS. RAN3 just need to wait for RAN2 progress. |
| E/// | See comments | We don’t see the necessity of sending any LS to RAN or RAN2. Once the F1 impacts can be identified, the rapporteur or any company is free to update WID in next RP. |
| Huawei | Yes | Agree that F1 is impacted.  For the LS to RAN, we are not sure an LS is needed. The WID update can be handled by the rapporteur in RAN.  Similarly for RAN2, we have some sympathy with NOK that an LS may not be needed unless we want to request something from them. |
| China Telecom | See comments | Ok to send the LS to RAN to update the WID scope and evaluate RAN3 work at the next meeting. |
| ZTE | Yes | We agree to consider the F1 impact in Rel-17 SL relay since CU/DU split architecture is widely deployed.  We also not sure about the LS to RAN2. We think RAN3 can decide by itself whether F1 impact should be considered in Rel-17. |
| Lenovo, Motorola Mobility | See comments | Yes, there will be F1 impact to support R17 SL relay.  If RAN3 has specific question to consult RAN2, e.g., content of adaptation layer configuration, LS seems helpful. Otherwise, we don’t need to send LS to explain the expected work at RAN3. |
| CMCC | See comments | RAN3 can identify the F1 impacts and workload, the rapporteur can update WID in RP if it is necessary. LS to RAN is not needed.  The aspects that impact RAN3 are now under discussion in RAN2. LS to RAN2 seem not needed unless some issues we need RAN2 progress but RAN2 haven’t considered them yet. |

**Summary**

LS to RAN/RAN2: (5/10) agrees to send LS to RAN, (2/10) agrees to send LS to RAN2, (3/10) prefers not to send LS.

However, the above comments seem to indicate that companies are willing to discuss F1 impact in Rel-17 sidelink WI. Thus, the moderator makes the following proposal:

**Proposal: RAN3 considers the F1 impact in Rel-17 sidelink WI.**

# 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)