3GPP TSG-RAN WG2 Meeting #119bis-e R2-211xxxx

Electronic Meeting, October, 2022

Agenda: 8.9.2

Source: InterDigital

Title: Summary of AI 8.9.2 – UE to UE Relay (InterDigital)

Document for: Discussion, Decision

# 1 Introduction

The following document summarizes the TDOCs submitted to AI 8.9.2, draws initial conclusions, and identifies further areas of discussion on the topic of UE to UE Relay.

# 2 Discussion

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### 2.1 Discovery Model

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 2: U2U relay discovery/selection procedures should be separated from U2U relay unicast link establishment procedure. | Given the agreement from last meeting (below), RAN2 will continue to follow SA2 decisions on discovery model and no further discussion is needed in RAN2.  Agreement:  RAN2 confirm that the Scenario, Assumption and Requirement in section 5.1 of TR 38.836 apply for UE-to-UE relay support, with below clarifications:  - For cast type on UE-to-UE communication, only unicast is considered  - FFS if coverage and RRC state aspects need to be revisited in light of the existing U2N support.  - RAN2 will follow SA2 decision on the discovery model including cast type. |
| R2-2209619 | Proposal 3: RAN2 can consider discovery Model A and Model B as baseline solution in U2U relay.  Proposal 4: RAN2 wait for SA2’s conclusion on if discovery integrated into PC5 unicast link establishment procedure is supported. |
| R2-2209839 | Proposal 3: RAN2 should wait for SA2 progress on U2U Relay discovery higher layer mechanism. |  |
| R2-2209922 | Proposal 1: Discovery Model A and Model B are both considered as a baseline solution for discovery in U2U NR sidelink relaying procedure. |  |
| R2-2210048 | Proposal 1. RAN2 to confirm that both discovery Models A and B are supported for U2U relaying. |  |
| R2-2210251 | Proposal 1: RAN2 to discuss whether an integrated discovery and selection within PC5 unicast link establishment is suitable. |  |
| R2-2210339 | Proposal 2: RAN2 should study the coordination among the source UE, the destination UE and the U2U Relay UE(s) in U2U relay discovery for L2 and L3 SL U2U based on SA2 outcome. |  |

Rapporteur does not see a need for further discussion on these proposals.

### 2.2 Discovery Configuration

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 4: For U2U relay, the discovery configuration acquisition procedure is same for relay and remote UE, which can be provided by SIB, dedicated signaling or pre-configuration. | Majority of companies want to re-use the principle of discovery configuration for U2N relaying, namely, a UE can receive discovery configuration from preconfiguration (for out of coverage), from SIB (for IDLE/INACTIVE) or from dedicated signaling (for CONNECTED). In R2-2210248 it is mentioned that whether providing the discovery configuration in dedicated signaling is supported should be further discussed in order to limit gNB involvement in U2U relaying. It would seem that the baseline is acceptable, with the possibility of adding further restrictions based on the outcome of the discussion on RRC states and coverage scenarios in section 2.4. |
| R2-2209499 | Proposal 1. In the UE-to-UE relay, the remote / relay UE can acquire discovery configuration as in R17. |
| R2-2209583 | Proposal 2a: In-coverage U2U Remote UE and in-coverage U2U Relay UE in RRC\_CONNECTED can rely on network configuration provided via dedicated signalling for discovery configuration.  Proposal 2b: In-coverage U2U Remote UE and in-coverage U2U Relay UE in RRC\_IDLE or RRC\_INACTIVE can rely on network configuration provided via system information for discovery configuration.  Proposal 2c: Out-of-coverage U2U Remote UE and out-of-coverage U2U Relay UE (L2 and L3) neither in RRC\_CONNECTED nor in RRC\_IDLE or RRC\_INACTIVE can rely on pre-configuration for discovery configuration.  Proposal 6: U2U relaying to follow U2N relaying principles to obtain discovery configuration/related SIB for in-coverage U2U relay/remote UE in RRC\_CONNECTED/RRC\_IDLE/ RRC\_INACTIVE states for a given serving frequency and SL frequency which may or may not be shared with the serving frequency.  Proposal 7. For UEs in-coverage interested in U2U relaying to rely on U2N principles for acquiring TX resource pool configuration for the purpose of discovery (as outlined above).  Proposal 12: PC5 link quality threshold, L3 filter coefficient for SD-RSRP/SL-RSRP and hysteresis can be provided via SIB/RRC by gNB or obtained via pre-configuration.  Proposal 13: When SD-RSRP measurement from discovery message is used for relay (re)selection trigger and candidate relay evaluation, L3 filtering is applied across measurements on the DMRS of PSSCH transmission which carries discovery message from the concerned U2U relay. |
| R2-2209839 | Proposal 1: U2U Discovery message reuses the following mechanisms defined in Rel-17.  - U2U Discovery message is carried by AS PDCP/RLC/MAC/PHY layers.  - SL-SRB4 is used to carry U2U Discovery message.  - Configuration can be provided by SIB/dedicated message or pre-configured.  - Reuse the resource pools defined for Rel-17 discovery.  - Resource allocation mode 1 or mode 2 based on in-coverage or out-of-coverage.  - Discovery message can be transmitted in any RRC states |
| R2-2209972 | Proposal 5: The agreements related to the conditions on which the relay and remote UE rely on dedicated signaling, SIB or pre-configuration for discovery configuration acquisition in UE to NW relay discovery and non-relay discovery are also applicable to UE to UE relay. |
| R2-2210248 | Proposal 1: RAN2 to simplify design efforts when there is gNB involvement for U2U relay in R18.  Proposl 2: For simplifying RAN2 design efforts for U2U, RAN2 to discuss the following two options  i. Option 1: RAN2 first focuses on the U2U design for UE out of coverage in R18. After completion of the basic work of U2U relay out of coverage, RAN2 can work on U2U for UE in coverage  ii. Option 2: RAN2 to introduce the minimum gNB control  1. Leave for UE decision in the U2U control procedures (e.g., triggering of discovery, relay selection and reselection)  2. Support cell specific configuration and Mode 2 RA for UE in coverage. FFS on whether Mode 2 configuration can be signalled in dedicated signalling; FFS on whether Mode 1 RA can be supported  3. Down-prioritize the coexistence scenario from the design scope (e.g., U2N coexists with U2U) |
| R2-2210498 | Proposal 2: The same principle defined in Rel-16/Rel-17 to obtain resource configuration for SL communication/discovery should be followed by Rel-18 U2U relay. |

Rapporteur suggests the following proposals.

Proposal 1.1: *In UE-to-UE relay, the remote/relay UE can acquire discovery configuration as in Rel17. FFS if any restrictions specific to UE to UE relay are introduced for in-coverage UE to minimize gNB control/involvement.*

### 2.3 Protocol Stack

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 5: The U2N relay discovery protocol stack can be reused for U2U relay discovery.  Proposal 9: The PDCP/RLC entities of the SL-SRB which is used to convey the U2U relay discovery message should be maintained similar as the SL-SRB4.  Proposal 10: PDCP entity re-establishment, ciphering and integrity are not used for the SL-SRB which is used to convey the U2U relay discovery message similar as the SL-SRB4.  Proposal 14: HARQ feedback is not supported for U2U relay discovery. | Rapporteur thinks it would be reasonable to agree to re-use the protocol stack and SL-SRB4 from U2N relay for the U2U relay discovery transmission/reception. |
| R2-2209499 | Proposal 1. Reuse SL-SRB4 for UE-to-UE relay discovery message transmission. |
| R2-2209518 | Proposal 2. SL-SRB4 is used for transmitting UE-to-UE discovery message (i.e., reuse same principle of RB configuration as for UE-to-Network relay). |
| R2-2209583 | Proposal 3: SL-SRB4 defined in Rel-17 along with its parameters and PDCP PDU format can be reused for U2U discovery message as well (with fixed parameters and SCCH configuration).  Proposal 4: No ciphering and integrity protection in PDCP layer is needed for U2U relaying discovery messages. |
| R2-2209619 | Proposal 12: SL-SRB4 is used for U2U discovery message transmission/reception. |
| R2-2209731 | Proposal 1 Reuse the SL-SRB4 and dedicated/shared resource pool configuration for U2U relay discovery. |
| R2-2209819 | Proposal 1: The Protocol Stack of Discovery Message for UE-to-Network Relay is taken as baseline for UE-to-UE relay discovery message.  Proposal 7: SL-SRB4 is reused for U2U relay discovery message transmission. |
| R2-2209839 | Proposal 1: U2U Discovery message reuses the following mechanisms defined in Rel-17.  - U2U Discovery message is carried by AS PDCP/RLC/MAC/PHY layers.  - SL-SRB4 is used to carry U2U Discovery message.  - Configuration can be provided by SIB/dedicated message or pre-configured.  - Reuse the resource pools defined for Rel-17 discovery.  - Resource allocation mode 1 or mode 2 based on in-coverage or out-of-coverage.  - Discovery message can be transmitted in any RRC states |
| R2-2209922 | Proposal 3: Reuse dedicated radio bearer SL-SRB4 for U2U relay discovery transmission. |
| R2-2209972 | Proposal 3: Reuse SL-SRB4 to carry all discovery messages for UE to UE relay. |
| R2-2210048 | Proposal 2. RAN2 to confirm the protocol stack of discovery message in Figure 16.12.3.1 in TS 38.300 [2] can be used for U2U relay discovery message.  Proposal 3. RAN2 is asked to confirm PDCP Data PDU format for SL-SRB4 is applied for U2U relay discovery message.  Proposal 4. RAN2 is asked to confirm SL-SRB4 is applied to U2U relay discovery message.  Proposal 5. If Proposal 4 is agreed, the following is applied for U2U relay discovery message:  - TX/RX PDCP entity establishment and release procedures for SL-SRB4 in TS 38.323 [5]  - No ciphering or integrity protection in PDCP layer  - TX/RX state variables, constants, timers for SL-SRB4 in TS 38.323 [5]  - TX/RX RLC entity establishment and release procedures for SL-SRB4 in TS 38.322 [6]  - TX/RX state variables for SL-SRB4 in TS 38.322 [6] |
| R2-2210232 | Proposal 1: The same protocol stack as L2 U2N relay can be supported. |
| R2-2210498 | Proposal 1: SL-SRB4 and dedicated resource pool configuration are reused for discovery message transmission and reception in R18 UE-to-UE relay. |

Rapporteur suggests the following proposals.

Proposal 2.1: *Protocol stack for U2N Relay discovery is re-used for U2U Relay Discovery*

Proposal 2.2: *U2U Relay re-uses SL-SRB4 (with associated PDCP, RLC procedures and configuration) to carry discovery messages*

### 2.4 Scenarios and States

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 1: Confirm that for U2U relay scenario, both relay UE and remote UE can be in any state which including IDLE, INACTIVE, CONNECTED or OOC. | At last meeting, an FFS was captured on whether the coverage and RRC states assumed in the Rel17 SI need to be revisited for Rel18 U2U relay. While all but one proposal indicates that no limitation is required for the RRC state and coverage, R2-2210248 prefers to have a simplified design effort when the gNB is involved for U2U relay.  Rapporteur suggests this be discussed in more detail. |
| R2-2209499 | Proposal 1. For Rel-18 U2U Remote UE, it can perform U2U service in any RRC state and in/out of coverage  Proposal 2. For Rel-18 U2U Relay UE, it can perform U2U service in any RRC state and in/ out of coverage as baseline.. |
| R2-2209583 | Proposal 5: There is no restriction on the RRC states of any UEs involved in UE-to-UE relaying and the U2U Relay UE need not be in RRC\_CONNECTED state for specifically forwarding source Remote UE’s data towards the target UE. |
| R2-2209619 | Proposal 1: The following mechanism can be used in U2U relay:  - No restrictions are assumed on the coverage and RRC state of the involved UEs.  - source UE, relay UE and target UE can be in the same or different cells .  - relay UE in any RRC state can transmit/receive end-to-end data between source remote UE and target remote UE. |
| R2-2209769 | Proposal 1: Support IC, OOC and partial coverage and all RRC states for UE-to-UE relay scenarios.  Proposal 2: Support all RRC state combinations for UE(s) involved in UE-to-UE scenarios. |
| R2-2209819 | Proposal 2: RAN2 supports the scenario that U2U UEs (Source UE, Relay UE, Destination UE) can be out-of-coverage or in-coverage of any RRC states. RAN2 will strive for a common solution between different coverage/RRC states for U2U UEs. |
| R2-2209839 | Proposal 1: U2U Discovery message reuses the following mechanisms defined in Rel-17.  - U2U Discovery message is carried by AS PDCP/RLC/MAC/PHY layers.  - SL-SRB4 is used to carry U2U Discovery message.  - Configuration can be provided by SIB/dedicated message or pre-configured.  - Reuse the resource pools defined for Rel-17 discovery.  - Resource allocation mode 1 or mode 2 based on in-coverage or out-of-coverage.  - Discovery message can be transmitted in any RRC states |
| R2-2209972 | Proposal 1: RAN2 confirm the coverage and RRC state in section 5.1 of TR38.836 apply for UE-to-UE relay support. |
| R2-2210136 | Proposal 1: Source UE, Relay UE and Target UE can transmit U2U discovery message in either RRC state.  Proposal 2: Source UE, Relay UE and Target UE can do U2U discovery operations no matter whether they are IC or OOC. |
| R2-2210232 | Proposal 5: A potential U2U Relay must be enabled to act as U2U Relay even in out of coverage situations. |
| R2-2210248 | Proposal 1: RAN2 to simplify design efforts when there is gNB involvement for U2U relay in R18.  Proposl 2: For simplifying RAN2 design efforts for U2U, RAN2 to discuss the following two options  i. Option 1: RAN2 first focuses on the U2U design for UE out of coverage in R18. After completion of the basic work of U2U relay out of coverage, RAN2 can work on U2U for UE in coverage  ii. Option 2: RAN2 to introduce the minimum gNB control  1. Leave for UE decision in the U2U control procedures (e.g., triggering of discovery, relay selection and reselection)  2. Support cell specific configuration and Mode 2 RA for UE in coverage. FFS on whether Mode 2 configuration can be signalled in dedicated signalling; FFS on whether Mode 1 RA can be supported  3. Down-prioritize the coexistence scenario from the design scope (e.g., U2N coexists with U2U) |
| R2-2210276 | Proposal 1 No limitation to coverage or RRC state is needed for supporting U2U relay. |
| R2-2210580 | Proposal 2: Remote UE and/or relay UE can be in coverage or out-of-coverage for UE-to-UE relay. |

Rapporteur suggests the following proposals.

Proposal 3.1: *RAN2 discusses whether Rel17 SI assumptions on RRC state and coverage scenarios can be re-used, and if so, whether some simplified gNB control is needed for the in coverage scenario.*

### 2.5 Discovery Resource Pool

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 13: Both shared and dedicated resource pools can be supported for U2U relay discovery, and it can reuse the current discovery dedicated resource pool for resource efficiency. | Strong majority of companies think that we can re-use the principle of Rel17 for the use of dedicated and shared resource pools for discovery transmission and also re-use the same dedicated resource pool for U2U and U2N discovery. Rapporteur sees no argument to change Rel17 behavior. |
| R2-2209499 | Proposal 1. Reuse the Rel-17 dedicated/shared discovery resource pool configuration and corresponding pool selection principle for UE-to-UE relay discovery. |
| R2-2209518 | Proposal-1: Both shared resource pool and dedicated discovery resource pool can be supported for Rel-18 UE-to-UE relay (i.e., reuse same principle of discovery resource pool configuration as for UE-to-Network relay). |
| R2-2209619 | Proposal 10: Both shared resource pool and dedicated discovery resource pool are supported for U2U discovery message transmission/reception.  Proposal 11: Dedicated discovery resource pool (if (pre)configured) is shared for U2N and U2U discovery message transmission/reception. |
| R2-2209731 | Proposal 1 Reuse the SL-SRB4 and dedicated/shared resource pool configuration for U2U relay discovery. |
| R2-2209819 | Proposal 4: The dedicated discovery resource pool introduced in Rel-17 for U2N relay discovery is used for U2U relay discovery as well. |
| R2-2209839 | Proposal 1: U2U Discovery message reuses the following mechanisms defined in Rel-17.  - U2U Discovery message is carried by AS PDCP/RLC/MAC/PHY layers.  - SL-SRB4 is used to carry U2U Discovery message.  - Configuration can be provided by SIB/dedicated message or pre-configured.  - Reuse the resource pools defined for Rel-17 discovery.  - Resource allocation mode 1 or mode 2 based on in-coverage or out-of-coverage.  - Discovery message can be transmitted in any RRC states |
| R2-2209922 | Proposal 2: Legacy resource pools (shared and dedicated), resource pool configuration and signalling and resource pool selection mechanisms can be reused for U2U relay discovery transmission. |
| R2-2209972 | Proposal 4: RAN2 confirm that the shared and dedicated discovery pools in R17 are reused to transmit/receive discovery messages for UE to UE relay and all agreements made for discovery pool are applicable to UE-to-UE relay discovery. |
| R2-2210048 | Proposal 6. The same principle of SL resource pool selection for U2N relay discovery is applied for U2U relay discovery.  - If resource pool dedicated for discovery is configured, only resource pool dedicated for discovery shall be used for U2U relay discovery.  - If only resource pool for NR sidelink communication is configured, the configured resource pool can be used for U2U relay discovery. |
| R2-2210136 | Proposal 3: The dedicated resource pool configuration introduced in R17 could be reused for R18 U2U Relay. |
| R2-2210232 | Proposal 2: Both shared resource pool and separated resource pool for U2U relay case can be supported as U2N relay.  Proposal 3: Dedicated resource pool for U2N relay case can be shared with U2U relay discovery. |
| R2-2210276 | Proposal 5 RAN2 should consider whether both U2N and U2U discovery types may co-exist and if this is strictly up to upper layer decision. |
| R2-2210339 | Proposal 6: RAN2 should study whether a dedicated resource pool configured for SL U2U relay discovery and SL U2U relay based indirect sidelink discovery is needed. |
| R2-2210498 | Proposal 1: SL-SRB4 and dedicated resource pool configuration are reused for discovery message transmission and reception in R18 UE-to-UE relay. |

Rapporteur suggests the following proposals.

Proposal 4.1: *Both shared and dedicated resource pool can be used for U2U discovery transmission and Rel-17 pool selection principle is re-used.*

Proposal 4.2: *The dedicated discovery resource pool introduced in Rel-17 for U2N relay discovery is used for U2U relay discovery as well.*

### 2.6 Measurement for Relay Selection

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209499 | Proposal 7. In UE-to-UE relay, both SL-RSRP and SD-RSRP can be used for relay selection/reselection criteria. Details can be discussed later. | SL-RSRP and SD-RSRP are both usable for measurements in U2U relay (same as U2N relay). As a result, it can be assumed these two measurements can be used, and RAN2 should discuss whether to use the same rule determining which one is used as in Rel17. |
| R2-2209583 | Proposal 8: Source Remote UE uses PC5 measurements (either SD-RSRP or SL-RSRP) as the primary AS layer criterion to trigger U2U relay (re)selection.  Proposal 9: SL-RSRP or SD-RSRP is used as the SL measurement quantity for U2U relay reselection trigger evaluation and it can be up to UE implementation to choose between the two (e.g. when no active data transmission between relay and remote UE, it can choose SD-RSRP). |
| R2-2210136 | Proposal 7. For relay selection, U2U Remote UE can measure SD-RSRP for the U2U relay discovery message from U2U Relay UE.  Proposal 8. For relay reselection, SL-RSRP measurement can be used when there is data transmission from current U2U Relay UE to U2U Remote UE. When there is no data transmission from current U2U Relay UE, SD-RSRP measurement can be used for relay reselection evaluation. |
| R2-2210221 | Proposal 1: Source UE will perform measurements at PC5 interface for U2U relay selection and reselection. When there is no unicast PC5 connection between the source UE and U2U relay UE or between source UE and destination UE, SD-RSRP measurements are used. |

Rapporteur suggests the following proposals.

Proposal 5.1: *SL-RSRP and SD-RSRP can be used for relay selection/reselection criteria. RAN2 discusses when each of the two quantities are used and whether to re-use the criteria in Rel17.*

### 2.7 Conditions at the relay/remote UE for transmitting discovery

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 6: Both upper layer and AS layer can trigger U2U relay discovery.  Proposal 7: The AS layer trigger condition for relay discovery can be the SL-RSRP/SD-RSRP of the current direct PC5 link between a pair of connected remote UEs is below a threshold.  Proposal 8: Only when the PC5 link between the source remote UE and the candidate relay UE is above an SD-RSRP threshold, the relay UE can forward the U2U relay discovery message or send response to the source remote UE. | At RAN2#119-e, it was agreed that a Uu RSRP threshold would not be used to trigger discovery signal transmission at the relay or remote UE.  Regarding the conditions for transmitting discovery signal, company contributions have suggested several conditions, including SL/SD-RSRP, upper layer indication, reception of discovery by other relay UE’s, and leaving it to UE implementation. This topic should therefore be further discussed. |
| R2-2209499 | Proposal 1. RAN2 discuss whether to introduce AS layer channel quality-based criteria for a UE to act as U2U Relay. (Whereas the conclusion should be aligned with SA2)  Proposal 2. RAN2 discuss whether to introduce AS trigger condition for initiate a UE to act as U2U Remote. (Whereas the conclusion should be aligned with SA2) |
| R2-2209583 | Proposal 1: U2U Remote UE(s) and U2U Relay UE are allowed to trigger discovery transmission when triggered by the upper layer. FFS whether the U2U Relay UE needs to fulfil any AS layer criterion in addition to upper layer trigger. |
| R2-2209619 | Proposal 5: It is suggested that the Relay UE is allowed to transmit discovery message if its neighbour list is not empty, and the neighbour(s) need to meet the condition that the measured signal strength with the relay UE is above a (pre)configured threshold.  Proposal 6: Send LS to ask SA2 whether the measured signal strength between the relay UE and its neighbour(s) could be considered when relay UE determines its neighbour(s).  Proposal 7: It is suggested that the Remote UE is allowed to transmit discovery message if measured signal strength of direct link is lower than a (pre)configured threshold.  Proposal 8: Relay UE can participate the procedure as a relay only when the link quality between source remote UE and relay UE is above a (pre)configured threshold.  Proposal 9: Target remote UE can response discovery message when the RSRP between relay UE and the target remote UE is above a (pre)configured threshold. |
| R2-2209769 | Proposal 5: RSRP threshold for Remote UE triggering U2U relay discovery is not needed, whether to trigger a U2U relay discovery can be up to remote UE implementation.  Proposal 4: Remote UE is allowed to discover and select a U2U relay UE even if the direct link is still feasible. It is up to remote UE to decide whether to trigger U2U relay discovery solicitation or not. |
| R2-2209819 | Proposal 5: No PC5 RSRP threshold is used to control the U2U relay discovery message transmission by remote UE. Whether to transmit U2U discovery or direct discovery by source remote UE to communicate with target remote UE, can be left to upper layer indication and details are up to SA2. FFS U2U relay UE. |
| R2-2209839 | Proposal 2: When receiving indication from upper layer for U2U discovery message transmission, AS layer transmit discovery message. |
| R2-2209922 | Proposal 4: U2U relay discovery shall be triggered if the Remote UE, or Relay UE determines that the PC5 channel quality is below a threshold. FFS whether the threshold is configurable.  Proposal 5: U2U relay discovery should be triggered in advance of sidelink RLF in case the sidelink measurement result is not available, in order to minimise any service interruption from potential sidelink RLF.  Proposal 6: For Model A, a UE can act as candidate relay UE when the SL-RSRP/SD-RSPR between this UE and a certain number of remote UE is above the minimum threshold.  Proposal 7: For Model B, a UE can act as candidate relay UE when the SL-RSRP/SD-RSPR between this UE and source/target remote UE is above the minimum threshold. |
| R2-2209972 | Proposal 6: WA: In discovery Model A, the Announcement message includes an up-to-date list of Target UEs that are directly reachable by the candidate Relay UE.  Proposal 7: In discovery Model A, Relay UE decides the list of Target UEs by comparing the signal quality between itself and the neighbouring UE with one configured lower threshold and/or one configured upper threshold.  Proposal 8: In discovery Model A, Relay UE is allowed to transmit the Announcement message if there is at least one target UE included in the target UE list.  Proposal 9: In discovery Model B, Source UE is allowed to transmit Solicitation message with relay indication enabled if the link quality between itself and Target UE is below one configured threshold (including the case where Source UE cannot discover Target UE) when the link quality results are available;  Proposal 10: In discovery Model B, candidate Relay UE decides whether it is allowed to send Solicitation message to by comparing the link quality between itself and Source UE with one configured lower threshold and/or one configured upper threshold.  Proposal 11: In discovery Model B, Target UE decides whether it is allowed to respond to the candidate Relay UE by comparing the link quality between itself and the candidate Relay UE with one configured lower threshold and/or one configured upper threshold. |
| R2-2210136 | Proposal 5：If a UE can operate/respond to be a Relay UE, it should meet the following Relay UE selection criterions:  - The neighbour list of Relay UE should not be empty  - Both two PC5 link quality should be above the threshold |
| R2-2210251 | Proposal 1: Relay UEs receiving a discovery message should confirm only in case the target UE can be reached. |
| R2-2210263 | Proposal 2: A relay UE can include, in its discovery message, the identity of remote UE’s it has discovered that have RSRP above a threshold.  Proposal 3: Transmission/forwarding of discovery by a relay UE can be conditioned on the RSRP measurement(s) of discovery messages it receives. FFS on the details.  Proposal 4: A Relay UE can use discovery message transmissions from other relays to determine whether to transmit its own discovery.  Proposal 6: Discovery message transmitted by the relay UE should carry the RSRP measurement(s) measured by the relay of the link to each source/destination UE. |
| R2-2210498 | Proposal 3: For UE-to-UE relay,  • For Model A, a UE can be a relay UE for a proximity UE only when threshold\_min\_RSRP < PC5 RSRP between the proximity UE and Relay UE < threshold\_max\_RSRP.  • For Model B, a UE can be a relay UE for a Source UE only when threshold\_min\_RSRP < PC5 RSRP between the Source UE and Relay UE < threshold\_max\_RSRP. |
| R2-2210580 | Proposal 1: Discovery message transmission triggering condition from AS layer:  If the following case occurs, AS layer informs the upper layer and the upper layer triggers discovery message transmission.  - When source remote UE detects RLF between source remote UE and relay UE.  - When source remote UE receives the notification message from relay UE about the RLF between relay UE and target remote UE.  - When source remote UE detects that the measurement result between source remote UE and relay UE is lower than a threshold.  - When source remote UE receives the notification message from relay UE that the measurement result between relay UE and target remote UE is lower than a threshold. |  |

Rapporteur suggests the following proposals.

Proposal 6.1: *RAN2 discusses the conditions at the relay and remote UE for transmission of discovery message among the proposals in the papers in section 8.9.2.*

### 2.8 Relay (Re)Selection Triggers

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 18: The relay reselection triggers includes at least the following:  - Triggered by upper layer;  - PC5 RLF between relay and remote UE is detected;  - Based on U2U relay UE’s indication. | At least the triggers for relay (re)selection which were agreed in Rel17 U2N relay are mentioned by almost all companies and should be straightforward to agree also for U2U relays.  A number of new triggers related to the signal strength of the second hop that are specific to U2U relays have been mentioned in some contributions and are reasonable to consider for U2U relays. |
| R2-2209499 | Proposal 1. Introduce the following trigger conditions for U2U Relay reselection:  - PC5 signal strength to the serving U2U Relay of current hop is below a configured threshold  - An indication via PC5-RRC is sent by U2U Relay UE due to PC5 RLF of the peer hop/ the RSRP of the peer hop is below a configured threshold  - U2U Remote UE receives a PC5-S link release message from U2U Relay UE  - U2U Remote UE detects PC5 RLF of the current hop  - Indicate from upper layer |
| R2-2209518 | Proposal-5a: Define “the indication from upper layer of the U2U source Remote UE” as the trigger for U2U relay selection.  Proposal-5b: As a baseline, define the following triggers for U2U relay reselection.  - PC5 signal strength of current U2U Relay UE is below a (pre)configured signal strength threshold;  - When source Remote UE receives a PC5-S link release message from Relay UE;  - When source Remote UE detects PC5 RLF;  - Indicated by upper layer.  Proposal-5c: Discuss additional trigger(s) for U2U relay reselection (e.g., the motivation to always connect to the best relay UE). |
| R2-2209583 | Proposal 10: U2U Relay selection can be triggered at source Remote UE based on a) trigger from upper layer b) PC5 measurement towards target Remote UE being below a (pre)configured threshold.  Proposal 11: U2U Relay reselection can be triggered at source Remote UE when: a) PC5 measurement towards current serving Relay UE is below a (pre)configured threshold; or b) there is an upper layer release message or similar indication from current serving Relay UE; or c) triggered by upper layer.  Proposal 15: U2U Remote UE may trigger relay reselection if PC5 RLF with current relay UE is detected by the remote UE. The U2U Relay UE and the Remote UE may inform the upper layer to initiate PC5-S/unicast connection release.  Proposal 16: Support notification message over sidelink (e.g. PC5 RRC) from U2U Relay UE to Remote UE(s) for RLF. FFS whether to reuse the legacy message or introduce a new message. |
| R2-2209619 | Proposal 15: Relay UE can send notification message to source remote UE when detecting PC5 RLF with target remote UE.  Proposal 16: Relay UE can send notification message to source remote UE when PC5 link quality towards the target remote UE is below a (pre)configured threshold.  Proposal 17: Source remote UE can trigger relay reselection when below conditions is matched:  - detecting RLF between source remote UE and the current relay UE.  - PC5 measurement towards current relay UE is below a (pre)configured threshold.  - receiving notification message from relay UE.  - triggered by upper layer. |
| R2-2209731 | Proposal 2 For the U2U relay selection, it can be triggered by  • Indicated by upper layer of the U2U remote UE;  • PC5 signal strength between the source UE and the target UE is below a threshold.  Proposal 3 For the U2U relay reselection, it can be triggered by  • Indicated by upper layer of the U2U remote UE;  • When U2U remote UE detects PC5 RLF;  • When U2U remote UE receives a PC5 link release message from U2U relay UE;  • PC5 signal strength of current U2U relay UE is below a (pre)configured signal strength threshold. |
| R2-2209769 | Proposal 8: U2U reselection can be triggered by 1) RLF in either PC5 hop; 2) PC5 link quality in either PC5 hop is below a configured threshold. |
| R2-2209819 | Proposal 9: The relay reselection is triggered by source U2U remote UE when one of the following conditions is met:   The PC5 signal strength of the current U2U relay UE is below a (pre)configured signal strength threshold.   U2U Remote UE detects PC5 RLF on its own hop, or is notified by the U2U relay UE about PC5 RLF on the other hop.   When upper layers trigger PC5 link release. |
| R2-2209839 | Proposal 6: U2U Remote UE performs relay selection when receiving indication from upper layer.  Proposal 7: U2U Remote UE may trigger U2U Relay reselection under the following conditions:  - PC5 link quality towards the current U2U Relay UE is below the (pre)configured threshold. FFS whether to configure separate threshold than the one configured to U2U Relay reselection.  - U2U Remote UE is notified by the Relay UE about the failure or release of PC5 link on the second hop.  - The current PC5 link is released due to e.g. RLF, release by upper layer, etc. |
| R2-2209972 | Proposal 12: Remote UE triggers relay selection when: a) PC5 link quality of peer remote UE is below a configured threshold; or b) RLF of PC5 link with peer remote UE is detected.  Proposal 13: Remote UE triggers relay reselection upon reception of an upper layer release message or similar indication from current relay UE. |
| R2-2210136 | Proposal 6: Agree the following cases for relay selection and reselection:  The U2U Source UE triggers relay selection in following cases:  - indicated by upper layer of U2U Source UE.  - Direct PC5 link signal strength between Source UE and target UE is lower than a threshold.  The U2U Source UE may trigger relay reselection in following cases:  - PC5 signal strength of current U2U Relay UE is below a (pre)configured signal strength threshold;  - RLF of PC5 link of current Relay UE and target UE is indicated by relay UE;  - When Source UE receives a PC5-S link release message from U2U relay UE;  - RLF of PC5 link with current Relay UE is detected by Source UE;  - Indicated by upper layer. |
| R2-2210221 | Proposal 2: The source UE triggers U2U relay selection in following cases: (1) PC5 link quality with destination UE is below a (pre)configured signal strength threshold; (2) Indicated by upper layer of the source UE.  Proposal 3: The source UE triggers U2U relay reselection in following cases: (1) When source UE detects its PC5 link quality with U2U relay UE is below a (pre)configured signal strength threshold; (2) When destination UE detects its PC5 link quality with U2U relay UE is below a (pre)configured signal strength threshold. |
| R2-2210247 | Proposal 1 Relay selection for a U2U remote UE is triggered by  a. by upper layer of the U2U remote UE  b. PC5 signal strength of the direct PC5 link is below a threshold  Proposal 2 The U2U Remote UE triggers U2U Relay reselection in following cases:  a. PC5 signal strength of current Relay UE is below a (pre)configured signal strength threshold;  b. When Remote UE receives a PC5-S link release message from Relay UE;  c. When Remote UE detects PC5 RLF of the link to Relay UE;  d. Indicated by upper layer of the Remote UE. |
|  | Proposal 7: SL-RLF of the hop between the relay and destination can be used as a trigger for reselection at the source UE.  Proposal 8: SL-RLF detected by the source UE (of the hop between the source UE and relay UE) can be used as a trigger for reselection at the source UE. |
| R2-2210498 | Proposal 7: When PC5 RLF is detected, the Source UE/Destination UE can release the current end-to-end connection via the old Relay UE and trigger a new connection establishment procedure via a new Relay UE as a baseline procedure of relay reselection. |

Rapporteur suggests the following proposals.

Proposal 7.1: *Relay (re)selection triggers include at least 1) Upper layer trigger; 2) PC5-RLF detection at the remote UE; 3) PC5-RLF indication received from the relay; 4) PC5 signal strength conditions. RAN2 further discuss details for trigger 4).*

### 2.9 Relay (Re)Selection Criteria

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 16: The AS layer criteria for U2U relay selection is the SD-RSRP between remote UE and relay UE is above a threshold.  Proposal 17: If multiple suitable candidate U2U relay UEs which meet all the AS-layer & higher layer criteria are available, it is up to remote UE implementation to choose one U2U relay UE. | As a first discussion topic, several companies have indicated that relay (re)selection should be performed by the remote UE(s), and that the relay UE is not involved in relay selection. However, there is some variation in opinion on whether the source/destination or both UEs perform (re)selection. This point should be further discussed.  The criteria for relay (re)selection also varies between the papers, and should be discussed. |
| R2-2209518 | Proposal-3a: At least the PC5 quality between source remote UE and the relay UE is considered as an AS criterion for UE-to-UE Relay (re)selection. FFS if other criteria (e.g., relay UE load, PC5 link quality between the relay UE and destination remote UE) are considered.  Proposal-3b: PC5 link quality for purpose of UE-to-UE Relay (re)selection is based on SD-RSRP above a threshold (as for U2N)  Proposal-4: Discuss the AS criteria and PC5 signalling used for the negotiation based UE-to-UE Relay reselection between the source UE and target UE. |
| R2-2209583 | Proposal 14: Relay load is not considered as an additional AS layer criterion for U2U relay (re)selection and Relay UE uses discovery modeling to control its load (i.e. no specification impact is foreseen). |
| R2-2209619 | Proposal 13: L3 U2U Remote UE and L2 RRC\_IDLE/INACTIVE U2U remote UE can trigger relay selection when direct PC5 link quality is below than a (pre)configured threshold.  Proposal 14: In U2U relay, gNB can perform relay selection through measurement event configuration on L2 RRC\_CONNECTED source remote UE.  Proposal 18: Source remote UE can select a relay as follow:  - gNB can perform relay selection through measurement event configuration on L2 RRC\_CONNECTED source remote UE;  - L3 source remote UE in all RRC states and L2 RRC\_IDLE/INACTIVE source remote UE can select a relay by it’s own implementation, the selected relay need to meet the condition that link quality between the remote UE and the relay UE is above a (pre)configured threshold . |
| R2-2209731 | Proposal 4 For the U2U relay (re)selection, the remote UE may select a relay UE from multiple suitable UEs based on its implementation. |
| R2-2209769 | Proposal 6: A single “minimum” RSRP threshold is used to determine whether U2U relay UE can claim the “reachability” for a remote UE in U2U relay discovery message.  Proposal 7: For U2U relay (re)selection, consider two additional AS layer criteria 1) PC5 link quality of 2nd PC5 hop; 2) whether the PC5 link of the 2nd PC5 hop is already established.  Proposal 9: RAN2 supports the scenario that remote UE reselect a new U2U relay with ongoing end-to-end traffic.  Proposal 11: L2 U2U remote UE can configure peer remote UE to provide SL measurements of the “all possible” 2nd-hop via end-to-end PC5-RRC procedure. |
| R2-2209819 | Proposal 8: PC5 signal strengths for all hops should be considered to select a U2U relay UE, i.e. only when the PC5 signal strengths for all hops are higher than a configured signal strength threshold, a U2U Relay UE can be selected as the candidate U2U relay UE.  Proposal 10: Other U2U relay (re)selection aspects (e.g. which UE to trigger, how the PC5 RSRP on all hops to be considered) should wait for SA2 progress. |
| R2-2209839 | Proposal 4: PC5 link quality (SD-RSRP) is the AS layer condition for U2U Remote UE to select a suitable U2U Relay UE.  Proposal 5: A threshold is configured by gNB or pre-configured to the U2U remote UE for U2U Relay selection evaluation. FFS whether to configure separate threshold than the one configured to U2N Relay selection.  Proposal 8: RAN2 should wait for SA2 progress on U2U Relay (re)selection higher layer related issues, e.g. how the two Remote UEs coordinate, which hops should be considered. |
| R2-2209922 | Proposal 8: Candidate U2U Relay UE is considered to meet the AS criteria if its PC5 link quality is above a configured threshold. FFS if same U2N threshold to be re-used.  Proposal 9: A Remote UE receiving multiple discovery messages may rank separately for selection the Relay UEs sending each of the messages. The Relay UE ranking shall be according to their respective PC5 link quality. The Relay UE ranking shall be forwarded to the Remote UE higher layer in order to assist the Remote UE in its Relay UE selection, and which discovery messages it replies to.  Proposal 10: Candidate U2U Relay UE should indicate the PC5 connection signal strength for target Remote UE to the source Remote UE, FFS if this is sent via the AS Information during discovery.  Proposal 11: If multiple U2U relay UE fulfils AS and NAS requirement, the Remote UE selects the U2U relay UE with the lowest load.  Proposal 12: For Model A, source Remote UE selects a Relay UE for which the SL-RSRP/SD-RSRP is above the minimum threshold.  Proposal 13: For Model B, target remote UE can select the relay UE for which the SL-RSRP/SD-RSRP is above the minimum threshold and forwards the discovery response message to the selected relay UE.  Proposal 14: For Model B, source remote UE can select the relay UE for which the SL-RSRP/SD-RSRP is above the minimum threshold if multiple discovery response messages from the same target remote UE are received from multiple Relay UEs.  Proposal 15: Load information of U2U relay UE can be included in the AS information transmitted with the U2U relay discovery message, FFS on how to determine the load information. |
| R2-2209972 | Proposal 14: No additional AS criteria for UE-to-UE relay (re)selection are considered in this release. |
| R2-2210221 | Proposal 4: A U2U relay UE is considered suitable if the PC5 link quality between source UE and U2U relay UE as well as PC5 link quality between U2U relay UE and destination UE exceeds a (pre)configured threshold.  Proposal 5: PLMN ID and cell ID should be considered as the criteria on the selection of U2U relay. |
| R2-2210232 | Proposal 4: RAN2 may not specify restriction for remote UE to select a U2U relay to reach another remote UE.  Proposal 6: RAN2 discuss if some relay selection criteria may be useful to be advertised in the U2U relay discovery message.  Proposal 7: RAN2 discuss the need for radio criterion to be used between the two interfaces (1st between Tx-Remote and U2U Relay; 2nd between U2U Relay and Rx-Remote UEs). |
| R2-2210247 | Proposal 1 RAN2 to reuse criteria for U2N relay for U2U relay (re)selection as the baseline.  Proposal 2 The U2U Remote UE triggers U2U Relay reselection when PC5 RLF on the PC5 hop between the Relay UE and the peer Remote UE has been indicated by the Relay UE. FFS on signalling details.  Proposal 3 When relay reselection is triggered, it is up to remote UE implementation to determine whether to select the direct PC5 link to the peer remote UE or a U2U relay UE when both are available.  Proposal 4 Introduce the PC5 RSRP threshold for Relay UE candidate so that Relay UE candidate can determine if it is suitable to be a Relay UE for the source Remote UE towards a destination Remote UE. FFS on whether both a maximum and a minimum threshold or only one of them is needed.  Proposal 6 Either source remote UE or destination remote UE may trigger relay UE reselection. FFS on the detailed procedures. |
| R2-2210251 | Proposal 1: Relay UEs should be able to inform remote UEs about its load.  Proposal 2: RAN2 to specify the U2U relay (re-)selection procedure for out-of-coverage scenarios.  Proposal 3: RAN 2 to consider additional selection criteria for relay selection other than RSRP.  Proposal 4: The discovery response message can include additional information from the relay UE or connected UEs to assist the remote UE during relay selection.  Proposal 5: RAN 2 to discuss which additional selection criteria are beneficial for selecting a U2U relay UE.  Proposal 6: RAN2 to discuss and specify re-selection criteria for U2U relays.  Proposal 7: RAN2 to discuss and specify support for relay (re-)selection by a target UE. |
| R2-2210263 | Proposal 1: Relay (re)selection is supported by source and/or destination UEs. No relay selection operations are performed at the relay UE. RAN2 informs SA2.  Proposal 5: RSRP measurements on both hops to the peer UEs can be used for relay (re)selection. FFS on the details.  Proposal 9: (Re)selection should prioritize a direct link over a relayed link. FFS on details.  Proposal 10: (Re)selection should prioritize a relay with the next hop already established via an existing PC5-RRC connection. FFS on details. |
| R2-2210276 | Proposal 4 For U2U relay, RAN2 should consider whether the quality of PC5 link between the candidate relay UE and the destination relay UE should be handled in the relay UE (re)selection procedure. |
| R2-2210339 | Proposal 3: RAN2 should study radio conditions needed for the source UE, the destination UE, and the U2U Relay UE in SL U2U relays, considering that SL U2U relays may be used for enhancing power efficiency for the source UE and/or the destination UE.  Proposal 7: RAN2 should consider whether the source UE or the destination UE is in charge of SL U2U relay (re)selection, i.e., making the (re)selection decision and selecting the U2U Relay UE among candidates.  Proposal 8: RAN2 should study the coordination among the source UE, the destination UE, and the U2U Relay UEs for SL U2U relay (re)selection, considering support of service continuity between the source UE and the relay UE. |
| R2-2210475 | Proposal 1. RAN2 should discuss whether to consider a unified U2U relay (re)selection procedure or the optimal U2U relay (re)selection procedure for each scenarios.  Proposal 3. For U2U relay selection, RAN2 discuss whether Source UE should use direct communication instead of U2U relay as much as possible. |
| R2-2210498 | Proposal 4: When there are multiple U2U Relay UEs available, for Model B, the Destination UE also perform the selection of the relays which are subjected to AS criteria between the Destination UE and the Relay UE..  Proposal 5: The AS criteria defined for U2N relay selection (i.e. SD-RSRP> sl-RSRP-Thresh by sl-HystMin) is reused for U2U relay selection.  Proposal 6: Agree the following additional AS criteria for U2U relay selection:  • Direct link between the Source UE and the Destination UE is prioritized over indirect link, when the RSRP of direct link> a threshold.  • Relay UE with established unicast link is prioritized over other Relay UEs among the Relay UEs meeting the AS criteria. |
| R2-2210580 | Proposal 4: Remote UE is better to select a relay UE having a connection with the same gNB of itself to avoid consistent resource collision when remote and relay UE is in SL mode1 operation.  Proposal 5: the relay selection threshold value (e.g., SD-RSRP) can be configured as the same or different from the relay selection SL threshold value used in Rel-17 U2N relay.  Proposal 6: It may be better if the source remote UE knows the measurement result between candidate relay UE and target remote UE for selecting the best relay UE. |

Rapporteur suggests the following proposals.

Proposal 8.1: *RAN2 discusses which of source and/or destination remote UE(s) perform relay (re)selection decision.*

Proposal 8.2: *RAN2 discusses the relay (re)selection criteria for U2U relay among the proposals in the papers in section 8.9.2.*

### 2.10 gNB Support for U2U Relay Discovery

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209499 | Proposal 1. To introduce indication(s) in SIB message for the network capability on U2U service. | Given the small number of contributions on this aspect, RAN2 should discuss the question further. |
| R2-2209819 | Proposal 6: RAN2 to discuss whether the indication is needed for whether the gNB is capable of U2U relay discovery (similar as L2/L3 U2N relay discovery indication in SIB12). |
| R2-2210276 | Proposal 2 For U2U relay, SIB12 should indicate whether U2U relay discovery is supported.  Proposal 3 For U2U relay, RAN2 should further discuss whether it is sufficient for the gNB to indicate U2U relay discovery support, considering certain discovery solutions discussed in SA2 does not require a separate discovery message. |

Rapporteur suggests the following proposals.

Proposal 9.1: *RAN2 to discuss whether the indication is needed for whether the gNB is capable of U2U relay discovery*

### 2.11 Questions to SA2

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 3: Send LS to SA2 to check whether U2U relay UE and remote UE can belong to different PLMNs.  Proposal 12: Send LS to SA2 to check whether the L2 ID for U2U relay discovery is dedicated or not.  Proposal 15: Send LS to SA2 to check whether relay discovery type of the discovery message will be sent to AS layer. | RAN2 can further discuss whether an LS is needed to SA2, or whether RAN2 waits for further information from SA2. |
|  | Proposal 5: RAN2 should study the use of L2 IDs of the source UE and the destination UE for fast identification of the source UE and the destination UE at U2U Relay UEs in SL U2U relay discovery. |

Rapporteur suggests the following proposals.

Proposal 10.1: *RAN2 to discuss whether to send LS to SA2 on allowable PLMNs, L2ID discovery, and discovery type for U2U relays*

### 2.12 De-prioritized Proposals

As per chairman’s agenda, focus for this meeting is on discovery and relay (re)selection. The following proposals discuss other topics and are therefore no to be treated at this meeting.

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| TDoc | Proposal | Rapporteur Comment |
| R2-2209370 | Proposal 11: The resource allocation mode determination for U2U relay and remote UE should follow the Rel-16 principle. | Not treated at this meeting. |
| R2-2209499 | Proposal 11. R2 do not pursue any AS-layer solution for U2U path switch.  Proposal 12. To carry a single Layer-2 ID within SRAP layer to support single hop U2U Relay.  Proposal 13. RAN2 confirm source and target remote UE exchange signaling to negotiate on E2E QoS if it is aligned with SA2 conclusion.  Proposal 14. RAN 2 confirm source and relay exchange signaling to negotiate on QoS split for the direction from source to target, and target and relay exchange signaling to negotiate on QoS split for the direction from target to source, if it is aligned with SA2 conclusion.  Proposal 15. Source and target remote UE (in case of RRC\_IDLE/RRC\_INACTIVE/ OOC) or its serving gNB (in case of RRC\_CONNECTED) derive SDAP/PDCP/SRAP/RLC of Tx entity based on E2E and split QoS information.  Proposal 16. Tx UE sends the derived configuration to the Rx UE (SDAP/PDCP to the E2E Rx UE, SRAP/RLC to the per-hop Rx UE). |
| R2-2209519 | Proposal 1: For L2 UE-to-UE relaying, three PC5-RRC connections are established: between the initiating remote UE and the relay UE, between the relay UE and the terminating remote UE, and between the initiating remote UE and the terminating remote UE.  Proposal 2a: No PC5-RRC connection state is introduced for UE-to-UE relaying.  Proposal 2b: The one-to-one relationship between the PC5 unicast link and the PC5-RRC connection is kept.  Proposal 3: RAN2 do not change the relationship between PC5-S layer and PC5-RRC connection establishment for UE-to-UE relaying.  Proposal 4: Hop-by-hop SL-SRB0 and SL-SRB1 (between the remote UEs and the relay UE) are carried using specified PC5 RLC configurations, as for legacy SL-SRB0 and SL-SRB1.  Proposal 5: End-to-end SL-SRB0 and SL-SRB1 (between the two remote UEs) are carried using specified bearer configurations, as for legacy SL-SRB0 and SL-SRB1 (without the lower layers, which do not apply to end-to-end bearers).  Proposal 6: After end-to-end PC5-RRC connection establishment, the remote UEs exchange an RRCReconfigurationSidelink message to configure SDAP and PDCP layers on the end-to-end connection, while omitting configurations for the (nonexistent) lower layers.  Proposal 7: The first RRCReconfigurationSidelink between the remote UEs is carried over the PC5 SRAP and PC5 RLC configurations that were established by previous signalling between the remote UEs and the relay UE.  Proposal 8: A PC5 SRAP configuration is added to the RRCReconfigurationSidelink message.  Proposal 9: The relay UE maintains its bearer mapping table autonomously, based on the SLRB configuration required by the initiating remote UE.  Proposal 10: The relay UE configures each remote UE with the local UE identity of its peer remote UE.  Proposal 11: At establishment of a relaying connection, the initiating remote UE configures the relay UE with the identities of SLRBs using RRCReconfigurationSidelink, and the relay UE configures the initiating remote UE with the local UE ID of the terminating remote UE also using RRCReconfigurationSidelink. The order of these reconfigurations depends on the setup procedure determined by SA2; the UE that receives the hop-by-hop DCA message should initiate the first reconfiguration.  Proposal 12: RAN2 further discusses whether the initiating remote UE or the relay UE configures the egress PC5 RLC channel used by the initiating remote UE for transmission of data on an SLRB.  Proposal 13: At establishment of a relaying connection, the relay UE configures the terminating remote UE with SLRB identities, the local UE ID of the initiating remote UE, and a mapping of ingress PC5 RLC channels to SLRBs, using RRCReconfigurationSidelink.  Proposal 14: RAN2 further discusses whether the terminating remote UE or the relay UE determines the lower-layer configurations for the hop-by-hop connection between the two.  Proposal 15: The structure of SL-SRAP-Config is reused as a baseline, in a new PC5-RRC IE (e.g., SL-U2U-SRAP-ConfigPC5) containing optional fields for a peer local UE identity and an ingress mapping table; the need for an egress mapping table can be further discussed. |
| R2-2209619 | Proposal 2: For U2U relay, both mode 1 and mode 2 resource allocation mechanism are supported for relay UE and remote UE.  Proposal 19: per hop SL-SRB/SLRB configuration can be performed by Tx UE of the hop. The configuration can be dedicated configuration/SIB12/pre-configuration.  Proposal 20: RAN2 should discuss in U2U relay how to set the value of ‘BEARER’ in the ciphering and deciphering function.  Proposal 21: Source UE L2 ID and target UE L2 ID and BEARER ID need to be included in U2U PC5 adaptation layer header.  Proposal 22: Adaptation layer is needed to present for SL-SRB0/1/2/3 and SLRB.  Proposal 23: Source UE perform QoS split when in RRC\_IDLE/INACTIVE state, Source UE’s serving gNB perform QoS split when in RRC\_CONNECTED state. |
| R2-2209731 | Proposal 5 RAN2 to discuss when and which node to implement QoS split according to the SA2 progress. QoS splitting can be managed by the Relay UE based on the end-to-end QoS needs.  Proposal 6 RAN2 to discuss how to perform AS layer configuration to achieve end-to-end QoS. |
| R2-2209769 | Proposal 3: RAN2 agree that UE-based solution is the baseline for U2U relay (re)selection, PC5 Relay RLC channel setup, SRAP mapping configuration, QoS Split for both IC and OOC scenarios.  Proposal 10: For L2 U2U relay reselection scenario, assume that S-Remote UE and T-Remote UE keep the same end-to-end PC5 link and end-to-end radio bearers for L2 U2U after relay reselection.  Proposal 12: During relay reselection, the new relay UE need notify the remote UE to drop the prior PC5 link between the remote UE and the old relay UE after PC5 link between the new relay UE and remote UE is established.  Proposal 13: In Rel-18, No special handling to avoid U2U relay discovery and selection processes conducted simultaneously by both remote UEs. |
| R2-2209819 | Proposal 3: RAN2 to discuss whether R16/R17 resource allocation mode 1/mode 2 can be reused in U2U relay discovery/communication.  Proposal 11: From RAN2’s point of view, the authorization information regarding whether the UE is authorized to act as a 5G ProSe Layer-3 UE-to-UE Relay or Layer-3 U2U UE, is not needed in "5G ProSe authorised" information. FFS for Layer-2 UE-to-UE relay and Layer-2 U2U UE. |
| R2-2210048 | Proposal 9. RAN2 to confirm that SRAP is present on both first hop (from Source UE to Relay UE) and second hop (from Relay UE to Destination UE).  Proposal 10. SRAP functions for U2N case also apply to the U2U case.  Proposal 11. Source UE inserts the SRAP ID of the Destination UE into the SRAP header.  Proposal 12. RAN2 to discuss whether Source UE inserts its own SRAP ID into the SRAP header.  Proposal 13. The SRAP function of ‘Determination of UE ID field and BEARER ID field for data packets’ needs to be modified according to Proposals 10 and 11.  Proposal 14. RAN2 to discuss self-assignment of SRAP IDs by Remote UEs.  Proposal 15. RAN2 to discuss assignment of SRAP IDs by Remote UEs or Relay UEs to other Remote UEs.  Proposal 16. RAN2 to discuss role of gNB in assignment of SRAP IDs. |
| R2-2210136 | Proposal 4：The discovery operations of U2U Relay and U2N Relay are individually and non-interacting  Proposal 7: Kindly ask RAN2 to agree with the work assumption for U2U relay as follow:  - the scenario that one or more Source UEs connect to one target UE with one relay UE is supported  - the scenario that one Source UE connect to more than one target UE with one relay UE is not supported in this release.  Proposal 8: Support the following functions on adaptation layer for U2U relay:  - Support N:1 mapping by first hop PC5 adaptation layer between Source UE SL Radio Bearers and first hop PC5 RLC channels for relaying.  - Support N:1 bearer mapping between multiple ingress PC5 RLC channels over first PC5 hop and one egress PC5 RLC channel over second PC5 hop.  - Support the Source UE identification function.  - Support end-to-end Radio Bearer identification function.  Proposal 9: Radio Bearer identification and Source UE identification and Source UE identity should be contained in adaptation layer header. FFS whether including target UE ID.  Proposal 10: Kindly ask RAN2 to discuss how to allocate local UE ID for source UE. |
| R2-2210232 | Proposal 8: SRAP layer is needed for each hop in U2U relay case.  Proposal 9: In U2U relaying, multiplexing of sidelink data by the transmitter remote UE towards more than one Rx remote UE served by the same relay node into a TB is supported.  Proposal 10: In U2U relaying, the multiplexing data from the different transmitting remote UEs towards the same destination UE at the relay UE is supported. |
| R2-2210247 | Proposal 8 No need to include the authorization information for U2U relay operation in the "5G ProSe authorised" information.  Proposal 9 To send a LS reply to SA2 indicating that no need to include the authorization information for U2U relay operation in the "5G ProSe authorised" information. |
| R2-2210277 | Proposal 1 RAN2 should consider the Rel-17 study for CP stack as the baseline for further discussions.  Proposal 2 RAN2 should consider whether the existing unicast transmission characteristics are needed for the E2E PC5 connection.  Proposal 3 RAN2 should consider how HARQ feedback should work for the E2E PC5 link, considering the source UE will not likely be able to receive HARQ feedback directly from the destination UE by monitoring PSFCH.  Proposal 4 RAN2 should consider how the source UE/destination UE determines the SL-RLF that occurs on the hop no directly observation by the source UE/destination UE.  Proposal 5 RAN2 should consider whether SL re-establishment of the E2E PC5 link should be supported for U2U relay.  Proposal 6 RAN2 should consider introducing PC5-RRC state if SL re-establishment of the E2E PC5 link is supported for U2U relay.  Proposal 7 RAN2 should consider if U2U path switch between direct path and indirect path can be supported. |
| R2-2210339 | Proposal 1: RAN2 check and confirm with SA2 on supporting the above aspects:  a) indirect sidelink discovery, and  b) service continuity including path switch from direct to indirect, indirect to direct or indirect to indirect.  Proposal 4: RAN2 should study the use of sidelink discovery Model A and Model B in coordination between the source UE, the destination UE, and the U2U Relay UEs for SL U2U relay discovery, taking into account the support of service continuity between the source UE and the destination UE.  Proposal 9: RAN2 should study support for direct-to-indirect and indirect-to-direct path switches with SL U2U relay between the source UE and the destination UE. |
| R2-2210475 | Proposal 2. RAN2 discuss whether UE can perform resource allocation mode 1 or only resource allocation mode 2.  Proposal 4. RAN2 should decide operation of U2U relay communication before discussion on condition for transmission of discovery signalling. |
| R2-2210498 | Proposal 8: RAN2 confirms the authorization that a UE can be a L3 or L2 UE-to-UE Relay UE is needed in RAN for the gNB to send the dedicated configuration to the UE when the UE is in-coverage. Details of any signaling needed for authorization to be performed at gNB can be discussed further.  Proposal 9: For U2U relay, the SRAP header includes Local ID and bearer ID in the same format as defined for U2N relay in Rel-17.  • FFS Local ID allocation and bearer ID determination.  Proposal 10: For L2 UE-to-UE relay, the E2E PC5 RRC between Source UE and Destination UE is supported without additional RAN2 effort.  • Further discuss if the E2E unicast establishment procedure has RAN2 impact, e.g. on message forwarding based on SRAP, which is pending to SA2 discussion.  Proposal 11: RAN2 to discuss whether MasterInformationBlockSidelink or parameter(s) in MasterInformationBlockSidelink should be forwarded by U2U Relay UE from Source UE to Destination UE.  Proposal 12: QoS split is performed per direction (i.e. Source UE->Destination UE, Destination UE->Source UE).  Proposal 13: Tx UE performs QoS split.  Proposal 14: In case of RRC\_CONNECTED state, it is Tx UE’s serving gNB perform QoS split and provide the per-hop QoS to the Tx UE.  Proposal 15: The existing RSRP measurement report and CBR measurement report can be used to assist Tx UE or its gNB on QoS split, FFS on other assistance information.  Proposal 16: For L2 U2U relay, the E2E security between Source UE and Destination UE is supported via E2E PDCP in the same manner of Rel-16 V2X, further discuss how to ensure the aligned LCIDs are used by Source UE and Destination UE. |
| R2-2210580 | Proposal 3: source remote UE, target remote UE and relay UE can be allowed to operate by using either SL resource allocation mode-1 or mode-2.  Proposal 7: The following three RRCReconfigurationSidelink procedures will need for UE-to-UE SL connection  - RRCReconfigurationSidelink procedure between source remote UE and relay UE  - RRCReconfigurationSidelink procedure between relay UE and target remote UE  - RRCReconfigurationSidelink procedure between source remote UE and target remote UE  Proposal 8: When source remote UE is in SL resource allocation mode-1, the source remote UE reports both the relay UE L2 ID and target remote UE L2 ID as the destination UE ID.  Proposal 9: RAN2 can discuss the following scenario will be handled or not:  Scenario 1) several radio bearers between source remote UE and relay UE can be mapped one radio bearer between relay UE and target remote UE.  Scenario 2) one radio bearers between source remote UE and relay UE can be mapped several radio bearers between relay UE and target remote UE.  Scenario 3) several radio bearers between different source remote UEs and relay UE can be mapped one radio bearer between relay UE and target remote UE.  Scenario 4) one radio bearers between source remote UE and relay UE can be mapped several radio bearers between relay UE and different target remote UEs. |

# 4 Conclusion

Rapporteur Suggests the following proposals

Proposal 1.1: *In UE-to-UE relay, the remote/relay UE can acquire discovery configuration as in Rel17. FFS if any restrictions specific to UE-to-UE relay are introduced for in-coverage UE to minimize gNB control/involvement.*

Proposal 2.1: *Protocol stack for U2N Relay discovery is re-used for U2U Relay Discovery*

Proposal 2.2: *U2U Relay re-uses SL-SRB4 (with associated PDCP, RLC procedures and configuration) to carry discovery messages*

Proposal 3.1: *RAN2 discusses whether Rel17 SI assumptions on RRC state and coverage scenarios can be re-used, and if so, whether some simplified gNB control is needed for the in coverage scenario.*

Proposal 4.1: *Both shared and dedicated resource pool can be used for U2U discovery transmission and Rel-17 pool selection principle is re-used.*

Proposal 4.2: *The dedicated discovery resource pool introduced in Rel-17 for U2N relay discovery is used for U2U relay discovery as well.*

Proposal 5.1: *SL-RSRP and SD-RSRP can be used for relay selection/reselection criteria. RAN2 discusses when each of the two quantities are used and whether to re-use the criteria in Rel17.*

Proposal 6.1: *RAN2 discusses the conditions at the relay and remote UE for transmission of discovery message among the proposals in the papers in section 8.9.2.*

Proposal 7.1: *Relay (re)selection triggers include at least 1) Upper layer trigger; 2) PC5-RLF detection at the remote UE; 3) PC5-RLF indication received from the relay; 4) PC5 signal strength conditions. RAN2 further discuss details for trigger 4).*

Proposal 8.1: *RAN2 discusses which of source and/or destination remote UE(s) perform relay (re)selection decision.*

Proposal 8.2: *RAN2 discusses the relay (re)selection criteria for U2U relay among the proposals in the papers in section 8.9.2.*

Proposal 9.1: *RAN2 to discuss whether the indication is needed for whether the gNB is capable of U2U relay discovery*

Proposal 10.1: *RAN2 to discuss whether to send LS to SA2 on allowable PLMNs, L2ID discovery, and discovery type for U2U relays*

# 4 References

1. R2-2209370 Discussion on U2U Relay Discovery and (Re)selection – CATT
2. R2-2209499 Discussion on NR sidelink UE to UE relay – OPPO
3. R2-2209518 Relay discovery and (re)selection for UE-to-UE relay – MediaTek Inc.
4. R2-2209519 Connection management and procedures for L2 UE-to-UE relay – MediaTek Inc.
5. R2-2209583 Discovery and reselection with UE-to-UE relaying – Intel Corporation
6. R2-2209619 Discussion on U2U relay communication – ZTE, Sanechips
7. R2-2209731 Discussion on UE-to-UE relay – China Telecom
8. R2-2209767 Discussion on U2U Relay Discovery and Relay (Re)-selection – Apple
9. R2-2209819 Discussion on the common L2/L3 parts for U2U relaying – vivo
10. R2-2209839 Discovery and Relay (re-)selection for UE-to-UE relay – Qualcomm Incorporated
11. R2-2209922 Further considerations on U2U relay discovery and relay selection – Beijing Xiaomi Mobile Software
12. R2-2209972 Discussion on relay discovery and (re)selection for U2U relay – Spreadtrum Communications
13. R2-2210048 U2U sidelink relay – Samsung R&D UK
14. R2-2210136 Discussion on U2U relay – CMCC
15. R2-2210221 UE-to-UE relay (re)selection – Sony
16. R2-2210232 Basic aspects for U2U Relay work – Lenovo
17. R2-2210247 Design aspects of relay selection and reselection for U2U relay – Ericsson
18. R2-2210248 Discussion on U2U coverage scenarios and RRC states – Ericsson, vivo, InterDigital
19. R2-2210251 Discussion on SL UE-to-UE Relay Discovery and (Re-)Selection - Fraunhofer IIS, Fraunhofer HHI
20. R2-2210263 Discovery and Relay Selection for UE-to-UE Relays – InterDigital
21. R2-2210276 Initial considerations for U2U relay discovery and (re)selection – Kyocera
22. R2-2210277 Initial considerations for U2U L2 relay CP operations – Kyocera
23. R2-2210339 On L2 and L3 U2U relays - Nokia, Nokia Shanghai Bell
24. R2-2210498 Discussion on UE-to-UE relay - Huawei, HiSilicon
25. R2-2210580 Relay selection and connection establishment - LG Electronics France