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Title: Summary of AI 8.7.3.2 Relay (re)selection

Agenda Item: 8.7.3.2

Document for: Discussion and Decision

# Introduction

This contribution is to summarize all contributions from agenda item 8.7.3.2 on Relay (re)selection.

# Discussion

## 2.1 High Priority Issues

### 2.1.1 Indication to Remote UE based on Relay Uu link quality

In RAN2 #113bis-e meeting, the following agreement was reached:

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| RAN2 #113bis-e meeting Agreements  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 |

And later in RAN2 #115e meeting, the RLF related indications such as Uu RLF detected, Uu RLF recovered, Uu recovery failed, Uu recovery at new gNB, etc. were discussed, but with no agreement:

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| RLF notifications:  Proposal 3: It is suggested that relay UE send the Uu RLF notifications such as Uu RLF detected, Uu RLF recovered, Uu recovery failed, Uu recovery at new gNB, etc., which can be used by remote UE to determine whether and when the relay/cell re-selection should be performed.  Proposal 4: Relay UE only need to send RLF notification to RRC\_CONNECTED remote UE to trigger potential relay re-selection. For the RRC\_IDLE/INACTIVE remote UE, it may keep the PC5 connection with relay UE even if relay UE detects RLF and even enters RRC\_IDLE state.  **Discussion:**  LG think the relay UE should also notify the remote UE when starting handover.  Huawei think on P3, multiple notifications from the relay UE are not needed, considering signalling load, and that only one notification is enough. For P4, they think for simplicity the notification should be sent to all remote UEs connected to the relay UE, and they think the paging and SI information is important as well.  vivo also think one notification is enough. On P4, they understand that we agreed the remote UE \*may\* trigger reselection, so no harm to send the indication. |

Some further discussions in contributions to this meeting are summarized as follows:

*Note: The Text highlight color is to mark the proposals from companies in below table belonging to which issue.*

#### Other cases to inform remote UE on radio condition changes of relay UE’s Uu link

Besides Uu RLF and HO, other cases happening to relay UE which it may inform remote UE can include:

1. Cell (re)selection
2. Uu RLF recovered
3. Uu Recovery failure
4. HO failure
5. Uu RRC reconfiguration failure

As Case A, i.e. cell (re)selection has impacts on IDLE/INACTIVE relay UE, it can be separately discussed.

For whether to indicate to remote UE by relay UE when it performs (re)selection:

* Yes: Qualcomm(R2-2109432), Huawei(R2-2110617)
* No: vivo(R2-2110219)

And rapporteur suggest to discuss this issue, therefore,

**Proposal 1: RAN2 to discuss when relay UE performs cell (re)selection, whether relay UE may send an indication/message to its connected remote UE(s) which may trigger relay reselection.**

* **Option-1: Yes**
* **Option-2: Yes, only when (re)select to a new gNB**
* **Option-3: No**

For other cases, it can be divided into two kinds of condition on relay UE’s Uu link, one is **a) when the Uu link becomes better (above Case B)** and the other is **b) when it deteriorates (above Case C/D/E)**. The agreed Uu RLF and HO can be regarded as the latter one. The division is because of different remote UE behaviour, i.e. remote UE may start or stop relay (re)selection procedure.

Therefore, we can first decide whether an indication is needed when a pervious Uu communication problem (e.g., RLF) is solved which means the relay connection is available again. And then we can discuss for all the cases when the relay UE Uu link deteriorates, which of them should be agreed and whether same/different indication should be needed.

**Proposal 2: RAN2 to discuss When Uu RLF is recovered by relay UE, whether relay UE may send an indication/message to its connected remote UE(s).**

**Proposal 3: RAN2 to discuss which of the following case should also be agreed for the relay UE to send an indication/message to its connected remote UE(s) which may trigger relay reselection:**

* **Uu Recovery failure**
* **HO failure**
* **Uu RRC reconfiguration failure**

#### Cause value in the indication/message

For Proposal 3, no matter we agreed more cases for the relay UE to inform remote UE or not, we need to decide the cause value in the PC5-S message. If no new cause value is introduced, then it means relay UE can send the same indication in all agreed cases and the remote UE cannot distinguish them between. While with new cause value, the remote UE is able to behave differently based on each indication (although this may be up to remote UE implementation).

For different cause value:

* Yes: Qualcomm(R2-2109432)，Nokia(R2-2110370), Lenovo(R2-2110303)
* No: vivo(R2-2110219)
* Leave it to CT1: OPPO(R2-2110502)

**Proposal 4: RAN2 to discuss whether different cause value is needed in PC5-S message for HO, RLF and other cases(if agreed in Proposal 1, Proposal 2 and Proposal 3).**

* **Option-1: Yes**
* **Option-2: No**
* **Option-3: Up to CT1**

#### Need of new indication/message (e.g. PC5-RRC)

There is an FFS:

* *FFS other indication/message can also be used for notification*.

For whether there is a need to introduce other indication/message:

* Yes: Intel(R2-2109961)
* No: OPPO(R2-2110502), Qualcomm(R2-2109432)

Considering no obvious supporting/non-supporting, it can also be discussed.

**Proposal 5: RAN2 to discuss whether new message/ indication is needed (e.g. PC5-RRC) for HO/RLF and other cases(if agreed in Proposal 1, Proposal 2 and Proposal 3).**

#### Other issue

It is proposed by Kyocera(R2-2110166) that when relay UE perform HO it should be gNB instead of relay UE to inform remote UE and trigger relay (re)selection. However, this is reverting the agreement and it seems no need to have any proposal.

It is proposed by Qualcomm(R2-2109432) that the agreed “PC5-S message (similar to LTE) to notify remote UE Uu RLF and HO” is the Disconnect Request message. It can be discussed by RAN2 or we can simply agree it is up to SA2.

**Proposal 6: RAN2 to discuss whether the agreed “PC5-S message (similar to LTE) to notify remote UE Uu RLF and HO” is the Disconnect Request message, or is up to SA2.**

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| Discussion in [116e][Offline-606][Relay]:  It is proposed by Qualcomm during email discussion that the remote UE’s behaviour should be further clarified when receiving the indication/message from relay UE upon e.g. RLF/HO.  Lenovo also thinks that RAN2 can confirm that remote UE may continue to keep the PC5 link after receiving notification from relay UE upon Uu RLF and relay HO, and this should be sent to SA. Therefore, a proposal was initially added as follows:  Proposal 12: RAN2 to confirm that it is up to remote UE implementation whether to perform relay (re)selection or continue to keep the PC5 link after receiving the indication/message from relay UE for HO/RLF and other cases(if agreed in Proposal 1, Proposal 2 and Proposal 3).  However, Interdigital, Ericsson and OPPO further reply in the email discussion that they think ‘the proposal is not needed as it does not add anything to previous agreements. It may be best then not to spend online time to rediscuss the understanding of agreements which have already been made’  Therefore the newly added Proposal 12 is finally removed. |

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| Tdoc Num | Proposal | Company |
| R2-2110502 | Proposal 2: When Uu RLF/HO happens, Relay UE can release the PC5 link by sending a PC5-S message towards remote UE. RAN2 not pursue further optimization on new PC5-RRC signalling design.  Proposal 3: Whether to introduce new cause value for PC5-S link release shall be discussed in CT1. | OPPO |
| R2-2109432 | Proposal 2: After PC5 RLF with current relay is detected by remote UE in L3 relay, RAN2 confirm that relay UE will detect PC5 RLF via keep alive timer and send PC5 RLF to notify gNB if it is CONNECTED state. No other RLF handling is required to be specified.  Proposal 3: RAN2 confirm that the agreed “PC5-S message (similar to LTE) to notify remote UE Uu RLF and HO” is the Disconnect Request message as captured in Section 6.3.3.3 of TS 23.287  Proposal 4: For both L2 and L3 relay, no need to introduce other message / indication for notification of Uu RLF and/or HO.  Proposal 5: For both L2 and L3 relay, when relay performs cell (re)selection to another gNB, relay UE may send the Disconnect Request message to its connected remote UE(s) and it may trigger relay reselection  Proposal 6: For L3 relay, upon reception of PC5-S message on notification of HO/RLF/Cell-(re)selection, RAN2 confirm that it is up to remote UE implementation whether / when to trigger relay (re)selection  Proposal 7: For remote UE to make decision on whether to trigger relay (re)selection, the Disconnect Request message sent by relay UE can include the cause value, i.e. HO or cell (re)selection or Uu RLF  Proposal 8: If Proposal 7 is agreed, RAN2 send LS to SA2 to request introducing the signaling | Qualcomm Incorporated |
| R2-2110370 | Proposal 1: The relay UE should notify the remote UE when there is any communication issue over Uu between the relay UE and the network, which may impact the SL U2N relay connection.  Proposal 2: The relay UE should include the type of problem in the notification about the Uu connectivity problem.  Proposal 3: The remote UE action upon receiving a notification about the Uu connectivity problem could be left to UE implementation.  Proposal 4: The relay UE should notify the remote UE when a pervious Uu communication issue (e.g., RLF, or UAC delay) is solved, and the relay connection is available. | Nokia, Nokia Shanghai Bell |
| R2-2110305 | Proposal 1: The relay UE informs remote UE about Uu RLF detection upon Uu RLF detection.  Observation 1: The remote UE may keep the current PC5 link after the remote UE receives the release request from the relay UE due to Uu RLF.  Proposal 2: The remote UE may keep the current PC5 link after the remote UE receives the release request from the relay UE due to Uu RLF. The remote UE(s) should be notified of Recovery failure due to failed re-establishment. Then, the remote UE should perform relay reselection once the remote UE receives the recovery failure notification from the L2/L3 relay UE.  Observation 2: The remote UE may keep the current PC5 link after the remote UE receives the release request from the relay UE due to relay handover.  Pproposal 3: If the remote UE keeps the PC5 link after receiving the PC5-S message in the case of relay handover, the relay UE needs to inform the remote UE with handover failure upon HO failure. The remote UE may perform relay reselection when receiving the indication of handover failure. | Lenovo, Motorola Mobility |
| R2-2110166 | Proposal 1: Since the gNB knows whether the target cell belongs to the same gNB or another gNB, the gNB should send an RRC message to the remote UE, instead of the PC5-S message from the relay UE.  Proposal 2: RAN2 should consider if one of the alternatives should be adopted. | Kyocera |
| R2-2109961 | Proposal 2: RAN2 to introduce an indication/message over PC5-RRC to indicate Relay UE’s intention to stop relaying to connected Remote UEs. | Intel Corporation |
| R2-2110219 | Proposal 2: One general indication may be sent to remote UE by relay UE when relay UE’s Uu link is deteriorated (e.g. Uu RLF detection, Uu recovery failure) and this indication may trigger relay reselection.  Proposal 3: When IDLE/INACTIVE relay UE performs cell (re)selection, it doesn’t need to send indication to remote UE to trigger relay (re)selection but can just update new cell ID in discovery message.  Proposal 4: Relay UE doesn’t send indication to remote UE in case of Uu RLF recovered, which is used to inform remote UE that the relevant relay UE can be candidate for relay reselection again. | vivo |
| R2-2109513 | Proposal 1: When relay UE Uu RRC reconfiguration failure, the relay UE may send a PC5-S message to its connected remote UE(s) and this message may trigger relay reselection. | CATT |
| R2-2110617 | Proposal 3: When IDLE/INACTIVE relay UE leaving the camped cell (due to cell barring or cell reselection), it sends indication to remote UE to trigger the relay reselection or cell (re)selection. | Huawei, HiSilicon |
| 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.  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.  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.  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.  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.  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’. | Lenovo, Motorola Mobility |

### 2.1.2 Cell ID in discovery message

#### 1) The use of Cell ID by IDLE/INACTIVE remote UE

The cell ID is agreed to be included in discovery message for relay (re)selection.

In RAN2 #114e meeting, there is an agreement:

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| Proposal 4: For L2 U2N relay, cell ID can be used as additional AS criteria for relay (re)selection. **RRC states under which the cell ID may be applied by L2 remote UE and how to use it by L2 remote UE are left to be addressed for L2 specific discussions.** And the usage of cell ID by gNB for RRC CONNECTED L2 remote UE is handled by CP procedure and service continuity topic for L2 relay. |

There are contributions to discuss whether the cell ID can be used for IDLE/INACTIVE remote UE. By current agreement rapporteur thinks it is not clear and can be confirmed by RAN2:

**Proposal 7: RAN2 to confirm whether Cell ID of relay UE candidate is used by L2 remote UE in RRC IDLE or RRC INACTIVE as additional AS criteria for relay (re)selection.**

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| Tdoc Num | Proposal | Company |
| R2-2109904 | Proposal 1 Cell ID of relay UE candidate is not used by L2 remote UE in RRC IDLE or RRC INACTIVE as additional AS criteria for relay (re)selection. | Ericsson |

#### 2) The form of Cell ID

In RAN2 #115e meeting, there is a working assumption:

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| **Working assumption**: Include NCI in the relay discovery message. |

There are several contributions to discuss whether to confirm the working assumption. According to SA2 newest LS in S2-2107394r09[1],

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| SA2 has discussed and agreed to include NCGI in the discovery message for 5G ProSe Layer-2 UE-to-Network Relay per the approved CR S2-21xxxxx as attached. |

The definition of NCGI is as follows:

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| 38.300  - NR Cell Global Identifier (NCGI): used to identify NR cells globally. The NCGI is constructed from the PLMN identity the cell belongs to and the NR Cell Identity (NCI) of the cell. The PLMN ID included in the NCGI should be the first PLMN ID within the set of PLMN IDs associated to the NR Cell Identity in SIB1, following the order of broadcast. |

As PLMN ID is already agreed by RAN2 to be included in discovery message and the working assumption is targeting at the cell ID part, the RAN2 working assumption can be confirmed by SA2 agreement.

**Proposal 8: RAN2 confirms the working assumption that to include NCI in the relay discovery message as the cell ID.**

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| Tdoc Num | Proposal | Company |
| R2-2109961 | Proposal 1: RAN2 discuss whether to follow cell ID supported for L3 relaying i.e. NR Cell Identity (NCI) of 36 bits or use PCI which is shorter (i.e. 10 bits) and is sufficient to identify the cell unambiguously along with ARFCN for L2 U2N relaying purposes. | Intel Corporation |
| R2-2110502 | Proposal 1: Confirm the below working assumption:  Working Assumption: Include NCI in the relay discovery message. | OPPO |
| R2-2110219 | Proposal 1: RAN2 confirms the working assumption that to include NCI in the relay discovery message | vivo |
| R2-2109858 | Proposal 3: It is suggested to agree that NCI is included in the relay discovery message. | ZTE, Sanechips |

### 2.1.3 Cell and relay selection in RRC-re-establishment procedure

For cell selection and relay selection happened during Remote UE connection re-establishment, the following agreement is reached in RAN2 #114e and RAN2 #115e:

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| **RAN2 #114e Agreements**  Proposal 5：[18/18][Easy]The Uu RLF indication from Relay UE may trigger the Remote UE connection re-establishment  Proposal 6：[18/18][Easy] The Remote UE may trigger the Remote UE connection re-establishment upon detecting PC5 RLF.  Proposal 7 (modified)：[16/17][Easy] The Remote UE may perform RRC re-establishment procedure as follows:  ‒ If only suitable cell(s) are available, the Remote UE initiates RRC re-establishment procedure towards a suitable cell;  ‒ If only suitable relay(s) are available, the Remote UE initiates RRC re-establishment procedure towards a suitable relay UE’s serving cell;  ‒ If both a suitable cell and a suitable relay are available, the remote UE can select either one to initiate RRC re-establishment procedure based on implementation.  **RAN2 #115e Agreements**  Proposal 5 (easy): The handling of RRC\_CONNECTED Remote UE’s mobility due to SL RLF or Uu RLF notified by Relay UE can be discussed in CP agenda item. |

One issue is raised by several contributions to discuss whether intra-gNB Relay UE should be prioritized or not during the relay selection. On one hand this is related to relay selection procedure but on the other hand, this is more a part of RRC re-establishment procedure, and it is agreed to be handled in CP agenda item, thus no need to address it in Relay (re)selection section.

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| Discussion in [116e][Offline-606][Relay]:  Ericsson suggest to add a Proposal x: For a L2 remote UE which is in RRC CONNECTED and has triggered the RRC connection re-establishment procedure, RAN2 to discuss whether it is up to remote UE implementation or define prioritization rules considering cell ID on how to select the relay UE or the target cell.  So the bracket is added in proposal 9 to give example on the UE behaviour for cell (re)selection and relay (re)selection which happens during RRC re-establishment procedure. |

**Proposal 9: UE behaviour for cell (re)selection and relay (re)selection which happens during RRC re-establishment procedure, is discussed in CP agenda item (e.g. it is up to remote UE implementation or define prioritization rules considering cell ID on how to select the relay UE or the target cell).**

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| Tdoc Num | Proposal | Company |
| R2-2109432 | Proposal 1: If Remote UE is in RRC\_CONNECTED state, the following priority rule is performed in RRC re-establishment  • If only suitable cell(s) are available, remote UE shall perform legacy cell selection procedure with best cell principle, irrespective of whether the target cell is intra-gNB or inter-gNB  **• If only suitable relay(s) are available, remote UE can prioritize to select relay served by same gNB, according to its implementation**  • If both suitable relay(s) and suitable cell(s) are available, remote UE selects the best cell according to legacy cell selection procedure and can prioritize to select relay served by same gNB, according to its implementation. And finally, it is up to remote UE implementation to decide whether to use the selected suitable relay or selected suitable cell. | Qualcomm Incorporated |
| R2-2109858 | Proposal 1: If RRC\_Connected remote UE preforms relay re-selection due to Uu RLF with gNB, PC5 RLF with relay UE, or relay UE’s Uu RLF, **it may prioritize the re-selection of a relay UE served by the same cell/gNB**.  Proposal 2: If RRC\_Connected remote UE performs cell re-selection due to PC5 RLF or relay UE’s Uu RLF, **it may prioritize the relay UE’s serving cell or cells controlled by the same gNB**. | ZTE, Sanechips discussion |
| R2-2109904 | Proposal 2 The remote UE reuses the existing RRC connection re-establishment procedure in case of RLF, i.e., the remote UE remains in RRC CONNECTED if the connection can be resumed otherwise, the remote UE goes to RRC IDLE.  Proposal 3 RAN2 discusses if the remote UE shall start the timer T311 or a new timer upon declaration of RLF.  Proposal 4 For a L2 remote UE which is in RRC CONNECTED and has triggered the RRC connection re-establishment procedure, **it is up to remote UE implementation to selects either the best relay UE or the best cell, i.e., no consideration of the cell ID of the relay UE.**  Proposal 5 For a L2 remote UE which is in RRC CONNECTED and has not triggered the RRC connection re-establishment procedure, **the usage of cell ID for the remote UE is handled by gNB.**  Proposal 6 For a L2 relay UE, when to include its cell ID in discovery message is up to the relay UE’s implementation. | Ericsson |

### 2.1.4 Limitation on too frequent relay (re)selection

It was proposed by two companies to consider the consistent relay (re)selection which may need to be restricted.

in R2-2110617(Huawei), the immediate relay (re)selection following one successful relay (re)selection can be due to the SD-RSRP of selected relay UE is lower than q-RxLevmin1 (obtained from relay UE after PC5 unicast link establishment).

In R2-2110219(vivo), it is mentioned that the remote UE may perform cell (re)selection immediately (or relay (re)selection) which follows a relay (re)selection (or cell (re)selection) that is just finished, because the cell (re)selection and relay (re)selection are independent procedure and at that time cell (re)selection (or relay (re)selection) criterion is still fulfilled.

No matter for what reason, it can be discussed whether consistent relay (re)selection in a short time should be limited.

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| Discussion in [116e][Offline-606][Relay]:  OPPO suggests to merge Proposal 10 and proposal 11. |

**Proposal 11: RAN2 to discuss whether it should be ensured that remote UE will not be triggered to perform relay (re)selection or cell (re)selection immediately after establishing PC5 unicast link with selected relay UE.**

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| Tdoc Num | Proposal | Company |
| R2-2110617 | Proposal 4: RAN2 to discuss the enhancement to ensure that Remote UE will not be triggered to perform relay UE reselection immediately after establishing PC5 unicast link with selected relay UE, due to the SD-RSRP of selected relay UE is lower than q-RxLevmin1 (obtained from relay UE after PC5 unicast link establishment). | Huawei, HiSilicon |
| R2-2110219 | Proposal 5: For L2 relay, if both a suitable cell and a suitable relay are available and the UE (re)selects a relay UE (or a cell), the UE should not reselect to another cell (or another relay UE) before some time has elapsed (e.g. 1 second). | vivo |
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## 2.2 Low Priority Issues

The following issues are proposed only by one company and are basically optimizations. Therefore, the rapporteur suggests to only give summary in the following tables without proposals for discussions. They may be postponed until high priority issues are resolved.

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| Discussion in [116e][Offline-606][Relay]:  Phillips suggests to have proposals for low priority issues because ‘Having no proposals means that those topics will not be discussed online but also not even offline. In other words, companies cannot see if there are any interest on their contributions.’  Therefore proposals for low priority issues are also added. |

### 2.2.1 Relay candidate list for Relay (re)selection procedure

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| Tdoc Num | Proposal | Company |
| R2-2109904 | Proposal 7 Upon reception of discovery messages, remote UE can build a list of relay UE candidates sorted in terms of one or multiple conditions, remote UE selects the first relay UE candidate in the list to set up the link.  Proposal 8 Define a discovery validity timer for remote UE to determine for how long time a stored relay UE candidate is valid.  Proposal 9 Remote UE selects the next relay UE candidate in the list if the connection establishment fails towards the first relay UE candidate.  Proposal 10 In case of relay UE reselection, remote UE may trigger a path switch towards another relay UE which is in the list without performing a discovery procedure first.  Proposal 11 In case of relay UE reselection, remote UE may select either a target Uu link or a target relay UE to re-establish the link according to radio signal strength. | Ericsson |

The method for relay (re)selection procedure to build a list of relay UE candidates and reselect to them on connection establishment fails without discovery procedure, is an optimization on the current relay (re)selection procedure. RAN2 can further discuss it if time allows.

**Proposal 13: RAN2 to discuss whether to support the optimization in Release-17 to build a list of relay UE candidates and reselect to them on connection establishment fails without discovery procedure.**

### 2.2.2 New trigger (cell barring) by remote UE for relay(re)selection

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| Tdoc Num | Proposal | Company |
| R2-2110617 | Proposal 2: When the remote UE receives the system information forwarded by relay UE and treats the cell (i.e. connected relay UE’s serving cell) is barred, the remote UE shall perform relay reselection or cell (re)selection. | Huawei, HiSilicon |
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As remote UE receives the system information forwarded by relay UE, it was proposed that the remote UE can trigger relay reselection if it finds the cell is barred. However, it is not clear whether this relay reselection is performed by remote UE itself when reading SIB1 or it is because of relay UE triggering cell (re)selection and informs remote UE. If the latter one, it can be discussed with **Proposal 1**. RAN2 can further discuss it after discussion of **Proposal 1** if time allows.

### 2.2.3 Limitation on establishing/maintaining relay connection for IDLE/OOC remote UE

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| Tdoc Num | Proposal | Company |
| Nokia, Nokia Shanghai Bell | Proposal 1: Remote UE is (pre-)configured whether to establish and maintain U2N relay connection to NW via relay UE or not when it enters OoC in RRC\_IDLE state.  Proposal 2: Remote UE in idle state is configured to establish SL based U2N relay connection on the need basis, e.g. triggered by configured conditions related to, e.g., registration area update, paging monitoring or for period traffic transmission. | R2-2110767 |
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There are proposals towards some optimizations on IDLE remote UE or OOC remote UE, to limit them for establishing/maintaining U2N relay connection to some specific cases (e.g. RNAU, paging). RAN2 can further discuss it if time allows.

**Proposal 14: RAN2 to discuss whether IDLE/OOC remote UE can be configured with certain conditions to establish SL based U2N relay connection.**

### 2.2.4 Mobility state to determine candidate relay UE

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| Tdoc Num | Proposal | Company |
| R2- 2109823 | Proposal 1: The mobility of the U2N Relay UE should be taken into account in the RSRP thresholds that determine whether the U2N Relay UE can send relay discovery messages.  Proposal 2: The parameters hystMinRelay / hystMaxRelay, used in U2N Relay UE operation threshold conditions, can be adapted to consider the mobility state of the U2N Relay UE by using a scaling factor (similar to q-hystSF in NR).  Proposal 3: It is proposed to modify the running CR for TS 38.331 based on section 2.5 of contribution R2- 2109823. | Philips |
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UE mobility state is used in legacy cell (re)selection procedure and it is proposed to consider the mobility state of the U2N Relay UE by using a scaling factor (similar to q-hystSF in NR). RAN2 can further discuss it if time allows.

**Proposal 15: RAN2 to discuss whether to consider the mobility state of the U2N Relay UE to determine candidate relay UE(s).**

### 2.2.5 gNB configure the SL-RSRP measurement to remote UE directly

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| Tdoc Num | Proposal | Company |
| R2-2110285 | Proposal: Remote UE can also perform SL-RSRP measurement in case of no SL-RSRP measurement configuration from relay UE. | Sharp |
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It is proposed ‘to allow the gNB to configure SL-RSRP measurement configuration for remote UE directly’ when relay UE doesn’t configure SL-RSRP measurement configuration to remote UE. But per current agreement the configurations should come from relay UE and it is not clear why gNB does not configure SL-RSRP measurement via indirect link but only via direct link if it wants to do so. Also, the UE can still use SD-RSRP in any case. Therefore it seems no need of Proposal here.

### 2.2.6 L2/L3 relay indication

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| Tdoc Num | Proposal | Company |
| R2-2109858 | Proposal 4: It is suggested that gNB broadcast L2 and or L3 relay indication via SIB, which can be used by UE capable of corresponding relay type to initiate the relay operation.  Proposal 5: For the gNB capable of neither L2 nor L3 relay, it may indicate the L3 relay not allowed indication to prohibit the L3 autonomous relay. | ZTE, Sanechips |
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The L2/L3 relay indication which is related to gNB and/or UE capability was initially discussed in discovery session and no need to discuss here in relay (re)selection.

**Proposal 16: L2 and or L3 relay indication are continued to be discussed in discovery agenda item.**

### 2.2.7 Cell (re)selection based on SIBs on indirect link

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| --- | --- | --- |
| Tdoc Num | Proposal | Company |
| R2-2110219 | Proposal 5: For L2 relay, if both a suitable cell and a suitable relay are available and the UE (re)selects a relay UE (or a cell), the UE should not reselect to another cell (or another relay UE) before some time has elapsed (e.g. 1 second). | vivo |
|  |  |  |
|  |  |  |

It is proposed that the cell (re)selection behaviour is not clear because now the RRC\_IDLE/INACTIVE L2 remote UE could both receive SIB2/SIB3/SIB4/SIB5 which are used for cell (re)selection on direct link (when in coverage) and on indirect link (when request the SIBs in on-demand way through relay UE). As the SIB forwarding has not been discussed sufficiently about which SIBs to be forwarded/requested, this issue can be postponed.

# Conclusion

[Prioritized to be agreed]

**Proposal 8:** RAN2 confirms the working assumption that to include NCI in the relay discovery message as the cell ID.

[Prioritized to be discussed]

**Proposal 1:** RAN2 to discuss when relay UE performs cell (re)selection, whether relay UE may send an indication/message to its connected remote UE(s) which may trigger relay reselection.

* Option-1: Yes
* Option-2: Yes, only when (re)select to a new gNB
* Option-3: No

**Proposal 2:** RAN2 to discuss When Uu RLF is recovered by relay UE, whether relay UE may send an indication/message to its connected remote UE(s).

**Proposal 3:** RAN2 to discuss which of the following case should also be agreed for the relay UE to send an indication/message to its connected remote UE(s) which may trigger relay reselection:

* Uu Recovery failure
* HO failure
* Uu RRC reconfiguration failure

**[cross WG]Proposal 4:** RAN2 to discuss whether different cause value is needed in PC5-S message for HO, RLF and other cases(if agreed in Proposal 1, Proposal 2 and Proposal 3).

* Option-1: Yes
* Option-2: No
* Option-3: Up to CT1

**Proposal 5:** RAN2 to discuss whether new message/ indication is needed (e.g. PC5-RRC) for HO/RLF and other cases(if agreed in Proposal 1, Proposal 2 and Proposal 3).

**[cross WG]Proposal 6:** RAN2 to discuss whether the agreed “PC5-S message (similar to LTE) to notify remote UE Uu RLF and HO” is the Disconnect Request message, or is up to SA2.

**Proposal 7:** RAN2 to confirm whether Cell ID of relay UE candidate is used by L2 remote UE in RRC IDLE or RRC INACTIVE as additional AS criteria for relay (re)selection.

**Proposal 9:** UE behaviour for cell (re)selection and relay (re)selection which happens during RRC re-establishment procedure, is discussed in CP agenda item (e.g. it is up to remote UE implementation or define prioritization rules considering cell ID on how to select the relay UE or the target cell).

Original Proposal 10 is merged to Proposal 11.

**Proposal 11:** RAN2 to discuss whether it should be ensured that remote UE will not be triggered to perform relay (re)selection or cell (re)selection immediately after establishing PC5 unicast link with selected relay UE.

[Low priority]

**Proposal 13:** RAN2 to discuss whether to support the optimization in Release-17 to build a list of relay UE candidates and reselect to them on connection establishment fails without discovery procedure.

**Proposal 14:** RAN2 to discuss whether IDLE/OOC remote UE can be configured with certain conditions to establish SL based U2N relay connection.

**Proposal 15:** RAN2 to discuss whether to consider the mobility state of the U2N Relay UE to determine candidate relay UE(s).

**Proposal 16:** L2 and or L3 relay indication are continued to be discussed in discovery agenda item.

Reference

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6. R2-2109904, Aspects for SL relay selection and reselection, Ericsson
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11. R2-2110305, Relay (re)selection for L2 and L3 relay, Lenovo, Motorola Mobility
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13. R2-2110502, Discussion on remaining issue of relay reselection, OPPO
14. R2-2110617, Discussion on relay reselection aspects, Huawei, HiSilicon
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16. R2-2110303, Considerations on control plane issues, Lenovo, Motorola Mobility