3GPP RAN WG2 Meeting #131 R2-250XXXX

Bangalore, India August 25th – 29rd, 2025

Agenda Item: 8.13.1

Source: Huawei, HiSilicon

Title: Open issues for Multi hop Sidelink Relay in TS 38.331

Document for: Discussion, Decision

# Introduction

The following document includes a list of open issues according identified during the following email discussion:

* [Post130][407][Relay] Rel-19 relay merged CR to 38.331 (Huawei)

 Scope: Merge the draft CRs from [Post130][402] and [Post130][406].

 Intended outcome: Endorsed CR as a baseline for RAN2#131 and merged open issues list

 Deadline: Long (late start to allow [Post130][402] and [Post130][406] to conclude)

 Deadline: August 4th

# Remaining open issues for specification 38.331

**Open issue RRC-1: Measure Events for Service Continuity Scenarios C and D**

For scenario A/B, the following agreements on measurement event were agreed.

RAN2#128/129

* Event X1 /X2 can be reused in multi-hop indirect to direct path switching with the understanding that the “first relay UE” in multi-hop relay link is “serving L2 U2N Relay UE” to be reported.
* The following measurement events can be reused in multi-hop indirect to single-hop indirect path switching:

- Event Y2

- Event Z1 with the understanding that the “first relay UE” in multi-hop relay link is “serving L2 U2N Relay UE” to be reported.

RAN2#128/129bis

* Measurement event X2 could be applied to scenario B with multi-hop indirect to single-hop indirect path switching.

Next, we suggest to further discuss that for Rel-19 intra-gNB direct/single-hop indirect to multi-hop indirect path switching (scenario C/D), whether the legacy measurement event could be reused. For example, for scenario C, whether the UE can perform the legacy measurement event Y1/Y2. For scenario D, whether the UE can perform the legacy measurement event X2/Y2/Z1.

**Status: Closed.**

The following agreements were made in RAN 2 # 130 to address the above open issues.

Event Y1 and Y2 can be reused in path switching Scenario C with the understanding that the “first relay UE” in a candidate multi-hop relay link is “candidate L2 U2N Relay UE”.

Event X2, Y2 and Z1 can be reused in path switching Scenario D with the understanding that the “first relay UE” in a candidate multi-hop relay link is “candidate L2 U2N Relay UE”.

**Open issue RRC-2: Contents of report for Service Continuity Scenarios C and D**

For scenario A/B, the following agreements on measurement event contents were agreed.

RAN2#129

For multi-hop i2d, Remote UE evaluates both relay link (for the link between remote UE and serving first relay UE) and Uu link, where the sidelink relay measurement report shall include at least serving first relay UE's source L2 ID, serving cell ID and sidelink measurement quantity result.

For multi-hop i2d, first relay UE evaluates adjacent upstream relay link and Uu link, where the sidelink relay measurement report shall include at least measured relay UE's source L2 ID, serving cell ID and sidelink measurement quantity result. FFS if intermediate relay UE reports.

For multi-hop i2i, the remote UE reports serving first relay UE and candidate single-hop relay UE(s), including at least a source L2 ID, serving cell ID, and a sidelink measurement quantity information.

For multi-hop i2i, first evaluates adjacent upstream relay link and candidate relay link, where the sidelink relay measurement report shall include at least serving intermediate/ last relay UE's source L2 ID, serving cell ID and sidelink measurement quantity result. FFS if intermediate relay UE reports.

Next, we suggest to further discuss that for Rel-19 intra-gNB direct/single-hop indirect to multi-hop indirect path switching (scenario C/D), what is the contents of measure report? For example, whether Candidate UE’s cell info, Candidate relay UE’s source ID, Measurement result and information indicating whether the measurement result is SL-RSRP or SD-RSRP are reported to the gNB as with legacy is enough. For the enhancement part, whether potential remote UE reports to the gNB the PC5 link qualities of each hops of the path first relay UE belongs or accumulated QoS for the PC5 links (i.e. Achievable PDB).

**Status: Closed.**

The following agreements were made in RAN 2 # 130 to address the above open issues.

Agreements:

For intra-gNB direct to multi-hop indirect path switch (scenario C), remote UE evaluates both relay link (for the link between remote UE and candidate first relay UE) and Uu link, where the sidelink relay measurement report shall include at least candidate first relay UE's source L2 ID, serving cell ID and sidelink measurement quantity result.

For intra-gNB single-hop indirect to multi-hop indirect path switch (scenario D), the remote UE reports serving single-hop relay UE and candidate first relay UE(s), including at least a source L2 ID, serving cell ID, and a sidelink measurement quantity information.

**Open issue RRC-3: Source relay becomes target for Service Continuity Scenario D**

For scenario B, the following agreement on path switch scenarios were agreed.

RAN2#128

For scenario B, RAN2 supports the case that the target U2N relay UE is a new relay UE which is not on the source relay path, and existing Rel-18 indirect path to indirect path switching can be reused.

For scenario B, RAN2 will support the case that the target single-hop relay UE is the last relay UE on the source path using the existing Rel-18 i2i path switching. Spec impact will be minimised.

For scenario B, RAN2 does not specify anything to support the case that that the target U2N relay UE is an intermediate relay UE which is on the source relay path using a single procedure. This case can be handled in the baseline control plane model, if necessary and subject to network implementation, by sequential path switches for the remote UE and the target intermediate relay UE.

Next, we suggest to further discuss that for Rel-19 intra-gNB single-hop indirect to multi-hop indirect path switching (scenario D), which scenario should be supported and potential spec impacts. For example, for scenario D, whether RAN2 supports the case that the target first/intermediate/last relay UE are all new relay UEs which are not the source single-hop U2N relay UE. Whether RAN2 needs to specify anything to support the case that that either the target first/intermediate/last relay UE is the source single-hop U2N relay UE.

**Status: Closed.**

The following agreements were made in RAN 2 # 130 to address the above open issues.

Agreements:

The target last relay UE can be the same as the source single-hop U2N relay UE, but the target first/intermediate relay UE cannot be the source single-hop U2N relay UE. No spec impact specific to this decision is expected (rely on the baseline procedure).

The gNB is expected to avoid triggering mobility to a path where the first/intermediate relay UE is the same as the source relay UE.

**Open issue RRC-4: Extending T300, T301 and T319**

The T300, T301 and T319 are relevant Multi hop U2N Relays and their handling is shown below

| Timer | Start | Stop | At expiry |
| --- | --- | --- | --- |
| T300 | Upon transmission of *RRCSetupRequest.* | Upon reception of *RRCSetup* or *RRCReject* message, cell re-selection, relay (re)selection or cell selection by a L2 U2N Remote UE, and upon abortion of connection establishment by upper layers. | Perform the actions as specified in 5.3.3.7.  |
| T301 | Upon transmission of *RRCReestabilshmentRequest* | Upon reception of *RRCReestablishment* or *RRCSetup* message as well as when the selected cell becomes unsuitable or the (re)selected L2 U2N Relay UE becomes unsuitable, upon reception of *NotificationMessageSidelink* indicating *relayUE-HO* or *relayUE-CellReselection*. | Go to RRC\_IDLE |
| T319 | Upon transmission of *RRCResumeRequest* or *RRCResumeRequest1 when the resume procedure is not initiated for SDT.* | Upon reception of *RRCResume,* *RRCSetup, RRCRelease, RRCRelease* with *suspendConfig* or *RRCReject* message, upon cell re-selection or upon relay (re)selection. | Perform the actions as specified in 5.3.13.5. |

Rapporteur recommend further discussion on whether these timers should be extended to reduce the risk of failures, considering they were originally designed for the Uu hop and we will now also be supporting three additional SL hops.

**Status: Closed.**

The following agreements were made in RAN 2 # 130 to address the above open issues.

Agreement:

Extend the T300, T301 and T319 timers for multi-hop U2N relay operation. The UE and gNB multiply the signalled timer value by the hop count.

**Open issue RRC-5: NotificationMessageSidelink message handling**

In the previous meeting, there was considerable discussion about sending the NotificationMessageSidelink to child UEs. However, we were still unable to reach a conclusion on whether this message can be sent in all scenarios, and whether it should be a forwarded copy of the original notification (with the same cause) or a regenerated message from the intermediate relay, reflecting its own cause based on its reaction.

 The relevant agreements from the previous meeting are listed below.

RAN2#129 bis

* When the intermediate relay UE receives a notification message from the last relay UE indicating a failure on Uu, the intermediate relay UE may transmit a notification message downstream (towards the remote UE). FFS if the notification message is a forwarded copy of the original notification (same cause) or a regenerated message from the intermediate relay (cause might reflect its own reaction such as relay reselection or re-establishment). This does not change the agreement that it is up to relay implementation whether to release the downstream link, and if the link is released there is no downstream notification message.
* FFS detailed information in the indication and child UE handling.
* FFS if there are exceptional cases where the indication can be suppressed, e.g., reselection under the same serving cell without changing the hop count.
* FFS if the notification message is used or we rely on upper layer signalling (e.g., discovery).

In the current specification, for example, when an L2 U2N Relay UE receives a reconfigurationWithSync, it either notifies the upper layers (to trigger the release of the PC5 unicast link) or sends a NotificationMessageSidelink message to the connected L2 U2N Remote UE(s). It is then up to the remote UE to take appropriate action to recover from the situation.

Upon L2 U2N Relay UE receiving *reconfigurationWithSync*, it either indicates to upper layers (to trigger PC5 unicast link release) or sends *NotificationMessageSidelink* message to the connected L2 U2N Remote UE(s) in accordance with 5.8.9.10.

The rapporteur's view is that, first and foremost, the same principle should be extended to the multi-hop scenario as outlined below.

Upon L2 U2N Relay UE receiving *reconfigurationWithSync*, it either indicates to upper layers (to trigger PC5 unicast link release with its connected downstream child UE(s)) or sends *NotificationMessageSidelink* message to the connected L2 U2N Remote UE(s) or to the connected downstream child UE(s) in accordance with 5.8.9.10.

When an intermediate relay UE receives a *NotificationMessageSidelink* message from the parent, it has two options

**Option 1** – Forward a copy of the original notification (with the same cause) to its child UEs.
**Option 2** – Generate a new notification message and send it to the child UEs, with an updated cause that reflects its own response, such as relay reselection or re-establishment.

The issue with Option 1 is that it will lead to **duplicate notifications** being sent by the intermediate relay UE: first, a forwarded copy of the parent’s original notification, and then a second notification reflecting the intermediate relay’s own actions. This redundancy is clearly undesirable as it does not provide the child UE with any additional information.

To avoid this, the **Rapporteur suggests adopting Option 2**, where the intermediate relay UE generates a new notification message. This message would reflect the relay's own status or reaction (e.g., relay reselection or re-establishment) and is always sent, allowing the Remote UE to take appropriate action based on the most relevant and current context of its parent UE.

In **Rapporteur view t**his approach also aligns with the principles established in Rel-17 and helps minimize the impact on the specifications. The current CR is drafted based on this baseline approach to support the essential handling. If any enhancements are deemed necessary beyond the baseline, companies are encouraged to discuss them further **along with text proposal for the enhancements at the next meeting**

**Status: Open.**

The following agreements were made in RAN 2 # 130 related to this aspect, However there couple of issues that needs further discussion.

Agreements:

Notification is always sent for AS failure cases at the intermediate relay UE (e.g., upstream RLF that prevents the intermediate relay from having a path to the network), using the legacy mechanism. FFS new cause values.

In principle, RAN2 consider that no AS-layer notification is sent by an intermediate relay UE in RRC\_IDLE/RRC\_INACTIVE when the AS-visible parameters that could affect relay reselection are not changed. FFS which parameters are related. This issue can be revisited if it is found that there are parameters not visible to the AS layer that would affect reselection and force the remote UE to be notified.

FFS if notification behaviour can be optimized for intermediate relay UEs in RRC\_CONNECTED.

Additionally there were following cases mentioned the open issue list discussion which will need further discussion during the next meeting

* Regarding the relay UE in idle/inactive state, the relay UE will perform relay reselection and/or cell selection if the relay UE receives notification message/PC5-S release message from its parent relay UE, or detects PC5 RLF since the intermediate relay UE may be in the cell coverage. The ‘cell selection’ was not discussed before. Therefore, we need to further discuss ‘cell selection’ in the intermediate relay UE side. And the corresponding cause value proposed in this document also should be updated.
* We may miss one case that the intermediate relay UE in idle/inactive/connected sate initiates notification message procedure due to the detection of PC5 RLF. The intermediate relay UE in idle/inactive state will perform relay reselection and/or cell selection upon detection of PC5 RLF. The intermediate relay UE in connected state will perform re-establishment upon detection of PC5 RLF. Therefore, the proposal for cause value of ‘relay reselection’ and ‘re-establishment’ cannot work in this case. The suitable cause value could be ‘PC5 RLF’ in this case.

Companies are encouraged to discuss the above two cases further **along with text proposal for the enhancements at the next meeting**

**Open issue RRC-6: Discovery Model B with no PC5 Link in multi hop scenario**

In the previous meeting were discussions on Discovery Model B with no PC5 Link established with the parent Relay UE. The relevant agreements from the previous meeting are listed below.

RAN2#129 bis

* If the candidate intermediate relay UE is out of coverage without a PC5 connection to a parent relay UE, it can forward discovery messages based on preconfiguration. If it is in (direct) coverage, or out of coverage but PC5 connected to a parent relay UE (and thus indirectly to the network), it needs SIB12 or dedicated configuration to forward discovery messages.
* For discovery model B when there is no established PC5 link between the remote UE and the intermediate relay UE, the intermediate Relay UE forwards the solicitation message only if the PC5 RSRP between the Remote UE (or intermediate Relay UE) and the intermediate Relay UE is above a threshold.
* For discovery model B when there is no established PC5 link between the last relay UE and the intermediate relay UE, the last Relay UE needs to check the PC5 AS condition before sending discovery response message to the intermediate Relay UE. FFS if this case can occur or if the intermediate relay UE always establishes itself as a remote UE first.
* For discovery model B, the quality of the PC5 links is assumed already to have been checked when the solicitation messages were forwarded, and no AS criterion is needed for the intermediate Relay UE(s) to forward the response message towards the Remote UE.
* For discovery model B, upon discovery response messages reception, the Remote UE considers an intermediate Relay UE(s) as a candidate first relay UE(s) along the path to the last Relay UE if the SD-RSRP towards the first intermediate Relay UE is above a configured threshold.FFS if the notification message is used or we rely on upper layer signalling (e.g., discovery).

It was agreed that in Discovery Model B, when there is no established PC5 link between the Remote UE and the Intermediate Relay UE, the Intermediate Relay UE should forward the solicitation message only if the PC5 RSRP between the Remote UE (or an Intermediate Relay UE) and the Intermediate Relay UE is above a defined threshold. This has been implemented in the current running CR.

However further discussion is needed regarding the scenario where there is no established PC5 link between the last relay UE and the intermediate relay UE, the last Relay UE needs to check the PC5 AS condition before sending discovery response message to the intermediate Relay UE.

First, we need to discuss whether this scenario can actually occur, or if the Intermediate Relay UE always establishes itself as a Remote UE beforehand. If this scenario is indeed possible, the next question is whether the same SD-RSRP threshold—used by the Intermediate Relay UE to decide whether to forward the solicitation message—can also be applied by the Last Relay UE when deciding whether to send the discovery response message to the Intermediate Relay UE.

Rapporteur recommends further discussion on this in the next meeting with contributions on these aspects.

**Status: Open.**

This aspect could not be discussed during RAN 2 # 130 hence remains open for RAN 2 # 131 .

One othere related issue that was raised was whether Uu threshold condition should be checked at the intermediate relay UE for discovery transmission no matter discovery Model and whether PC5 link is available needs to be discussed as well

Rapporteur recommends further discussion on this in the next meeting with contributions on these aspects.

**Open issue RRC-7: Introduce a new field sl-L2U2N-MH-Relay in SIB 12**

In R17 we had introduced new field *sl-L2U2N-Relay-r17* indicating the support for NR sidelink Layer-2 U2N relay operation in SIB 12. Similarly, in R18 we had introduced new field *sl-L2-U2U-Relay* indicating the support for NR sidelink Layer-2 U2U relay operation.

In rapporteur’s view it is straight forward to add similar field *sl-L2U2N-MH-Relay* for indicating the support of NR sidelink Layer-2 U2N multi hop relay operation in SIB 12.

Companies can look at the running CR that proposes adding *sl-L2U2N-MH-Relay*  in the running CR and provide any comments.

**Proposal 1: Introduce *sl-L2U2N-MH-Relay* for indicating the support of NR sidelink Layer-2 U2N multi hop relay operation in SIB 12.**

**Status: Closed.**

The following agreements were made in RAN 2 # 130 to address the above open issues.

Agreement:

Introduce sl-L2U2N-MH-Relay for indicating the support of NR sidelink Layer-2 U2N multi hop relay operation in SIB 12.

**Open issue RRC-8: introduce a new field *relayUE-Operation-L2-r17* and *remoteUE-Operation-L2-r17* in *SidelinkParameters***

In R17 we had introduced new field *relayUE-Operation-L2-r17* and *remoteUE-Operation-L2-r17* in *SidelinkParameters* which is used to convey capabilities related to NR and V2X sidelink communications/ positioning.

In rapporteur’s view it is straight forward to add similar capabilities for R19 e.g. *relayUE-MH-Operation-L2-r19* and *remoteUE-MH-Operation-L2-r19* in *SidelinkParameters* IE.

**Proposal 2: Introduce capabilities for R19 e.g*. relayUE-MH-Operation-L2-r19 and remoteUE-MH-Operation-L2-r19* in *SidelinkParameters* IE.**

**Status: Closed.**

The following agreements were made in RAN 2 # 130 to address the above open issues. The names for the capabilities are to be aligned between the TS 38.331 and TS 38.30.

Agreements:

Define a new capability for Rel-19 remote UE, e.g., remoteUE-MH-Operation-L2, with Rel-17 remote UE capability as a prerequisite.

As a baseline, implement the capability CR with a new capability for Rel-19 multihop relay UE, e.g., relayUE-MH-Operation-L2 with no distinction between last and intermediate cases. FFS if there is a need to distinguish last and intermediate (based, e.g., on the need for remote UE functionality in the intermediate relay).

There is no capability distinction between first and “non-first” intermediate relay UE.

Remote UE operation is a prerequisite for relay UE functionality (intermediate only if we decide to have the distinction between last and intermediate).

**Open issue RRC-9: Need to clarify in the definition section 3.1 that the** **intermediate and first relay UE access the network as the remote UE**

In RAN 2 # 130 meeting we had made the following agreements

Agreements:

The intermediate relay UE can have its own traffic acting as a remote UE simultaneously. Running CRs will be checked to make sure this functionality is supported.

Clarify in the normative text that the UE can be a relay and remote UE simultaneously (to be determined case by case where it needs to be documented).

The currently running Change Request (CR) for **TS 38.331** contains an editor's note in Section 3.1 stating:

*Editor’s note: FFS where to capture that the Intermediate U2N Relay UE first establishes a connection to the network as a U2N Remote UE, before transitioning to operate as a U2N Relay UE. Should it be captured in the definition of the Intermediate U2N Relay UE in Stage 2 or in Stage 3 specs.*

While the ongoing CR for **TS 38.300** (Section 16.2.1) on multihop sidelink (SL) relay does provide some clarification:

*“In multi-hop U2N Relay, U2N Remote UE refers to both the actual U2N Remote UE and the intermediate U2N Relay UE that also functions as a U2N Remote UE.”*

This statement may not sufficiently clarify, within **TS 38.331**, whether the **Intermediate** and **First Relay UEs** initially access the network as **U2N Remote UEs**.

From the rapporteur’s perspective, it appears necessary to explicitly state that:

*“An Intermediate U2N Relay UE first establishes a connection to the network as a U2N Remote UE, before beginning to relay traffic for connected U2N Remote UEs”*.

This clarification would ensure consistency and remove ambiguity across specifications.

**Proposal 3: Update TS 38.331, Section 3.1, to include the following clarification in the definitions of Intermediate U2N Relay UE and First Relay UE:**

**“An Intermediate U2N Relay UE first establishes a connection to the network as a U2N Remote UE, before beginning to relay traffic for connected U2N Remote UEs.”**

**Open issue RRC-10: Extension of SFN-DFN Offset Mechanism to Multihop Relay Scenarios**

The current SFN-DFN offset mechanism is defined for single-hop sidelink relay scenarios. In multihop configurations, it is not clear whether this mechanism can or should be extended when the Remote UE requests it in such a scenario.

The current assumption in the running CR is that the SFN-DFN offset provided at the L2 U2N Relay UE or the L2 Last U2N Relay UE can be forwarded by intermediate U2N Relay UEs within the multihop relay chain.

However, this behavior is not confirmed by the positioning experts, and confirmation is needed on whether such forwarding—as currently implemented in the running CR—is sufficient to meet the intended timing alignment and positioning requirements.

**Proposal 4: Confirm that the Remote UE can request the SFN-DFN offset from the connected parent Relay UE and that the SFN-DFN offset provided at the L2 U2N Relay UE or the L2 Last U2N Relay UE can be forwarded by intermediate U2N Relay UEs within the multihop relay chain, as proposed in the current running CR.**

**Open Issue RRC-11: AS-Layer Notification Behavior of Intermediate Relay UEs in RRC\_IDLE/RRC\_INACTIVE**

During RAN 2 #130 RAN 2 made an agreement that in principle, RAN2 considers that no AS-layer notification is required to be sent by an intermediate relay UE operating in RRC\_IDLE or RRC\_INACTIVE, when there is no change in AS-visible parameters (such as the hop count provided by upper layers or the serving cell of the last U2N relay UE ) that could influence relay reselection behavior by the Remote UE.

Additionally, this issue can be revisited if it is found that there are parameters not visible to the AS layer that could nevertheless impact relay reselection and require the Remote UE to be notified.

**Proposal 5 – RAN 2 should discuss if there are any parameter not visible to AS layer that could change and would affect reselection and force the remote UE to be notified.**

**Open Issue RRC-12: FFS Cause Value / Indication Type for Notifications from Intermediate Relay UE**

The cause value or indication type used by the Intermediate Relay UE to notify the Remote UE of certain upstream events remains FFS. One possible approach in rapporteurs view is for the Intermediate Relay UE to set the **indication type** to a specific value, such as relayUE-RelayReselection, to clearly signal that the notification is due to **its own reselection action**. This would provide clarity to the Remote UE and help ensure appropriate handling of the change

**Proposal 6 – RAN2 to confirm** **that the** **Intermediate Relay UE** **sets the** **indication type** **to a specific value, relayUE-RelayReselection, to clearly signal that the notification is triggered by its own reselection action**, **which follows a notification of** **AS failure** **received from its** **parent relay UE.**

**Open Issue RRC-13: Fine Tuning of Extended Timer Values Covering Both Uu and PC5 Hops**.

In the RAN2 # 130 meeting, we agreed to extend the T300, T301 and T319 timers for multi-hop U2N relay operation such that the UE and gNB will multiply the signalled timer value by the hop count. In the current running CR, the Remote UE timer values, *UE-TimersAndConstantsRemoteUE*, which include components from both the Uu and PC5 hops, were considered to be multiplied by the hop count. However with this approach the value of the timer for the multi hop remote UE might be quite large as the Remote UE timer already considers one PC5 hop and one Uu hop and multiplying it with the hop count will result in higher values. Some of the companies think that the time required for the RRC Connection Setup may increase exponentially when the number of hops increases so we may need higher values of the timers. There are four possible options to fine tune the timer values.

**Option 1** - Instead of multiplying the timers in *UE-TimersAndConstantsRemoteUE* with the hop count we multiply the ***UE-TimersAndConstants*** with the hop count ( eg t300 \* hop count) that includes only the Uu hop count.

**Option 2** – We introduce a new timer for a PC5 hop, e.g., t300-PC5/t301-PC5/t319-PC5 and calculate the value as t300 for n-hop relay = t300 + t300-PC5\*n.

**Option 3** – We multiply the timers in *UE-TimersAndConstantsRemoteUE* with the hop count as currently captured in the CR

Option 4 - Further extend the timer T300 to cover setup times that grow exponentially with the number of hops in *UE-TimersAndConstantsRemoteUE*

Option 1 seems simpler but less accurate while Option 2 seems to be more accurate but would require introducing new PC5 timers. Option 3 preserves the current implementation but may lead to unnecessarily prolonged timers in multi-hop configurations. Option 4 needs further extension of timers

**Proposal 7 – RAN2 to discuss if we need to further fine tune the timers value calculation for the multihop scenario.**

**Open Issue RRC-14: Clarification on Reporting of Target Relay UEs in RRC\_CONNECTED State for Scenarios C and D**

Clarification is needed to explicitly state that Remote UEs shall only report target relay UEs that are in RRC\_CONNECTED state when operating in Scenario C and Scenario D. This ensures consistent behavior across implementations and avoids ambiguity regarding the state of candidate relay UEs during reporting procedures.

The Relay UE includes an indication of its **RRC\_CONNECTED** status in the **discovery message RRC container**. The Remote UE can utilize this indication to determine the connection state of each candidate Relay UE and subsequently report only those candidate First /Intermediate Relay UEs that are in the **RRC\_CONNECTED** state.

Such clarification can be included in the **Stage 2 specification**, specifically in the description of the signalling flows for **Scenario C** and **Scenario D or in RRC Specification**.

**Proposal 8 – RAN2 should clarify in TS 38.300 or TS 38.331 that, for Scenario C and Scenario D, the Remote UE shall report only Relay UEs in RRC\_CONNECTED state for path switching, based on the Relay State indication received in the discovery message RRC container.**

**Open Issue RRC-15: Guidance for Remote UE to Select or Reselect a Suitable Relay UE in RRC\_CONNECTED to Ensure Low Latency**

In multi-hop scenarios, it is advantageous for the Remote UE to select or reselect a suitable NR sidelink U2N Relay UE that satisfies both AS-level and higher-layer criteria (together covering all parameters required for relay reselection) **and** is in the RRC\_CONNECTED state. This helps to ensure lower latency during connection establishment.

To address this, a note has been added to the running CR providing such guidance to UEs, using “may” to indicate its optional nature.

One company suggested that this decision could be left entirely to the Remote UE’s implementation. However, in the rapporteur’s view, without such optional guidance, relying solely on implementation-specific behavior may result in consistently high system latency, with no guarantee of improvement.

**Proposal 9 – RAN2 confirms that the existing note, stating that the Remote UE may prioritize selecting/reselecting a suitable Relay UE that is in the RRC\_CONNECTED state based on RRC state information included in the Discovery Message container, is retained in the running CR.**

# Other identified open issues

Companies are invited to describe any other identified open issues not currently included within this document

|  |  |
| --- | --- |
| **Company** | **Other identified open issues? (please describe)** |
| OPPO | 1. One clarification question: what is the different of Open issue RRC-6 and RRC-9?

[Rapp] RRC-6 is about the transmission of the Discovery message in the Discovery Model B while RRC-9 is about clarifying the definition of the intermediate relay UE that - An Intermediate U2N Relay UE first establishes a connection to the network as a U2N Remote UE, before beginning to relay traffic for connected U2N Remote UEs.1. Whether Uu threshold condition should be checked at the intermediate relay UE for discovery transmission no matter discovery Model and whether PC5 link is available needs to be discussed as well.

[Rapp] This is incuded to be discussed as a part of RRC – 6.1. For relay reselection based on RRC state indication in discovery message, whether it can be fully up to UE implementation or specify remote UE prioritizes RRC\_CONNECTED relay.

[Rapp] In multihop scenario, it is beneficial to select a suitable NR sidelink U2N Relay UE that meets both AS-level and higher-layer criteria (both these criterion covers all the parameters needed for relay reselection), and is also in RRC\_CONNECTED state, to ensure lower latency in the system. To this effect a note has been added for this providing guidance to the UEs using "may" to reflect its optional nature. |
| Lenovo | The RRC-5 related to notification message should be still open based on the following.* Regarding the relay UE in idle/inactive state, the relay UE will perform relay reselection and/or cell selection if the relay UE receives notification message/PC5-S release message from its parent relay UE, or detects PC5 RLF since the intermediate relay UE may be in the cell coverage. The ‘cell selection’ was not discussed before. Therefore, we need to further discuss ‘cell selection’ in the intermediate relay UE side. And the corresponding cause value proposed in this document also should be updated.
* We may miss one case that the intermediate relay UE in idle/inactive/connected sate initiates notification message procedure due to the detection of PC5 RLF. The intermediate relay UE in idle/inactive state will perform relay reselection and/or cell selection upon detection of PC5 RLF. The intermediate relay UE in connected state will perform re-establishment upon detection of PC5 RLF. Therefore, the proposal for cause value of ‘relay reselection’ and ‘re-establishment’ cannot work in this case. The suitable cause value could be ‘PC5 RLF’ in this case.

[Rapp] This is incuded to be discussed as a part of RRC – 5. |
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# Conclusions

The following proposals have been provided based on open issues identified above in the document:

**Proposal 1: Introduce *sl-L2U2N-MH-Relay* for indicating the support of NR sidelink Layer-2 U2N multi hop relay operation in SIB 12. Status: Closed.**

**Proposal 2: Introduce capabilities for R19 e.g*. relayUE-MH-Operation-L2-r19 and remoteUE-MH-Operation-L2-r19* in *SidelinkParameters* IE. Status: Closed.**

**Proposal 3: Update TS 38.331, Section 3.1, to include the following clarification in the definitions of Intermediate U2N Relay UE and First Relay UE:**

**“An Intermediate U2N Relay UE first establishes a connection to the network as a U2N Remote UE, before beginning to relay traffic for connected U2N Remote UEs.”**

**Proposal 4: Confirm that the Remote UE can request the SFN-DFN offset from the connected parent Relay UE and that the SFN-DFN offset provided at the L2 U2N Relay UE or the L2 Last U2N Relay UE can be forwarded by intermediate U2N Relay UEs within the multihop relay chain, as proposed in the current running CR.**

**Proposal 5 – RAN 2 should discuss if there are any parameter not visible to AS layer that could change and would affect reselection and force the remote UE to be notified.**

**Proposal 6 – RAN2 to confirm** **that the** **Intermediate Relay UE** **sets the** **indication type** **to a specific value, relayUE-RelayReselection, to clearly signal that the notification is triggered by its own reselection action**, **which follows a notification of** **AS failure** **received from its** **parent relay UE.**

**Proposal 7 – RAN2 to discuss if we need to further fine tune the timers value calculation for the multihop scenario.**

**Proposal 8 – RAN2 should clarify in TS 38.300 or TS 38.331 that, for Scenario C and Scenario D, the Remote UE shall report only Relay UEs in RRC\_CONNECTED state for path switching, based on the Relay State indication received in the discovery message RRC container.**

**Proposal 9 – RAN2 confirms that the existing note, stating that the Remote UE may prioritize selecting/reselecting a suitable Relay UE that is in the RRC\_CONNECTED state based on RRC state information included in the Discovery Message container, is retained in the running CR.**

# References

1. R2\_129b\_Positioning\_Relay\_2025-0410-1040
2. R2\_129\_Positioning\_Relay\_2025-02-21-0845\_eom