3GPP TSG-RAN WG2 Meeting#116e R2-21xxxxx

**Electronic meeting, Online, November 2021**

**Agenda item: 8.7.2.1**

**Source: Intel Corporation**

**Title: [Draft] Summary of agenda item 8.7.2.1 on Control plane procedures**

**Document for: Discussion and Decision**

1. Introduction

In this document, we provide the summary of AI 8.7.2.1 on Control plane procedures taking into account the email discussion from previous meeting i.e. [Post115-e][610][Relay] Control plane procedures (InterDigital).

Areas already covered in the email discussion are not discussed in this summary although some related sub-topics may be outlined. Due to the large number of proposals, the topics are categorized into first priority, second priority and so on depending on the FFS issues associated, number of companies that addressed the issues, etc. The suggestion is to start with the first priority topics and continue with second priority topics that are either straightforward or addressed by multiple companies.

1. System information left over issues

System information forwarding has been discussed in detail using multiple summary documents in the previous meeting. We outline the follow-up issues (FFS and open aspects from previous meeting) in this section and try to provide some easy and some to be discussed proposals.

* 1. First priority topics (FFS or open aspects from the previous meetings)
		1. Which SIB can Remote UE request?

We have the following FFS from the previous meeting.

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| FFS which SIBs the remote UE could request. |

This section provides a list of companies’ proposals related to which SIBs can the Remote UE request, which SIBs are excluded and which specific SIBs can be obtained.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Any SIB | OPPO, R2-2109414 | Proposal 4: Remote UE can request any SIBs, i.e. no specification restriction to forbid remote UE requesting a specific SIB. |
| Qualcomm, R2-2109419 | Proposal 11: For forward [compatibility](http://www.baidu.com/link?url=OtOCsDrXzrm4DJanblMkWrp2mtvQDUyTIneo9gm7iXRJsbXItm-Vo0d5g75LPy2OapQzVtkpKKiOdg3goosWYhDQV1KgC35niHGXp_Qj9V7) consideration, remote UE can request any SIB(s) from spec perspective. It doesn’t mean the remote UE needs to support the feature related to the request SIB. |
| CATT, R2-2109507 | Proposal 8: Remote UE can request any SIB from the linked relay UE. |
| China Telecom, R2-2109763 | Proposal 1: the remote UE could request any SIB. |
| Lenovo, Motorola Mobility , R2-2111190 | Proposal 2: When the remote UE is unable to acquire SI directly, the information on SIBs of interest to it is communicated to the linked relay UE.Proposal 3: The U2N relay maintains the information on SIB(s) of interest for each remote UE and stores/ maintains an updated version of such SIBs, required by one or more linked remote UEs.  |
| Except SIB1 | Interdigital, R2-2109930 | After PC5-RRC connection with a relay UE, all SIBs except SIB1 can be requested by the remote UE.MSG3-based SI request RRC message is used as the baseline for the PC5-RRC SI request messageA relay UE in RRC\_IDLE/RRC\_INACTIVE can perform SI request for multiple remote UEs and/or multiple SIs simultaneously.A relay UE in RRC\_CONNECTED performs dedicated SIB request for all SIBs associated with the SI request(s) it receives on PC5-RRC.[Rapp view]: Details of how to perform SI request can be discussed once the baseline is agreed. |
| Specific SIBs | ZTE, Sanechips, R2-2109860 | Proposal 1: The remote UE could request SIB1/SIB9/SIB12 in on-demand manner. |
| Vivo, R2-2110213 | Proposal 13 Support the following SIBs that the Remote UE could request in on-demand manner:* + - * + SIB2/SIB3/SIB4/SIB5;
				+ SIB12;
				+ SIBX (FFS new SIB or SIB12) related to NR sidelink discovery.
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| Notification based | Apple, R2-2110064 | Proposal 2 RAN2 stick to “one-shot” pull model and not support interest-based SI subscription between remote UE and relay UE. Proposal 3 After detecting SI change, Relay UE only notifies the remote UE about SIB number X if SIBx has been updated and then remote UE can trigger on-demand request if SIBx is relevant to remote UE. Proposal 4 Forwarding of ETWS or CMAS can be skipped if relay UE has already forwarded the same message to remote UE. |
| Xiaomi, R2-2110221 | Proposal 2: IDLE/INACTIVE Remote UE only inform the requested SI(s), of which it doesn’t have a valid version, as Uu.[Rapp view]: This does not have any specification impact. |
| Exclusion of SIBs | Ericsson, R2-2110688 | 1. The acquisition of SIB13 and SIB14 via relay UE is not supported (either on-demand or directly).
2. The acquisition of SIB9 and SIB10 via relay UE is not supported (either on-demand or directly).
3. The acquisition of positioning SIBs via relay UE is not supported (either on-demand or directly).
 |
|  | Vivo, R2-2110213 | Proposal 14 NOT support the following SIBs that the Remote UE could request in on-demand manner:* + - * + SIB9, SIB10, SIB11, SIBpos (any cross-WI feature is not supported)
				+ SIB13/SIB14 (LTE SL is not supported)
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Multiple companies (at least 6) indicate that the Remote UE can request any SIB. A couple of companies prefer to exclude the following SIBs: SIB1, SIB9, SIB10, SIB11, SIBpos, SIB13, SIB14. Two companies prefer to request only specific SIBs. One company prefers to support pull model as opposed to interest based model.

**Rapporteur’s suggestion:** Given the time limitation for the WI to complete, rapporteur thinks that we go with somewhat majority view to support request of any SIB as per Uu with some valid exceptions to be FFS.

**[Easy] Proposal 1. The Remote UE could request any SIB to be forwarded from Relay UE in an on-demand manner. FFS whether some SIBs such as SIB1, SIB9, SIB10, SIB11, SIBpos, SIB13, SIB14 are specified to be skipped.**

* + - 1. On-demand SIB request procedure

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| Merging multiple Remote UEs’ request | NEC, R2-2109696 | Proposal 4 When MSG3 based on-demand SI procedure is selected to obtain updated SI, Relay UE merges multiple UEs’ SI request information into only one MSG3.Proposal 5 Relay UE forwards the updated SI to specific Remote UE based on stored SI request information after receiving the updated SI via dedicated RRC signaling.[Rapp view]: Details of how updated SI is sent can be discussed once the baseline is agreed. |
| Interdigital, R2-2109930 | MSG3-based SI request RRC message is used as the baseline for the PC5-RRC SI request messageA relay UE in RRC\_IDLE/RRC\_INACTIVE can perform SI request for multiple remote UEs and/or multiple SIs simultaneously.A relay UE in RRC\_CONNECTED performs dedicated SIB request for all SIBs associated with the SI request(s) it receives on PC5-RRC.[Rapp view]: Further details of Relay UE RRC state based SI request can be discussed later. |

The on-demand SIB request procedure can be based on MSG3-based framework and Relay UE uses MSG3-based SI request to further request SIB over Uu for incoming request from Remote UE. Once the baseline is agreed, we can further discuss if the Relay UE can also merge multiple Remote UEs’ requests within one MSG3 request.

**[Easy] Proposal 2. Agree that the current Uu on-demand SI request procedure is used as baseline for PC5-RRC on-demand SI acquisition.**

**[Easy] Proposal 3. Agree that Relay UE uses MSG3 based SI request procedure to support Remote UE’s on-demand SIB request.**

* + 1. Relay UE voluntarily forwarding SIBs to Remote UE

We have the following FFS from the previous meeting:

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| FFS whether relay UE can voluntarily forward the SIBs/posSIBs to remote UE without a request. |
| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Can voluntarily forward any SIB | OPPO, R2-2109414 | Relay UE can voluntarily forward the SIBs/posSIBs to remote UE. |
| Qualcomm, R2-2109419 | Proposal 12: relay UE can voluntarily forward any SIBs/posSIBs to remote UE without a request based on its implementation. RAN2 don’t specify when/which SIB(s) are voluntarily forwarded by relay UE  |
| CATT, R2-2109507 | Proposal 9: Relay UE can voluntarily forward the SIBs/posSIBs to remote UE without a request.Proposal 10: Relay UE can voluntarily forward the SIBs/posSIBs to remote UE via SL broadcast. |
| China Telecom, R2-2109763 | Proposal 2: relay UE can voluntarily forward the SIBs/posSIBs to remote UE without a request. |
| Specific SIBs | ZTE, Sanechips, R2-2109860 | Proposal 5: After PC5 connection setup complete the relay UE may voluntarily forward the SIB1 and SIB12 to remote UE without a request. |
| Vivo, R2-2110213 | Proposal 15 Support the following SIBs that relay UE can voluntarily forward w/o request:* + - * + SIB1;
				+ SIB6/SIB7/SIB8.
 |
|  | Ericsson, R2-2110688 | The relay UE forwards SIB6/SIB7/SIB8 autonomously once that acquire them from the network. |
| Only SIB1 for UAC | Huawei, HiSilicon, R2-2109557 | Proposal 5: Relay UE directly forwards the SIB1 to remote UE via PC5 RRC, without the need of remote UE’s request. |
| Store the SIB types of Remote UE  | NEC, R2-2109696 | Proposal 1 RAN2 support that Relay UE can obtain updated SI on behalf of Remote UE with stored information and without a request.  |
| Forward changed/updated SIB to Remote UE | Interdigital, R2-2109930 | Other than on-demand case, a relay UE forwards SI to the attached remote UE(s) only when a particular SI needed by a remote UE has changed  |
| Samsung, R2-2110449 | Proposal 1. Relay UE can voluntarily forward updated SIB(s) to its Remote UE in RRC\_IDLE/RRC\_INACTIVE when the requested SIB(s) is updated.  |
| Intel, R2-2109959 | Proposal 3: Relay UE does not voluntarily forward SI to Remote UE unless triggered by short message notification.  |
| MTK, R2-2109544 | Proposal -2: Following the acquisition of the updated SI, the Relay UE should know Remote UE’s SIB interest before SIB forwarding. |
| Apple, R2-2110064 | Proposal 3 After detecting SI change, Relay UE only notifies the remote UE about SIB number X if SIBx has been updated and then remote UE can trigger on-demand request if SIBx is relevant to remote UE. |
| LG, R2-2110163  | Proposal 3: If relay UE detects SI change indication via short message for remote UE, the relay UE reports only changed SIB type to the remote UE. If remote UE is interesting in the reported SIB type from relay UE, the remote UE requests on-demand SIB to the relay UE. |
| Xiaomi, R2-2110221 | Proposal 1: SI, e.g. SIB1 and MIB, could be delivered by broadcast/groupcast to remote UE to reduce signaling. |
| Futurewei, R2-2111029 | Proposal 3: Using PC5 RRC message, a remote UE may provide a relay UE with a list of SIBs it is interested in receiving, and the relay UE forwards the current version of these SIBs to the remote UE, whenever there is update. |
| Lenovo, R2-2111190 | Proposal 3: The U2N relay maintains the information on SIB(s) of interest for each remote UE and stores/ maintains an updated version of such SIBs, required by one or more linked remote UEs.  |

For the FFS, there is also diverged view ranging from any SIB to specific SIBs to no forwarding for which SIBs to be voluntarily forwarded. But most companies agree that Relay UE can voluntarily forward SIBs to Remote UE.

**[Easy] Proposal 4. Agree that Relay UE can voluntarily forward [certain] SIBs to Remote UE. FFS for posSIB.**

**[Discuss] Proposal 5. If proposal 4 is agreed, discuss which option is preferable for the Relay UE to voluntarily forward it to the Remote UE:**

**Option a) any SIB (4)**

**Option b) only specific SIBs such as SIB1, SIB6, SIB7, SIB8 (4)**

**Option c) only updated SIB (9)**

* + 1. Relay UE Forwarding SIB before PC5-RRC establishment

As per SA2 LS [R2-2111236], Remote UE should be able to receive the list of non-serving PLMN IDs before it establishes connection to the network through the Relay UE. In general, SA2 has defined Relay Discovery Additional information (which is optional) to share system information. Companies think that the system information can be broadcast using a) Relay discovery message b) PC5 broadcast message. [2] prefers option a) suggesting that the UE might have to monitor both discovery and PC5 broadcast if we go with option b). We have the following options based on company views; the issue to discuss is whether it is mandatory for the remote UE to have the list of non-serving PLMN IDs before establishing PC5 connection.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Use PC5 to broadcast  | OPPO, *R2-2109414* | Proposal 1: Remote UE can receive the system information, i.e., list of non-serving PLMN IDs in the RAN sharing scenario before PC5 connection establishment with relay UE via new broadcast PC5-RRC message.Proposal 2: Define dedicated L2 ID for the forwarded SI if broadcast PC5-RRC is adopted.[Rapp view]: This can be discussed further once the baseline is agreed. |
| Spreadtrum Communications R2-2110121 | Proposal 1: Remote UE can receive the system information via PC5 before PC5 connection establishment with Relay UE. Proposal 2: Broadcast as baseline for SI forwarding before PC5 connection establishment with Relay UE. |
| Interdigital, R2-2109930 | Proposal 1: An L2 remote UE can receive system information from a relay UE before PC5-RRC connection establishment with the L2 RelayProposal 2: A broadcast PC5-RRC message is used by the relay UE to send system information to a remote UE before PC5-RRC connection establishment |
| Use Relay discovery additional information to reduce RAN2 spec impact | Qualcomm, R2-2109419 | Proposal 10: To help initiate RRC establishment for OOC remote UE, introduce the following essential bits from MIB/SIB1 in discovery message:* TAC (24bit), ranac (7bit), t300 (3bit), t319 (3bit), *useFullResumeID* (1bit), *cellBarred*(1bit) and *cellReservedForOperatorUse* (1bit) as mandatory fields.
* UAC configuration (~217bit) in “Relay Discovery Additional Information” as optional field
 |
| Huawei, HiSilicon, R2-2109557 | Proposal 2: There is no need to support the broadcast and groupcast based SI forwarding from relay UE to remote UEs.Proposal 4a: Include the *cellBarred* and *intraFreqReselection* from MIB in the discovery message. Proposal 4b: Include the *cellAccessRelatedInfo* from SIB1 in the discovery message.[Rapp view]: This can be discussed further once the baseline is agreed. |
| Intel R2-2109959 | Proposal 4a: Agree that system information is available to the (OOC) Remote UE before PC5 RRC connection establishment. Proposal 4b: Agree that Relay Discovery Additional information is utilized to broadcast system information of at least part or all of SIB1. There is no RAN2 specification impact. FFS the exact information that is forwarded.  |
| Either PC5 broadcast or discovery | China Telecom, R2-2109763 | Proposal 3: necessary parameters from system information can be forwarded by relay UE to remote UE before PC5 connection established. These information can be conveyed in discovery message or broadcast PC5 RRC message. |
| Vivo, R2-2110213 | Proposal 12 If RAN2 decide that L2 Remote UE can receive the system information via PC5 before PC5 connection establishment with L2 Relay UE, RAN2 to further discuss which option(s) of the PC5 signalling is used to carry the system information from L2 Relay UE to L2 Remote UE:- Option 1: Discovery message- Option 2: Broadcast PC5 RRC message. |
| No forwarding | CATT, R2-2109507 | Proposal 7: L2 Remote UE doesn’t receive the system information via PC5 before PC5 connection establishment with L2 Relay UE. |
| ZTE, Sanechips, R2-2109860 | Proposal 2: It is not necessary for relay UE to forward the system information to remote UE before the PC5 connection established with remote UE. |

**[Discuss] Proposal 6. Discuss based on SA2 recent LS [R2-2111236], how to enable Remote UE to receive the list of non-serving PLMN IDs before PC5 connection establishment.**

**Rapporteur’s suggestion:** Based on majority view from the contributions, and the understanding from SA2 LS it is noted that forwarding of system information from Relay UE to Remote UE before PC5 connection establishment should be supported.

**[Easy] Proposal 7. Agree that Relay UE supports forwarding of system information to Remote UE before PC5 connection establishment.**

**[Discuss] Proposal 8. If proposal 7 is agreed, discuss which option is preferable to enable forwarding of system information before PC5 connection establishment:**

1. **PC5 broadcast (2 + 2(either option) or 4)**
2. **Relay discovery additional information (3+2 (either option) or 5)**
	* 1. How to forward SIB after PC5 connection establishment

In this section, we discuss how SIB can be forwarded after PC5 connection establishment.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Using SL unicast | OPPO, R2-2109414 | Existing unicast PC5-RRC (e.g., RRCReconfigurationSL) is enough to deliver SI to remote UE after PC5 connection establishment.Remote UE can receive TAI after PC5 connection establishment with relay UE via unicast PC5-RRC message. [Rapp view]: This can be considered when the message content is discussed. |
| Huawei, HiSilicon, R2-2109557 | Proposal 1: Introduce two PC5 RRC procedures for SI request and delivery respectively, which are one-way procedures. |
| Intel, R2-2109959 | Proposal 1: A SI specific new PC5-RRC based *dedicatedSIBRequestSidelink*/ *dedicatedSIBResponseSidelink* message pair is defined for Remote UE to request on-demand SIB and obtain a response from the Relay UE.Proposal 2: RAN2 discuss whether SI and paging specific information are sent using one combined message or separate/new PC5 RRC based messages.  |
| Vivo, R2-2110213 | Proposal 16 Introduce a new PC5-RRC message to deliver SI to Remote UE which can be used for both voluntarily-forward case and the on-demand case.Proposal 17 Introduce a new PC5-RRC message to request SI to Relay UE which is used only for the on-demand case. |
| Futurewei, R2-2111029 | Proposal 3: Using PC5 RRC message, a remote UE may provide a relay UE with a list of SIBs it is interested in receiving, and the relay UE forwards the current version of these SIBs to the remote UE, whenever there is update. |
| OOC Remote UE Only via Unicast | Ericsson, R2-2110688 | RAN2 to confirm that a remote UE that is OOC can only request/receive SIBs via the relay UE via PC5-RRC. |
| Using SL broadcast and groupcast - support | Xiaomi, R2-2110221 | Proposal 1: SI, e.g. SIB1 and MIB, could be delivered by broadcast/groupcast to remote UE to reduce signaling. |
| Using SL broadcast – not support | Huawei, HiSilicon, R2-2109557 | Proposal 2: There is no need to support the broadcast and groupcast based SI forwarding from relay UE to remote UEs. |
| Groupcast or unicast or both; no SL broadcast | ZTE, Sanechips, R2-2109860 | Proposal 3: RAN2 is suggested to consider whether the groupcast PC5 signalling, dedicated PC5-RRC signalling, or both should be supported for system information forwarding. |
| Groupcast | Interdigital, R2-2109930 | Proposal 9:A relay UE can send SI to all PC5-RRC connected remote UEs using groupcast transmission on SL. |
| Lenovo, Motorola Mobility, R2-2111190 | 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. |

Based on the following agreement from previous meeting, we can discuss further about the unicast message:

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| Proposal 14: PC5-RRC message is used to deliver SI to remote UE after PC5 connection establishment. FFS whether to use new or existing PC5-RRC message. |

**[Discuss] Proposal 9. Discuss which option is preferable for the PC5-RRC message when Relay UE forwards SIB to Remote UE after PC5 connection establishment:**

1. **Two new SI dedicated messages, one for SI request and response; FFS message content/details (3)**
2. **Existing *RRCReconfigurationSidelink* message (1)**

**[Discuss]Proposal 10. Further discuss if SIB forwarding using broadcast [and groupcast] from Relay UE is allowed after PC5 connection establishment.**

**[Discuss]Proposal 11. Further discuss whether only OOC Remote UE can receive SIB from Relay UE using unicast option.**

* + 1. Reception of SI by in-coverage Remote UE

This issue was discussed during email discussion [605] in RAN2#114e but not discussed/concluded.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Reception of SI over Uu - supported | Qualcomm, R2-2109419 | For in-coverage Remote UE, it can receive SI either via Uu or relay based on its implementation |
| China Telecom, R2-2109763 | Proposal 4: direct reception of system information via Uu is supported for the in-coverage Remote UE. |
| Nokia, Nokia Shanghai Bell, R2-2109811 | Proposal 1: The in-coverage remote UE should be able to receive SI in addition via relay UE over Uu as well. |
| LG, R2- 2110163 | Proposal 1: When Remote UE and Relay UE are in RRC CONNECTED, we need to discuss how to handle the short message when remote UE monitors short message for remote UE.[Rapp view]: This is an optimization that can be considered once we agree to the baseline. |
| Vivo, R2-2110213 | Proposal 18 For L2 U2N relay, direct reception of SI via Uu is supported for in-coverage Remote UE. No specification impact is expected. |
| Lenovo, Motorola Mobility, R2-2111190 | Proposal 1: A remote UE may acquire system information of the serving cell on its own and when this is not possible it can request the L2 U2N relay UE to acquire the SIs on its behalf.  |
| Specific SIBs | Ericsson, R2-2110688 | A remote UE that is IC shall be allowed to acquire the necessary SI message via Uu broadcast.The remote UE needs to acquire SIB6/SIB7/SIB8 via Uu broadcast as baseline.  |

In general, several companies agree that it is up to Remote UE to acquire system information via Uu whenever it is IC/possible.

**[Easy] Proposal 12. As a baseline, Remote UE is allowed to acquire SIB over Uu irrespective of its PC5 connection to Relay UE. FFS if we allow only specific SIBs when PC5 connected.**

* 1. Other SIB forwarding issues [Second priority]

 SIB related topics brought up by mostly one company are outlined in this section. They can be discussed as second priority once we finalize and agree to the previous aspects.

**Rapporteur’s suggestion:** No proposal is yet provided in the below topics due to limited input from companies, but this can be revisited further once the baseline is agreed.

* + 1. Essential information to be broadcast and other optimizations

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Not entire SIB, essential parts of MIB/SIB1 | Qualcomm, R2-2109419 | Proposal 8: To initiate RRC establishment, remote UE in OOC can receive some essential bits of MIB/SIB1 before PC5 connection with relay UE. And the entire SIB(s) don’t need to be broadcast before PC5 connection.Proposal 9: The essential bits of MIB/SIB1 for RRC establishment are only ~152 bits, including PLMN ID (~75bit), TAC (24bit), ranac (7bit), cell ID (36bit), t300 (3bit), t319 (3bit), *useFullResumeID* (1bit) *cellBarred*(1bit) and *cellReservedForOperatorUse* (1bit). And UAC configuration can be optionally provided.[Rapp view]: This can be discussed further once the baseline is agreed.  |
| Save on broadcast transmission resources | Spreadtrum Communications R2-2110121 | Proposal 3: Relay UE only forwards the system information when it does not detect the same system information from other Relay UEs. [Rapp view]: This can be discussed further once the baseline is agreed. |

* + 1. How to forward SIB optimizations

There were a couple of different optimizations and details on how system information can be forwarded (not specific to before or after PC5 establishment).

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Using PC5-RRC sent in broadcast for request | Interdigital, R2-2109930 | A remote UE can use PC5-RRC SI request mechanism to obtain system information (at least SIB1) from the relay UE before PC5-RRC connection with the relay UE[Rapp view]: This is an optimization that can be considered once baseline of how to forward SIB is finalized. |
| Store the SIB types of Remote UE  | NEC, R2-2109696 | Proposal 2 New variable or new IE in UE context shall be introduced to store the SIB type(s) requested by Remote UE.Proposal 3 The stored SIB type(s) for specific Remote UE shall be canceled when it is in coverage of one cell.[Rapp view]: This can be discussed further once the baseline is agreed.  |

* + 1. SIB format and segmentation

There are some further views on whether segmented SIB or full SIB only can be forwarded. These details can be discussed once the rest of the SIB framework is finalized.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Support for On-demand Request of SIB segments | Nokia, Nokia Shanghai Bell R2-2109811 | Proposal 6: The remote UE that may have missed one or more individual SIB12 segments, should only request the missing SIB12 segments (instead of complete SIB12).Proposal 7: The UE performing cell-reselection, should only request the missing SIB12 segments (instead of complete SIB12) in the new cell if the content of the SIB12 in the new cell is identical to the previous cell. |
| Full SIB forwarded | Ericsson, R2-2110688 | A full SIB is relayed by the relay UE to the remote UE (FFS on the stage3 details e.g., whether the SIB is delivered in an OCTET STRING). |
| New SIB or existing SIB for relaying | Ericsson, R2-2110688 | RAN2 to discuss whether a new SIB is needed for sidelink relay or whether the existing NR sidelink SIB can be re-used. |

* + 1. On-demand SIB Request and reject

This is the case when an on-demand SIB request from remote UE cannot be decoded by the Relay UE and has to be rejected. We think that this is somewhat similar to connection management scenarios when Relay UE fails to perform connection establishment and might have to reject Remote UE’s request. There is no consensus on that issue as companies think that other mechanisms can be used rather than reject. Furthermore, these details can be discussed once the rest of the SIB framework is finalized.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| SIB Request Reject | LG, R2- 2110163 | Proposal 4: When remote UE requests the relay UE on-demand SIB, there is the case that relay UE cannot decode the requested SIB due to capability differences. 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. |

* + 1. Inter-cell SI reception

In this sub-section, it is discussed about the case when the Remote UE camped in a cell receives SI broadcast from the Relay UE which is camped in a different cell. These details can be discussed once the rest of the SIB framework is finalized.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Inter-cell SI reception | Nokia, Nokia Shanghai Bell R2-2109811 | Proposal 2: Intra-cell scenario should be considered by RAN2 for receiving SIs via Uu and/or PC5 interface.Proposal 3: Inter-cell scenario should be considered by RAN2 for receiving SIs via Uu and/or PC5 interface.Proposal 4: RAN-2 to discuss how to handle SI reception via different paths (PC5 and Uu) inter-cell UE-to-Nwk relay scenario, where SIs (associated to different cells) may differ.Proposal 5: RAN2 to discuss whether a custom SIB is provided to remote UE(s) to address UE specific requirements in a multi-cell scenario where a remote UE may receive the SIB either on Uu and/or over PC5 interface via the relay UE. |

* + 1. System Information Area ID monitoring

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| System Information Area ID  | Sony, R2-211350 | Proposal 1: RAN2 to address the scenario that relay UE and remote UE are in different cell coverages and the SIA ID of requested SIB could be different.Proposal 2: Relay UE monitors any SIB update including *systemInformationAreaID* for the SIBs that remote UE requests for. |

* 1. Miscellaneous [Third priority]

In this section we highlight further topics raised by individual companies.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| SI Request prohibit timer | Samsung, R2-2110449 | Proposal 3. A timer can be introduced to restrict frequent SI delivery requests by RRC\_IDLE/RRC\_INACTIVE Remote UE via PC5-RRC. |
| ETWS or CMAS capable Remote UEs | Samsung, R2-2110449 | Proposal 2. Relay UE can forward PWS SIB(s) only to ETWS or CMAS capable Remote UEs. |
| Issue with forwarding SIB9 | Nokia, Nokia Shanghai Bell R2-2110470 | Proposal 1: RAN2 to discuss how to handle the forwarding of SIB9 i.e. by looking at how to interpret the SFN boundary provided in the ReferenceTimeInfo.(**Observation 3:** The remote UE may not be able to determine which SFN the timestamp applies to, as it is implicitly defined based on the end of the SI-window it was delivered at the Uu interface to the relay UE and not over PC5.) |

**Rapporteur’s suggestion:** No proposal is yet proposed in this sub-section but this can be revisited further once the baseline is agreed.

1. Paging

Additional paging related topics not covered in email discussion [610] are discussed in this section.

* 1. Forwarding Remote UE ID to network [First priority]

To support the network’s visibility to the Remote UE’s ID for the case when Remote UE is in RRC\_IDLE/INACTIVE, and Relay UE is in RRC\_CONNECTED, the Remote UE ID is to be forwarded to the network.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| UE Assistance information | OPPO, R2-2109414 | UEAssistanceInformation can be used to report 5G-S-TMSI / I-RNTI of each remote UE has PC5 RRC connection with it to NW. |
| SidelinkUEInformation | Qualcomm, R2-2109419 | Proposal 6: For CONNECTED relay UE to send paging record of IDLE remote UE in dedicated RRC message, it notifies gNB IDLE remote UEs’ 5G-S-TMSI via SUI  |
| SHARP, R2-2109644 | Proposal 1: For the case that Relay UE is not configured with CSS, a dedicated message is used to report the paging information of the remote UE(s) which requires paging monitor via the relay UE.Proposal 2: For the case that Relay UE is not configured with CSS, a dedicated message is used to update the paging information of the remote UE(s) which requires paging monitor via the relay UE when a PC5 connection is released.Proposal 3: Use existing Sidelink UE information for NR sidelink communication to report the paging information of the remote UE(s). |
| SUI Not needed for INACTIVE Remote UE. | Qualcomm, R2-2109419 | Proposal 7: For INACTIVE remote UE connecting to CONNECTED relay UE, RAN2 confirm that gNB can directly include their paging record in dedicated RRC message towards the relay UE[Rapp view]: Relay UE message to gNB still under discussion; |
| New message | Huawei, HiSilicon, R2-2109557 | Proposal 7a: Connected relay UE reports the 5G-S-TMSI/I-RNTI list of its connected remote UEs to gNB.Proposal 7b: New Uu UL RRC message is introduced for all the U2N relay specific reporting from relay UE to gNB. |
| No preference provided | Samsung, R2-2110450 | Proposal 3. For paging delivery to RRC\_IDLE/RRC\_INACTIVE Remote UE, RRC\_CONNECTED Relay UE can provide gNB with its PC5 connected Remote UE’s 5G-S-TMSI/I-RNTI if *pagingSearchSpace* is not configured in the active DL BWP. |
| Lenovo, Motorola Mobility R2-2109729 | Proposal 3: An updated 5G S-TMSI list must be sent by a U2N relay to the gNB. |

**[Discuss] Proposal 13. Discuss which one of the following options is preferable to be used by Relay UE to notify Remote UE ID (i.e. 5G-S-TMSI/I-RNTI) information to the gNB for paging delivery purpose:**

1. **UE Assistance information (1)**
2. **SidelinkUEInformation (2)**
3. **New RRC message (1)**
	1. Paging message [First priority]

While [610] email discussion is handling the contents of the PC5-RRC paging message delivering paging to Remote UE, in this section we try to evaluate how it works alongside system information delivery message based on some of the company proposals.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Paging message details | Vivo, R2-2110213 | Proposal 19 Introduce a new PC5-RRC message to deliver paging message to Remote UE which is the same PC5-RRC message for SI delivery.Proposal 20 Introduce a new PC5-RRC message to deliver paging monitoring request to Relay UE which is the same PC5-RRC message for SI request.[Rapp view]This is dependent on SI delivery message progress.  |
| Paging request | R2-2109729 Lenovo, Motorola Mobility | Proposal 2: A U2N relay shall confirm if it can monitor requesting Remote’s POs.[Rapp view] This is dependent on SI delivery message progress.And related to the request message and message format. |

This discussion is related to proposal 9. Similar to SI delivery, we can also consider whether new or existing PC5-RRC message is used for paging delivery.

**[Discuss] Proposal 14a. Discuss whether the SI delivery and paging delivery use the same PC5-RRC message or separate PC5-RRC messages (taking into consideration that both form a request/response format as per proposal 9).**

**[Discuss] Proposal 14b. Discuss whether the paging delivery uses new or existing PC5-RRC message.**

* 1. Further paging details [Second priority]

Several companies brought up additional details (e.g. stage-3) on the paging topic and some of the proposals from companies that are similar to those covered in the email discussion are not discussed in this summary; while further next stage details are summarized here that can be discussed if there is support and time.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Duplication of paging message transfer | CATT, R2-2109508 | Proposal 3: Even if gNB transmits the paging through dedicated RRC message to relay UE, it shall also transmit the paging information of RRC\_IDLE/RRC\_INACTIVE remote UE at the remote UE’s paging occasion.Proposal 4: If gNB delivery of the remote UE’s paging to relay UE through dedicated RRC message is supported, gNB needs to duplicate the paging message of the remote UE to transmit it via both paging message and dedicated RRC message. |
| SL paging monitoring occasions | Interdigital, R2-2109929 | A minimum set of SL monitoring slots for a remote UE in RRC\_IDLE/RRC\_INACTIVE and PC5-RRC connected to a relay UE is defined relative to the PO timing of the remote UE. |
| Relay UE skipping monitoring PO | Interdigital, R2-2109929 | A relay UE can skip monitoring of POs of one or more remote UEs based on network indication.  |
| Inform Relay UE of Remote UE RRC state | Interdigital, R2-2109929 | The remote UE informs the relay UE of a state transition and the new RRC state of the remote UE.[Rapp view] We have the following FFS in the proposal in [610] where it could be covered.Proposal 3: *Relay UE determines all parameters except for the UE specific DRX cycle and the UE ID, from the relay’s own acquisition of SIB1. FFS details of what the remote UE provides to the relay UE for the remote UE’s UE specific DRX cycle. [20/23]* |
| Paging priority | Huawei, HiSilicon, R2-2109557 | Proposal 9: RAN2 to discuss whether gNB should provide relay UE with the information of the paging priority per paging message. |
| Paging occasion alignment | Huawei, HiSilicon, R2-2109557 | Proposal 10: RAN2 to discuss whether there is need to consider paging occasion optimization for power saving of the relay UE, e.g. make the POs of remote UE and relay UE overlap. (A straight forwarding way is to make POs of remote UE and relay UE overlapped is by requesting a new 5G-S-TMSI, which can reduce the wake up time for the relay UE.) |
| Alignment  | Ericsson, R2-2110688 | RAN2 to discuss how to align the remote UE’s paging DRX and the relay UE’s Uu DRX need to be aligned between each other when the network wants to page a remote UE in RRC\_IDLE/RRC\_INACTIVE via a relay UE in RRC\_CONNECTED via dedicated RRC signalling. |
| Paging message construction | ASUSTek, R2-2111003 | Proposal 1: The construction of information of paging received on SL-SRB3 is aligned with the construction of the Paging message received on PCCH.Proposal 2: gNB sends the Paging message on DCCH to the relay UE for the paged remote UE(s). gNB can include the PagingRecord entries for the paged remote UE(s) in the Paging message sent on DCCH.Proposal 3: The relay UE sends the Paging message on SL-SRB3 to the paged remote UE(s).Proposal 4: The current paging procedure is reused for the remote UE to handle the Paging message received on SL-SRB3. |

**Rapporteur’s suggestion:** No proposal is yet proposed in this sub-section due to limited company input and to focus on other higher priority proposals but this can be revisited further once the baseline is agreed.

1. Access Control
	1. Cause value [First priority]

As part of the response to RAN2 **LS on establishment/resume cause value and UAC on L2 SL Relay**, CT1 provided a response LS as per the following:

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| Option 1: define a new establishment/resume cause value that is used for all cases when a relay UE establish/resume an RRC connection due to a connection of remote UE;Option 2: reuse existing establishment/resume cause values.***Question 1:*** *Which option does CT1 prefer?***Answer 1:** CT1 cannot reach the consensus on which option is preferred. It is up to RAN2 to progress Option 1 or Option 2. |

In general, the establishment/resume cause value is provided by the upper layer or derived at the AS layer. Based on CT1 preference that the relay UE may skip the UAC procedure when establishing RRC connection for relaying purpose only, some companies agreed and indicate the same. Furthermore, [20] discusses “One limitation with the use of a new establishment cause, however, is that the network may be unable to distinguish accesses at the remote UE that should be considered as higher priority, such as when the remote UE attempts an emergency access, or a re-establishment following a HO or RLF. *”* in support of Remote UE sending its specific cause value to Relay UE; but prefer to use new cause value in general.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| New Cause Value | OPPO, R2-2109414 | New cause value should be defined for relay UE to establish/resume an RRC connection due to a connection of remote UE.RAN2 not pursue remote UE sending cause value to relay UE for RRC connection establishment /resumption. |
| Interdigital,R2-2109934 | A new Establishment/Resume cause value is introduced for a relay UE access triggered by a remote UE access. |
| Reuse and forward Remote UE’s cause value | Huawei, HiSilicon, R2-2109556 | Proposal 3: Relay UE reuses the existing establishment/resume cause values, by copying the one in remote UE’s Msg3, in case the relay UE’s establishment/resume procedure is triggered by the remote UE. |
| Intel, R2-2109964 | Proposal 2: Remote UE provides the establishment/resume cause value to the Relay UE using existing or new PC5-RRC message.Proposal 3: Relay UE uses remote UE’s establishment/resume cause when the relay UE establish/resume an RRC connection due to a relaying connection from remote UE. |
| Xiaomi, R2-2110222 | Proposal 1: Remote UE indicate its cause value to relay UE. |
| Reuse cause value (which one is not mentioned) | Xiaomi, Apple, Lenovo, Motorola Mobility, R2-2110363 | Proposal: Reuse existing establishment/resume cause value for relay UE when relay UE enter RRC\_CONNECTED only for relaying purpose. |
| Reuse and forward Remote UE’s cause value for specific cases | Interdigital,R2-2109934 | The remote UE can inform the relay UE via PC5 of when the relay UE should use a higher priority (e.g., emergency) cause value for its establishment/resume. FFS details of signalling.[Rapp view]: This will cause increased signalling over PC5 and more specification impact to specify both new cause value and this conditional method.  |
| Reuse Relay UE’s upper layer cause value | ZTE, Sanechips R2-2109859 | Proposal 2: Existing establishment/resume cause provided by upper layer is reused when relay UE initiates the RRC establishment/resume only for the purpose of relaying. The interaction with NAS can be left to UE implementation.  |
| Vivo, R2-2110213 | Proposal 1 RAN2 to agree that existing establishment/resume cause values are re-used for Relay UE to enter RRC\_CONNECTED only for relaying purpose.Proposal 2 The Relay UE’s NAS layer provides the establishment/resume cause value to AS layer when Relay UE initiates RRC establish/resume procedure only for relaying purpose. |
| Relay UE connection setup | CATT R2-2109507[Rapp view]: (AS per legacy)Indicating that cause value comes from upper layer.. | Proposal 5: RRC\_IDLE/ RRC\_INACTIVE relay UE initiates RRC establishment/resume procedure upon service request procedure from NAS.Proposal 6: RAN2 sends LS to CT1 and CC SA2 to inform the agreement that RRC\_IDLE/ RRC\_INACTIVE relay UE initiates RRC establishment/resume procedure upon service request procedure from NAS. |

**[Easy] Proposal 15. Agree that the Relay UE reuses existing establishment/resume cause value when Relay UE enters RRC\_CONNECTED only for relaying purpose.**

**[Discuss] Proposal 16. If proposal 15 is agreed, discuss which one of the following options is preferable for Relay UE to use for establishment/resume cause value when Relay UE enters RRC\_CONNECTED only for relaying purpose:**

1. **Provided by its upper layer**
2. **Received from Remote UE**
	1. Miscellaneous Access control issues [Second priority]

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Timer for remote UE UAC | SHARP R2-2110284 | **Proposal 1: The legacy T390 values can be reused for the UAC of remote UE.**[Rapp view]: To be discussed once the AC details are finalized. |
| Alleviate access barring upon cell/relay (re)selection | SHARP R2-2110284 | **Proposal 2: When remote UE is in RRC\_IDLE or RRC\_INACTIVE, if cell selection or reselection occurs the remote UE alleviates the access barring if any. When remote UE is in RRC\_CONNECTED, upon selection a suitable cell the remote UE alleviates the access barring if any.****Proposal 3: When remote UE is in RRC\_IDLE or RRC\_INACTIVE, if relay selection or reselection occurs the remote UE alleviates the access barring if any. When remote UE is in RRC\_CONNECTED, upon selection a suitable relay the remote UE alleviates the access barring if any.**[Rapp view]: Can be done by Remote UE implementation. |

**Rapporteur’s suggestion:** No proposal is yet proposed in this sub-section but this can be revisited further once the baseline is agreed.

1. Configuration and RRC Connection management left over issues

This section pertains to RRC connection management related aspects, configuration related open issues and a variety of different open issues raised by companies.

* 1. First priority topics
		1. Re-establishment related open issues

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Inter-gNB support | Qualcomm, R2-2109427 | Proposal 4: RAN2 confirm that inter-gNB RRC re-establishment is allowed in this release. And no spec impact is foreseen.  |
| Inter-gNB not supported | Mediatek, R2-2109545 | Proposal-5: Postpone the discussion of inter-gNB RRC reestablishment for Relay UE and its connected Remote UE(s) to the next release. |
| Vivo, R2-2110213 | Proposal 6 RAN2 to confirm that inter-gNB case is NOT supported for RRC Reestablishment of Remote UE.Proposal 7 RAN2 to further study how to handle the inter-gNB case during RRC re-establishment of Remote UE by considering the following impacts:* + - * Remote UE may prioritize cell selection to intra-gNB cell.
			* If inter-gNB cell is selected by Remote UE, the RRC Reestablishment procedure is handled as failure.

[Rapp view]: Our understanding is that only service continuity is restricted to intra-gNB case.  |
| Uu RLF recovery notification to provide new cell information | Mediatek, R2-2109545 | Proposal-3: Relay UE provides the new serving cell information to the Remote UE(s) after its successful Uu RRC reestablishment. Proposal-4: Remote UE performs RRC reestablishment with Relay UE’s new serving cell.[Rapp view]: This was discussed during last meeting and there was no strong support to have multiple indications/notifications/exchanges for status upon RLF. |
| Prioritization | Qualcomm, R2-2109427 | Proposal 5: Best cell principle shall be followed by remote UE in cell selection triggered by RRC re-establishment. Corresponding, when remote UE performs RRC re-establishment procedure, if only suitable cell(s) are available, remote UE shall select best cell based on legacy S/R criteria, irrespective of whether the target cell is intra-gNB or inter-gNB  Proposal 6: When remote UE performs RRC re-establishment procedure, if only suitable relay(s) are available, remote UE can prioritize to select relay served by same gNB, according to its implementation[Rapp view]: As already mentioned, can be up to implementation. |

We need to clarify whether inter-gNB is supported for Re-establishment. Rapporteur understanding is that only service continuity is restricted to intra-gNB case and there is no restriction for Remote UE to perform inter-gNB connectivity during reselection or re-establishment.

**[Discuss] Proposal 17. Discuss whether Inter-gNB RRC Re-establishment is allowed.**

* + 1. Uu RLC Configuration related open issues

Some of the configuration aspects are still open and covered as per below:

For the Uu RLC configuration for the delivery of SRB0, we have the following agreement with FFS from previous meeting:

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| RLC configurations:[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) |

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| **Sub-Topic** | **Company, Tdoc** | **Proposal** |
| RLC configuration for delivery of SRB0 – no default | OPPO, R2-2109414 | The default Uu RLC configuration for delivering remote UE’s SRB0 is not needed. |
| ZTE, Sanechips R2-2109859 | Proposal 3: Default configuration of Uu RLC channel for remote UE’s SRB0 message is not supported. |
| Vivo, R2-2110213 | Proposal 4 For the delivery of L2 Remote UE SRB1 signalling (RRCResume and RRCReestablishment) over Uu RLC channel, default configuration is also NOT supported (i.e., always rely on NW configuration). |
| RLC configuration for delivery of SRB0/SRB1 – support default | Huawei, HiSilicon, R2-2109556 | Proposal 1: Support the default value for the Uu RLC configuration for SRB0/SRB1 (such as RRCSetup, RRCResume, RRCReestablishment, and RRCReconfigurationComplete for path switch to indirect path). |
| CATT R2-2109507(do not prefer reconfiguration by network) | Proposal 2: Uu RLC configuration for remote UE’s SRB0 message should be specified (fixed) in specification.[Rapp view]: Rapporteur assumes this refers to default config.  |
| Interdigital, R2-2109934 | Default configuration is supported for the Uu RLC channel carrying the remote UE’s SRB0 message. |
| Samsung, R2-2110448 | Proposal 1. Default Uu RLC configuration is used for the delivery of Remote UE’s SRB0. |
| Dedicated RLC configuration for delivery of SRB1 | OPPO, R2-2109414 | Dedicated Uu RLC configuration for delivering remote UE’s SRB1 such as RRCResume and RRCReestablishment is sufficient. |
| Other | Huawei, HiSilicon, R2-2109556 | Proposal 2a: The Uu RLC for relay UE’s SRB0/SRB1 is not shared with the Uu RLC for remote UE’s SRB0/SRB1.[Rapp view]: This is potentially related to separation of relay and non-relay traffic.Proposal 2b: Use the terminology of “Relay RLC CH” for the Uu RLC for remote UE’s traffic.[Rapp view]: Note for CR rapp.. |

There is no majority support for default configuration for carrying Remote UE’s SRB0. Companies supporting default configuration assume that Uu RLC can be common for any Remote UEs and can be sent before gNB reconfigures the concerned Remote UE if the Relay UE happens to be in connected mode. On the contrary, companies not supporting default configuration assumes that there is always gNB’s reconfiguration of Relay UE to enable relaying for the concerned Remote UE. Therefore, rapporteur thinks that this issue can potentially be resolved once the mechanism of when the gNB provides Remote UE’s local/temporary ID to the Relay UE is finalized in the Adaptation layer design topic. If concerned Remote UE’s local/temporary UE ID should be provided for Remote UE’s SRB0, it would be ok not to define default configuration and rely on network configuration.

**[Discuss] Proposal 18. RAN2 discuss whether gNB should configure Relay UE’s Uu RLC carrying Remote UE’s SRB0 while sending Remote UE’s local/temporary ID towards the Relay UE.**

**[Discuss] Proposal 19. Based on outcome of the previous proposal, RAN2 discuss whether default configuration is needed for Uu RLC carrying remote UE’s SRB0.**

* + 1. RLF handling

We still have few open aspects related to RLF handling from RAN2#113bise meeting as per below.

Agreement (R2-2104287):

Proposal 8: RAN2 confirm that remote UE triggers relay reselection if PC5 RLF with current relay UE is detected by remote UE. FFS if there is any impact to other RLF handling activities.

Agreement (from R2-2104415):

Proposal 4: When Uu RLF is detected by relay UE, 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.

Proposal 5: 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

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Uu/PC5 RLF handling – no PC5-RRC approach | OPPO, R2-2109414 | Rely on UE implementation (e.g., via PC5-S signalling to release the link) to handle Uu/PC5 RLF and RRC setup/resumption/re-establishment failure of Relay UE. RAN2 not pursue PC5-RRC based approach.  |
| Uu/PC5 RLF handling – support PC5-RRC approach | Mediatek, R2-2109545 | Proposal-1: PC5 RRC message is used to notify Relay UE’s Uu RLF status to its connected Remote UE(s)  |
| Huawei, HiSilicon, R2-2109556 | Proposal 6: Upon Uu RLF, relay UE informs remote UE via a new PC5 RRC message. |
| Uu RLF handling – PC5-S or PC5-RRC approach | Lenovo, Motorola Mobility , R2-2110303 | Proposal 1: The indication of Uu RLF should be indicated to remote UE when the relay UE declares Uu RLF.Proposal 2: RAN2 needs to discuss how to indicate Uu RLF to remote UE.* Option 1: If only PC5-S message is used to indicate to remote UE, the cause e.g Uu RLF should be included.
* Option 2: A new RRC message is introduced to indicate Uu RLF to the remote UE.
 |
| Uu/PC5 RLF handling – support PC5-S, release indication, gNB support | Xiaomi, R2-2110222 | Proposal 5: if relay UE selects the same cell to re-establish RRC connection after RLF, remote UE may not need to be released.Proposal 6: If remote UE is not release after relay UE’s RLF, Relay UE indicates remote UE upon RRC re-establishment failure. [Rapp view]: This was discussed during last meeting and there was not strong support to have multiple indications/notifications for status upon RLF.Proposal 7: Whether relay UE releases remote UE upon its RLF can be configured by gNB. [Rapp view]: This can be perceived as optimization. |

Multiple companies (3) show support for an indication to be provided to Remote UE upon Relay UE RLF while one company does not wish to support PC5-RRC based RLF indication. To address the FFS from past meeting, we can discuss one more time to converge on a way forward.

**[Discuss] Proposal 20. Upon Uu RLF, Relay UE sends indication to Remote UE via a new PC5 RRC message.**

* + - 1. Actions upon RLF

This topic is potentially also discussed in Relay (re)selection topic.

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Maintaining PC5 connection, notification and data handling | Lenovo, Motorola Mobility, R2-2110303 | Proposal 3: The remote UE should suspend the UL data transmission towards the gNB via relay UE if the remote UE decides to keep the current PC5 link after the remote UE receives the failure notification due to Uu RLF from the L2 relay UE.[Rapp view] We already agreed that PC5-S based release may happen.Proposal 4: The remote UE(s) should be notified of the state of Uu link from the L2 U2N relay UE: * Recovery failure due to unsuccessful re-establishment;
* Recovery success due to successful re-establishment.

[Rapp view]: This was discussed during last meeting and there was no strong support to have multiple indications/notifications for status upon RLF.Proposal 5: The remote UE should resume the UL data transmission towards the gNB via relay UE once the remote UE receives the recovery success notification from the L2 relay UE. |
| Re-establishment | Lenovo, Motorola Mobility, R2-2110303 | Proposal 6: The relay belonging to the serving cell can prioritized over the neighbour cell and the suitable relay belonging to the neighbour cell during re-establishment.[Rapp view]: This can be up to UE implementation. |
| Data forwarding during RLF  | Mediatek, R2-2109545 | Proposal-2: No data forwarding is performed from Relay UE to target cell after Relay UE’s Uu RLF and Remote UE(s) initiates data recovery to target cell at PDCP layer [Rapp view]: It is not clear how Relay UE is aware of Remote UE’s target cell.  |

**Rapporteur’s suggestion:** No proposal is needed for this sub-section as per the comments provided but it is kept here for completion and if any need for discussion is identified, it can be revisited.

* + 1. HO handling

We have the following FFS from previous meeting discussions.

Agreement (from R2-2104415):

Proposal 5: 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

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| Release indication | Xiaomi, R2-2110222 | Proposal 8: Relay UE releases remote UE upon legacy and CHO handover. (Option 1, relay UE sends release indication to remote UE)[Rapp view] We already agreed that PC5-S based release may happen. |
| Response to indication over PC5-S | Lenovo, Motorola Mobility, R2-2110303 | Proposal 7: After remote UE receives the PC5-S message from the relay UE due to relay handover, the remote UE needs to response to the received indication. The response can inform the relay UE with ‘keep or release PC5 connection’.[Rapp view] This will be up to SA2 |

There were not many proposals to support indication upon HO in this AI. Rapporteur wonders if this is covered in a different topic i.e. Relay (re)selection.

**[Easy] Proposal 21. Remove the FFS point from the previous agreement (dependent on discussion in different topic e.g. relay (re)selection): “FFS other indication/message can also be used for notification “.**

* + 1. PCI of relay UE’s serving cell

As per [8], when remote UE is in CONNECTED state via a relay UE and needs to perform RRC reestablishment (e.g. in case Uu RLF of relay UE), remote UE needs to know the PCI of the source cell to derive shortMAC-I for reestablishment.

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| PCI  | Huawei, HiSilicon, R2-2109556 | Proposal 7a: The PCI of relay UE’s serving cell should be known by remote UE.Proposal 7b: PCI of relay UE’s serving cell is included in the discovery message. |
|  | Vivo, R2-2110213 | Proposal 8 The PCell’s PCI of RRC\_CONNECTED Relay UE or serving cell’s PCI of RRC\_IDLE/RRC\_INACTIVE Relay UE should be indicated to Remote UE for shortMAC-I/ resumeMAC-I calculation.Proposal 9 The same RRC message for C-RNTI configuration is to be used to carry PCI information to Remote UE by the NW.[Rapp view] We think PCI could be considered in lieu of (or in addition to) NCI within the Relay discovery message. |

**[Easy] Proposal 22. Agree that Remote UE needs to know the PCI of Relay UE’s serving cell. FFS the message used by the Relay UE to send the PCI to the Remote UE.**

* + 1. Resume related open issues

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Context storage details  | Qualcomm, R2-2109427 | Proposal 1: Adaptation layer related configuration (i.e., dedicated PC5 RLC channel for relaying and bearer mapping configuration) is not stored as remote UE’s Inactive AS context. And remote UE rely on default PC5 configuration for delivery of *RRCResumeRequest/ RRCResumeRequest1.*Proposal 2: Adaptation layer related configuration (i.e., dedicated PC5 and Uu RLC channel for relaying and bearer mapping configuration) is not stored as relay UE’s Inactive AS context[Rapp view]: These aspects can be discussed once the configuration details are finalized.  |
| Inter-gNB support | Qualcomm, R2-2109427 | Proposal 3: RAN2 confirm that INACTIVE remote UE can resume via relay UE served by a different gNB or via a different gNB directly, i.e., inter-gNB resume is allowed.[Rapp view]: This aspect is straightforward and to be confirmed.  |

Based on the previous RAN2 agreement, for L2 U2N relay, cell ID can be used as additional AS criteria for relay (re)selection. We assume that the Remote UE uses it for cell prioritization. But it is not clear if it means that the Relay UE of the different cell can be selected or not. If it is allowed, it would make sense that the Remote UE can resume via Relay UE served by a different gNB.

**[Discuss] Proposal 23. RAN2 discuss whether INACTIVE remote UE can Resume via Relay UE served by a different gNB or via a different gNB directly, i.e., inter-gNB resume is allowed.**

* 1. Second priority topics

The following sub-sections are all identified as second priority topics that can be discussed once we have made progress in the preceding topics/proposals. These are presented here for providing Rapporteur view and reference purpose.

* + 1. Sending C-RNTI

One company suggests to revisit the previous agreement to use first reconfiguration after reestablishment to share the C-RNTI..

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| **Sub-topic** | **Company, Tdoc** | **Related Proposal** |
| C-RNTI related agreement revisit | Vivo, R2-2110213 | **Proposal 5 Revise the previous agreement on Remote UE’s C-RNTI to “During remote UE’s initial access, C-RNTI is included in the ~~relevant RRC message, e.g.~~ first RRCReconfiguration after RRCSetup/RRCResume/first RRCReconfiguration after RRCReestablishment”.**[Rapp view] Company view at the time of discussion was to provide C-RNTI for use during re-establishment and following legacy operation..  |

Rapporteur thinks it can be briefly discussed potentially in an email discussion whether it can be provided at *RRCReconfiguration*.

* + 1. Service continuity related open issues

Some of the open issues related to path switching are listed below;

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Path switching to RRC\_IDLE/INACTIVE Relay UE | OPPO, R2-2109414 | For delivery of *RRCReconfigurationComplete* in direct-to-indirect path switching procedure, for RRC\_IDLE/RRC\_INACTIVE relay UE, default configuration on PC5 hop which can be reconfigured by NW and dedicated configuration on Uu hop should be used.[Rapp view] Discuss this aspect once open issue of switching to IDLE/INACTIVE Relay UE is addressed. |
| Path switch to indirect path  | ZTE, Sanechips R2-2109859 | Proposal 4: Default configuration is used for the PC5 RLC channel configuration of remote UE SRB1 for RRCReconfigurationComplete in path switch to indirect path for RRC\_IDLE/INACTIVE relay UE.Proposal 5: Dedicated signalling from gNB to relay UE is used for the Uu RLC channel configuration of remote UE SRB1 for RRCReconfigurationComplete in path switch to indirect path for RRC\_IDLE/INACTIVE relay UE. [Rapp view] Discuss this aspect once open issue of switching to IDLE/INACTIVE Relay UE is addressed. |

* + 1. RLC related (for Remote UE’s SRB0)

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| RLC mode for SRB0 | CATT R2-2109507 | Proposal 1: RLC TM mode should be used for remote UE’s SRB0 in both PC5 and Uu interface.[Rapp view] Discuss this detail once the configuration (default or dedicated) is finalized although at least for Uu interface, it need not be RLC TM as Relay UE is already RRC\_CONNECTED. |
| Separate RLC channels | Samsung, R2-2110448 | Proposal 2. Separate Uu RLC channels can be configured for SRB and DRB for Remote UE.Proposal 3. Separate PC5 RLC channels can be configured for SRB and DRB for Remote UE.[Rapp view] Think it can be up to gNB implementation. If spec impact found, can be discussed later. |
| Number of RLC channels | Samsung, R2-2110448 | Proposal 4. Two Uu RLC channels can be configured for SRB1, SRB2 of all Remote UEs connected to a Relay UE.Proposal 5. RAN2 is asked to discuss whether normal LCID is enough for Uu DRB RLC channels for relaying.[Rapp view] Discuss this detail once leftover configuration aspects are agreed. |

* + 1. PC5 RLC entity establishment

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| PC5 RLC entity establishment | CATT R2-2109507 | Proposal 3: The relay UE establishes the PC5 RLC entity for relay when receiving the first unicast TMD PDU from the remote UE.[Rapp view] Can be discussed once the RLC mode configuration is finalized. |

* + 1. Release upon RNAU/TAU

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Release of PC5 connection upon RNAU | Ericsson, R2-2110688 | The PC5 connection between the remote UE and relay UE is handled according to the RRC state transition Rel-16 V2X principles.When performing the RNAU/TAU procedure and selecting a new cell, the remote UE/relay UE releases the existing PC5 connection.[Rapp view]: Can be considered once the RNAU/TAU discussion is completed from [610] |

* + 1. Carrying Remote UE SRB messages

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Relay UE uses SRB to carry Remote UE SRB messages | Interdigital, R2-2109934 | The first RRC message from the remote UE is carried by SRB1 of the relay UE.The relay UE encapsulates the first RRC message from the remote UE in its own RRC message (e.g., RRCConnectionComplete/ RRCResumeComplete/ RRCReconfigurationComplete, etc.) on Uu.[Rapp view]: To be discussed once adaptation layer header and configuration details are finalized.  |
| Buffering incoming messages for RRC\_IDLE/RRC\_INACTIVE Relay UE | Interdigital, R2-2109934 | The relay UE in RRC\_IDLE buffers the remote UE’s first RRC message until reception of the RRCSetup message.The relay UE in RRC\_INACTIVE buffers the remote UE’s first RRC message until reception of the RRCResume message.[Rapp view]: Stage-3 detail to be potentially discussed in future email discussion. |

* + 1. Timer related open issues

This topic was covered in the [610] email discussion about the different timers. Further details are proposed by other companies as per below that can be discussed once the high level timer details are finalized.

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Timer details | Qualcomm, R2-2109427 | Proposal 7: Introduce 4 new timer IEs (T300-like/T319-like/T301-like/T311-like) in SIB1 for remote UE in L2 U2N relayProposal 8: For T300-like timer, start condition and action at expiry of T300 can be reused. On top of legacy stop conditions, introduce a new stop condition “the (re)selected relay becomes unsuitable”Proposal 9: For T319-like timer, start condition and action at expiry of T319 can be reused. On top of legacy stop conditions, introduce a new stop condition “relay (re)selection” Proposal 10: For T301-like timer, start condition and action at expiry of T301 can be reused. On top of legacy stop conditions, introduce a new stop condition “the (re)selected relay becomes unsuitable”Proposal 11: For T311-like timer, start condition and action at expiry of T311 can be reused. On top of legacy stop conditions, introduce a new stop condition “upon (re)selection of a suitable relay” |
| Larger timer value | Huawei, HiSilicon,R2-2109556 | Proposal 5: NW can configure larger T300/T301/T311/T319 timer value for remote UE (e.g. introducing new timer for remote UE). |
| ZTE, Sanechips R2-2109859 | Proposal 7: A new access timer with larger value is needed for remote UE’s RRC setup procedure. |
| Including timestamp | LG, R2-2110163 | Proposal 6: we need to discuss how to handle RRC setup/resume/re-establish failure increasing problem due to time ambiguity between remote UE and gNB.* Alt. solution1: leave on gNB implementation. Marginal time for delivering the messages for RRC setup/resume/re-establish procedure may be configured on relay UE.
* Alt. solution2: The messages for RRC setup/resume/re-establish procedure may include time stamp to indicate starting/expiration time for the timer.
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* + - 1. Miscellaneous connection management issues [Third priority]

The next level of details for different topics to aid in stage-3 formulation are provided below.

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| **Sub-Topic** | **Company, Tdoc** | **Related Proposals** |
| Relay message content | Qualcomm, R2-2109427 | Proposal 12: Relay related message contents / configurations in different RRC messages: * In *RRCSetup* message towards remote UE, gNB can include PC5 RLC/LCH config for Uu SRB1 and Uu PDCP config for Uu SRB1
* In *RRCResume* / *RRCReconfiguration* message towards remote UE, gNB can include PC5 RLC/LCH config for Uu SRB1/SRB2/DRB, Uu PDCP config for Uu SRB1/SRB2/DRB, and Uu SDAP config for Uu DRB
* In *RRCReconfiguration* message towards relay UE, gNB can include PC5 RLC/LCH config for Uu SRB1/SRB2/DRB, Uu RLC/LCH config for Uu SRB1/SRB2/DRB, and bearer mapping configuration between PC5 and Uu
 |
| Maintain Remote UEs context to help with reselection | Apple R2-2110065 | Proposal 1 RAN2 discuss how long relay UE shall keep an INACTIVE remote UE’s context when remote UE is disconnected to relay UE (e.g., after PC5 RLF).[Rapp view] It can be up to UE implementation? |
| Maintain PC5 link when Remote/Relay UE enter inactive/idle | Vivo, R2-2110213 | Proposal 10 The PC5 RRC connection between Remote UE and Relay UE is kept when Remote UE or Relay UE is sent to RRC IDLE/RRC INACTIVE by the NW via RRC Release.[Rapp view] There is no specification impact as it is not trigger for PC5 connection release.  |

1. RNAU/TAU open aspects [Third priority]

The Rapporteur views are provided and no proposal is provided yet for these aspects to be discussed after the first priority topics are addressed.

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| **Sub-topic** | **Company, Tdoc** | **Related Proposals** |
| RNAU trigger | Lenovo, Motorola Mobility , R2-2111190 | Proposal 7: CN Registration/RNAU for the remote UE can be triggered by registration tracking change and periodic registration area update as legacy.[Rapp view]: As per legacy, no spec. impact. |
| List of remote UEs to be informed to network | Lenovo, Motorola Mobility , R2-2111190 | 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.[Rapp view]: This is part of message contents, related to forwarding Remote UE ID to the network. |

1. Conclusion

In this contribution, we discussed the feature summary for AI 8.7.2.1 and have the following proposals:

* 1. **Proposals for potential agreement**

**[Easy] Proposal 12. As a baseline, in-coverage Remote UE is allowed to acquire some necessary SIB over Uu irrespective of its PC5 connection to Relay UE.**

**[Easy] Proposal 15. Agree that the Relay UE reuses existing establishment/resume cause value when Relay UE enters RRC\_CONNECTED only for relaying purpose.**

**[Easy] Proposal 22. Agree that Remote UE needs to know the PCI of Relay UE’s serving cell. FFS how Remote UE obtains the PCI of relay UE’s serving cell.**

**[Easy] Proposal 24. Confirm previous agreement that for L2 relay UE in RRC\_CONNECTED and L2 remote UE(s) in RRC\_IDLE/RRC\_INACTIVE, we specify signalling for delivery of the remote UE’s paging through dedicated RRC message. [Network implementation decision whether to use it (or keep the relay UE on BWP with CSS). Can be revisited if a problem is found with network knowledge of which paging to forward.]**

**[Easy] Proposal 25. Agree that Relay UE can notify Remote UE ID (i.e. 5G-S-TMSI/I-RNTI) information to the gNB via dedicated RRC message for paging delivery purpose.**

**[Easy] Proposal 1. The Remote UE could request any SIB (of which it doesn’t have a valid version of) to be forwarded from Relay UE in an on-demand manner. FFS whether request of any specific SIBs is not allowed.**

* 1. **Proposals for further discussion**

**[Discuss] Proposal 9. Discuss which option is preferable for the PC5-RRC message when Relay UE forwards SIB to Remote UE after PC5 connection establishment for SI request and response:**

* **Option a) New PC5-RRC messages; FFS message content/details (3)**
* **Option b) Existing *RRCReconfigurationSidelink* message (1)**

**[Discuss] Proposal 5. If we agree that Relay UE can voluntarily forward SIBs without a request, discuss which option is preferable for the Relay UE to voluntarily forward it to the Remote UE:**

**Option a) any SIB (4)**

**Option b) only specific SIBs such as SIB1, SIB6, SIB7, SIB8 (4)**

**Option c) only updated SIB (9)**

**[Discuss] Proposal 6. Discuss based on SA2 recent LS [R2-2111236], how to enable Remote UE to receive the list of non-serving PLMN IDs before PC5 connection establishment.**

**[Discuss] Proposal 7. Discuss whether Relay UE could support forwarding of some essential bits of system information besides agreed PLMN ID and cell ID to Remote UE before PC5 connection establishment.**

**[Discuss] Proposal 8. If proposal 7 is agreed, discuss which option is preferable to enable forwarding of system information before PC5 connection establishment:**

**Option a) PC5 broadcast (2 + 2(either option) or 4)**

**Option b) Relay discovery message (3+2 (either option) or 5)**

**[Discuss]Proposal 10. Further discuss if SIB forwarding using broadcast [and groupcast] from Relay UE is allowed after PC5 connection establishment.**

**[Discuss] Proposal 13. If P25 is agreed, discuss which one of the following options is preferable to be used by Relay UE to notify Remote UE ID (i.e. 5G-S-TMSI/I-RNTI) information to the gNB via dedicated RRC message for paging delivery purpose:**

**Option a) UE Assistance information (1)**

**Option b) SidelinkUEInformation (2)**

**Option c) New RRC message (1)**

**[Discuss] Proposal 14a. In case P9 is agreed to use new message for SI request/response, discuss whether the SI request/response and paging request/response use the same PC5-RRC message or separate PC5-RRC messages.**

**[Discuss] Proposal 16. If proposal 15 is agreed, discuss which one of the following options is preferable for Relay UE to use for establishment/resume cause value when Relay UE enters RRC\_CONNECTED only for relaying purpose:**

**Option a) Provided by its upper layer**

**Option b) Received from Remote UE**

**[Discuss] Proposal 17. Discuss whether Inter-gNB RRC Re-establishment for the Remote UE is allowed.**

**[Discuss] Proposal 18. RAN2 discuss whether gNB should configure Relay UE’s Uu RLC carrying Remote UE’s SRB0 while sending Remote UE’s local/temporary ID towards the Relay UE i.e. default configuration is not needed for Uu RLC for SRB0.**

**[Discuss] Proposal 20. Upon Uu RLF, RAN2 discuss whether Relay UE sends new PC5-RRC message based indication to Remote UE.**

**[Discuss] Proposal 23. RAN2 discuss whether INACTIVE remote UE can Resume via Relay UE served by a different gNB or via a different gNB directly, i.e., inter-gNB resume is allowed.**

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