**3GPP TSG RAN meeting #98e draft\_RP-22xxxxx**

**Online, 12 – 16 December, 2022**

## Status Report to TSG

**Agenda item:** 9.3.2.4

|  |  |
| --- | --- |
| **WI / SI Name** | NR sidelink relay enhancements |
| included in this status report | Study Item: No | Core part: Yes | Performance part:Yes | Testing part:No |
| **Acronym** | NR\_SL\_relay\_enh |
| **Unique ID** | 941002 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-221262 |
| **Target Completion Date****(indicate if changed)** | Study Item: mm/yyyy | Core part: 12/2023 | Performance part: 06/2024 | Testing part: mm/yyyy |
| **Overall Completion level** | Study Item: xx % | Core part: 30% | Performance Part: 0% | Testing part: xx% |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |
| --- | --- |
| **Leading WG** | RAN WG2 |
| **Rapporteur** | **Name** | Youngdae LEE |
| **Company** | LG Electronics Inc. |
| **Email** | youngdae.lee@lge.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.
 One time unit (TU) corresponds to ~ 2 hours in the meeting.
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

 NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

#### 2.1.2 Remaining Open issues

## 2.2 RAN2

#### 2.2.1 Agreements

**RAN2#119bis-e (October 2022)**

99 contributions ([1] ~ [99]) were submitted in this meeting. The following agreements were made:

**UE-to-UE relay**

* RAN2 postpone discussion of authorization for UE-to-UE relay and intend to reply to the SA2 LS in R2-2209357 when there is progress.
* In UE-to-UE relay, the remote/relay UE in RRC\_IDLE/RRC\_INACTIVE or OOC can acquire discovery configuration as in Rel17 (i.e., cell-specific configuration/preconfiguration). FFS if any restrictions specific to UE-to-UE relay are introduced for in-coverage UE in RRC\_CONNECTED.
* Protocol stack for U2N Relay discovery is re-used for U2U Relay Discovery
* U2U Relay re-uses SL-SRB4 (with associated PDCP, RLC procedures and configuration) to carry discovery messages
* Both shared and dedicated resource pool can be used for U2U discovery transmission and Rel-17 pool selection principle is re-used.
* SL-RSRP and SD-RSRP can be used for relay selection/reselection criteria. FFS when each of the two quantities are used and whether to re-use the criteria in Rel17.
* Relay selection triggers include at least 1) Upper layer trigger; 2) PC5 signal strength conditions. RAN2 further discuss details for trigger 2).
* Relay reselection 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; 5) PC5 link release message from relay to remote. RAN2 further discuss details for trigger 4), potentially including T400 expiry. FFS if some of the conditions could be indicated to upper layer instead of directly causing reselection.
* RAN2 will strive to simplify the gNB involvement in U2U-relay-specific operation as compared to the U2N case. Details are FFS, including whether some gNB control is needed for the in-coverage scenario and how/whether the gNB involvement can be simplified compared to U2N.
* Rel17 SI assumptions on RRC state and coverage scenarios can be re-used.
* Discovery message transmission at the remote UE is conditioned on at least upper layer indication.

**Service continuity enhancements for L2 UE-to-network relay**

* For i2i path switch procedure, introduce a new measurement event based on individual thresholds i.e., Event Z1: Serving L2 U2N Relay UE becomes worse than threshold1 and Candidate L2 U2N Relay UE becomes better than threshold2. FFS if we also have an event Z2: Candidate L2 U2N Relay UE becomes an offset better than serving L2 U2N Relay UE, and in this case if/how to compare SL-RSRP of serving U2N relay UE and SD-RSRP of candidate U2N relay UE.
* For i2i scenario, re-use the SL-RSRP or SD-RSRP measurement quantities for path switching.
* For i2i scenario, serving/candidate U2N relay UEs, when SL-RSRP is unavailable, SD-RSRP is used as the measurement quantity. Wording can be revisited if it is determined that L2IDs for U2U and U2N are always different (so that candidate U2N relay UEs would never have SL-RSRP available).
* For i2d path switch scenario, re-use the existing T304 timer
* For d2i and i2i path switch scenarios, re-use the existing T420 timer.

**Multi-path relaying**

* The following cases are to be supported for Scenario 1.

A. The remote UE operating only on the direct path adds the indirect path under the same gNB;

B. The remote UE operating only on the indirect path adds the direct path under the same gNB;

C. The remote UE operating in multi-path releases the indirect path;

D. The remote UE operating in multi-path releases the direct path;

G. The remote UE operating in multi-path changes to a new relay UE for the indirect path while keeping the direct path under the same gNB. FFS if this case would be supported via separate release-and-add (A+C in separate reconfigurations) or a single switch procedure (e.g. similar to i2i service continuity).

* The following case is to be not supported for Scenario 1 as a group mobility scenario.

F. The remote UE configured with multi-path keeps the serving relay UE for the indirect path and the serving cell of the remote UE for the direct path while the serving relay UE changes the serving cell of the relay UE under the same gNB;

* The following case can be supported via separate release-and-add for scenario 1 (B+D in separate reconfigurations):

E. The remote UE operating in multi-path changes the direct path to a different cell of the same gNB while using the serving relay UE for the indirect path under the same gNB.

FFS if a single procedure for this case would be supported.

* The following cases are proposed to be supported for Scenario 2.

A. The remote UE configured only on the direct path adds the indirect path under the same gNB;

C. The remote UE configured with multi-path releases the indirect path;

* The following case is proposed to be not supported for Scenario 2.

F. The remote UE configured with multi-path keeps the serving relay UE for the indirect path and the serving cell of the remote UE for the direct path while the serving relay UE changes the serving cell of the relay UE under the same gNB;

* Whether to support the following case can be further discussed for Scenario 2.

B. The remote UE configured only on the indirect path adds the direct path under the same gNB;

D. The remote UE configured with multi-path releases the direct path;

E. The remote UE configured with multi-path changes the serving cell of the remote UE for the direct path while keeping the serving relay UE for the indirect path under the same gNB;

G. The remote UE configured with multi-path changes to a new relay UE for the indirect path while keeping the direct path under the same gNB.

* For scenario 1, SRB1 and SRB2 can be configured on either the direct or the indirect path, or on both at least with duplication. FFS if they can be configured on different paths from one another.
* For scenario 2, SRB1 and SRB2 can be configured at least on the direct path. FFS if there are restrictions on the configuration and if they can be configured on both paths.
* FFS CPDU submission; if legacy CPDU submission behaviour is supported, the primary RLC entity of the MP split bearer for DRB can be configured on any of the paths for Scenario 1.
* PDCP DRB duplication is supported for the MP split bearer in Scenario 1 based on the existing framework.
* PDCP DRB duplication is supported for the MP split bearer in Scenario 2 based on the existing framework.
* The relay UE is restricted to serve only one remote UE in Scenario 2.
* For Scenario 2, different Uu logical channels are configured for identification of data directed to/originating from the relay UE and data relayed from/to the remote UE over the Uu link of the indirect path, as in Rel-17.
* RAN2 assumes that in Scenario 2, without the adaptation layer over non-3GPP link, a PDCP PDU can be delivered to an intended PDCP entity or RLC entity for support of more than one RB over UE-to-UE link based on UE implementation.
* RAN2 does not impose a requirement for interoperability between two UEs from different vendors for scenario 2 in this release.
* RAN2 understand that UE identification in L2 PDU over non-3GPP link is not in 3GPP scope in Scenario 2.
* Do not specify adaptation layer over UE-to-UE link for scenario 2 in RAN2.
* UE identification is not needed over Uu link in Scenario 2, if relay UE serves only one remote UE and different Uu RLC channels can be assumed for the remote UE and the relay UE.
* Working assumptions:
	+ Bearer identification except LCID is not needed in L2 PDU over Uu link in Scenario 2. Only 1:1 bearer mapping is supported over Uu link for the indirect path. FFS how to configure the mapping.
	+ Without the adaptation layer over Uu link in scenario 2, a PDCP PDU can be delivered to an intended PDCP entity or RLC entity for support of more than one RB over Uu link e.g. by configuring 1:1 bearer mapping and different Uu RLC channels for relay UE local traffic and relay traffic for PDU delivery.
	+ Do not specify adaptation layer over Uu link for scenario 2 in RAN2.
* Multi-path Relay is applicable to RRC\_CONNECTED remote-UE, for scenario-1 and scenario-2.
* Multi-path Relay is NOT applicable to RRC\_IDLE remote-UE, for scenario-1 and scenario-2.
* For multi-path Relay, support RRC\_IDLE/RRC\_INACTIVE target relay UE, for the path switching scenario where there is an addition of indirect path or a change of indirect path.
* When UE operating in multi-path Relay, it performs RLM for Uu interface, for Scenario-1 and Scenario-2. For PC5 interface in Scenario-1, it performs sidelink RLF detection based on Rel-16 V2X specification. For UE-UE link in Scenario-2, whether/how to have failure detection is out of 3GPP scope.
	+ FFS whether there is impact to layers under our control from a failure of the UE-UE link in scenario 2.
* RAN2 aims at reusing R17 mechanism of paging delivery for R18 U2N Relay on the indirect path and legacy mechanism on the direct path, in the multi-path setting when paging is applicable for RRC\_CONNECTED.
* Multi-path Relay is NOT applicable to RRC Setup procedure, for scenario-1 and scenario-2.
* Working assumption: For multi-path Relay Scenario-2, leave it to relay and remote UE implementation on how to trigger the RRC\_IDLE/RRC\_INACTIVE target relay UE to initiate RRC connection establishment procedure. RAN2 further discuss the solution for Scenario-1.
* Multi-path Relay is NOT applicable to RRC\_INACTIVE remote-UE, for scenario-1 and scenario-2. Support storing direct path configuration for potential resume as legacy operation (to single-path configuration), FFS if the UE can also store indirect path configuration and resume directly into multi-path.
* Multi-path Relay is NOT applicable to RRC Resume procedure, for scenario-1 and scenario-2. RAN2 further study how for UE operating in multi-path Relay operate for RRC Re-establishment procedure.

**RAN2#120 (November 2022)**

98 contributions ([100] ~ [197]) were submitted in this meeting. The following agreements were made:

* Multi-path relay study phase is complete and can proceed to normative work from RAN2 perspective, for both scenarios 1 and 2.
* LS to SA2 on Differentiation of Layer2 ID and Coexistence of U2N/U2U is approved in [197].

**UE-to-UE relay**

* RAN2 to agree that in U2U relay, OOC UEs obtain discovery configuration from pre-configuration and IDLE/INACTIVE UEs obtain discovery configuration from SIB.
* RAN2 to confirm that SL-SRB0 is reused for DCR message if discovery is integrated into PC5 unicast link establishment procedure.
* UE-to-UE relay selection can be triggered based on the PC5 RSRP (FFS SL-RSRP or SD-RSRP) of the direct link falling below a threshold. FFS which remote UE (or both) can trigger relay selection. FFS the relationship between selection and discovery.
* UE-to-UE relay reselection can be triggered based on the PC5 RSRP (FFS SL-RSRP or SD-RSRP) between a remote UE and the relay UE falling below a threshold. FFS which remote UE (or both) can trigger relay reselection. FFS if/how the second hop between the relay UE and the peer UE is considered.
* RAN2 does not agree T400 as a new relay reselection trigger because it is already considered when determining PC5 RLF to trigger relay reselection.
* When the remote UE receives PC5-RLF indication from the U2U relay UE, it would inform upper layers and rely on upper layers to trigger relay reselection (or not). FFS if there would be any constraints on the remote UE implementation behaviour to keep or release the PC5 link with the relay UE.

**Service continuity enhancements for L2 UE-to-network relay**

* RAN2 will investigate whether providing lossless delivery in DL and UL in the inter-gNB service continuity cases is feasible using Rel-17 mechanisms.

**Multi-path relaying**

* Support PCell on the direct path only when the UE is in multi-path operation, for both scenario 1 and scenario 2.
* RAN2 confirms the following WA for Scenario 2.
	+ Bearer identification except LCID is not needed in L2 PDU over Uu link in Scenario 2. Only 1:1 bearer mapping is supported over Uu link for the indirect path. FFS how to configure the mapping.
	+ Without the adaptation layer over Uu link in scenario 2, a PDCP PDU can be delivered to an intended PDCP entity or RLC entity for support of more than one RB over Uu link e.g. by configuring 1:1 bearer mapping and different Uu RLC channels for relay UE local traffic and relay traffic for PDU delivery.
	+ Do not specify adaptation layer over Uu link for scenario 2 in RAN2.
* How to configure 1:1 bearer mapping and potential spec impact can be discussed in normative phase.
* In principle, Mode 1 RA can be supported for the remote UE configured with multi-path in Scenario 1.
* RAN2 confirms that split SRB can be configured with or without duplication as a baseline, for both scenarios (assuming it is supported in scenario 2 as proposed elsewhere). Further restrictions can be discussed in normative phase.
* For scenario 2, non-split SRB1/2 is allowed to be configured on direct path.
* Remote UE storing indirect path configuration (e.g., SRAP and PC5-RLC channel configurations) and resuming directly into multi-path configuration is not supported for scenario 1.
* If CSS for SI is configured within the active BWP on PCell, the remote UE can perform direct system information acquisition on PCell as currently specified in 38.331; besides, dedicated signaling can be used to deliver SIB via SRB1 configured on direct and/or indirect path as currently specified in 38.331.
* Upon detection of 3GPP-defined RLF failure in one path, remote UE (configured with MP) can report path failure via the alternative available path if SRB1 is configured on the alternative path or split SRB1 is configured.
* PDCP Control PDU is not duplicated.
* RAN2 do not define a control plane primary path concept in the study phase; FFS if something needs to be defined in normative work, but it should be driven by functionality and technical benefits.
* Case B and case D are not supported for Scenario 2.
* For Scenario 2, Case E is not supported.
* For Scenario 2, whether to support Case G is discussed in normative phase, but RAN2 will not do additional work to enable it for Scenario 2 over Scenario 1.
* Whether SRB1/2 can be configured in different path for Scenario 1 can be discussed in normative phase.
* Whether non-split SRB1/2 is allowed to be configured on indirect path for scenario 2 and whether split SRB1/2 is supported for scenario 2 can be discussed in normative work.
* Remote UE storing indirect path configuration or not and use it to resume to MP configuration in scenario 2 is not supported.
* RAN2 will downselect the solution for triggering IDLE/INACTIVE relay UE to enter CONNECTED state from:
	+ Option 1 (SL-RLC or UP-based approach (excluding SL-RLC1)),
	+ Option 3 (PC5-RRC approach)
	+ Option 4( RRCReconfigurationComplete-based approach),

Discovery/PC5-S-based solution can be further discussed if initiated from SA2.

* Multi-path relay study phase is complete and can proceed to normative work from RAN2 perspective, for both scenarios 1 and 2.

#### 2.2.2 Remaining Open issues

* Specify mechanisms to support single-hop Layer-2 and Layer-3 UE-to-UE relay for unicast
	+ Details of relay discovery and (re)selection
	+ Signalling support for UE-to-UE relay authorization
	+ UE-to-UE relay adaptation layer design
	+ Control plane procedures
	+ QoS handling if needed, subject to SA2 progress
* Specify mechanisms to enhance service continuity for single-hop Layer-2 UE-to-Network relay
	+ Details of service continuity procedures
	+ Investigate whether providing lossless delivery in DL and UL in the inter-gNB service continuity cases is feasible using Rel-17 mechanisms
* Specify mechanisms for the multi-path support in Scenario 1 and 2 based on the agreements of the study.
	+ Details of control plane procedures
	+ Details of user plane protocols.
	+ Signalling support for multi-path authorization if SA2 concludes it is needed

## 2.3 RAN3

#### 2.3.1 Agreements

**RAN3#117bis-e (October 2022)**

27 contributions ([198] ~ [224]) were submitted in this meeting. The following agreements were made:

**UE-to-UE relay**

* WA: The multi-path authorization can be added in the 5G ProSe Authorized IE if it is needed.

**Service continuity enhancements for L2 UE-to-network relay**

* WA: Source gNB selects the target path type (direct or indirect)
* For direct/indirect to indirect path switching, enhance Xn: HANDOVER REQUEST to include at least the Remote UE L2 ID and Relay UE L2 ID. FFS whether to include a single Target Relay L2 ID or a list of Target candidate Relay L2 IDs.
* For inter-gNB path switching scenarios, RAN3 should specify mechanisms to support service continuity for L2 U2N relays in NG based handovers as well after supporting service continuity for L2 U2N relays in Xn based handovers, If there is some conclusion from SA2, and then to support NG based HO.
* WA: During inter-gNB path switching, source gNB can signal the serving cell of the relay UE to target gNB via existing IE Target Cell Global ID.

**Multi-path support**

* For Scenario 1, the responsibility of gNB-CU and gNB-DU in Rel-17 SL relay can be reused as a baseline. Whether to enhance the responsibility of gNB-CU and gNB-DU in Rel-18 is FFS.
* For the responsibility of gNB-CU and gNB-DU in Scenario 2, the RAN3 waits for RAN2’s progress on protocol stack for Scenario 2.
* For the multi-path support, the gNB-CU takes the responsibility to decide the addition/modification/release of the path.
* For intra-DU and inter-DU cases, the UE Context Setup / Modification procedure can be reused to configure the 2nd path with possible enhancements. The details will be discussed based on RAN2 progress.
* The RAN3 waits for the RAN2 progress on whether the gNB-DU knows the path information of each configured path.
* WA: The direct path and indirect path cannot be configured for a remote UE simultaneously in this release, depending on RAN2 decision.
* The gNB-CU is responsible to determine the data split among two paths for a DRB for both intra-DU and inter-DU cases.
* For intra-DU case, two F1-U tunnels are setup between CU and DU for a split DRB. FFS on how to support the multi-path delivery of split SRB.
* WA: For inter-DU case, legacy DC based data split/duplication mechanism can be reused as baseline for split DRB/SRB.
* WA: The RAN3 will specify the details of the path change procedure after introducing the procedure of the direct/indirect path addition.
* Previous RAN3 agreement is updated as follows:
	+ For Scenario 1, addition of direct/indirect path are supported as follows:
		- Add direct path, after the establishment of the indirect path.
		- Add indirect path, after the establishment of the direct path.
	+ For Scenario 2, addition of direct/indirect path are supported as follows:
		- Add indirect path, after the establishment of the direct path.
		- Whether to add direct path, after the establishment of the indirect path is pending to RAN2 decision.
* For Scenario 2, interface between UEs are non-3GPP defined. Therefore, in the UE context setup/modification procedure, the PC5 Relay RLC channel configurations are not needed for remote UE and relay UE.

**RAN3#118 (November 2022)**

24 contributions ([225] ~ [248]) were submitted in this meeting. The following agreements were made:

* Reply LS to SA2 and RAN2 on ProSe Authorization information related to UE-to-UE Relay operation to NG-RAN is agreed in [228].
* From RAN3 point of view, the Multi-path study phase is completed, and the Multi-path can move to normative work phase.

**UE-to-UE relay**

* Reply LS to SA2 and RAN2 on ProSe Authorization information related to UE-to-UE Relay operation to NG-RAN is agreed in [228].
	+ RAN3 currently considers that there is no need to provide the authorization information for UE-to-UE Relay operation to the NG-RAN
	+ However, since whether the gNB involvement to support the U2U relay operation is needed or not is within RAN2 remit, the RAN3 could enhance the "5G ProSe authorised" information, if needed, based on the RAN2’s progress

**Service continuity enhancements for L2 UE-to-network relay**

* Turn WA to agreement: Source gNB selects the target path type (direct or indirect).
* Focus on the following two ways for the future discussion,
	+ Way1: to go for Op1, and Op2 can be further discussed.
	+ Way2: accept Op2, or at least as a compromise.
* No more discussion on Op3 in RAN3.

**Multi-path support**

* From RAN3 point of view, the Multi-path study phase is completed, and the Multi-path can move to normative work phase.

#### 2.3.2 Remaining Open issues

* Signalling support for multi-path authorization if SA2 concludes it is needed
* Signalling support for UE-to-UE relay authorization if RAN2 concludes it is needed
* Mechanisms to enhance service continuity for single-hop Layer-2 UE-to-Network relay
	+ FFS on which node (source node or target node) decides the target relay UE
	+ FFS whether to include a single Target Relay L2 ID or a list of Target candidate Relay L2 IDs
* Mechanisms for the multi-path support in Scenario 1 and 2

## 2.4 RAN4

#### 2.4.1 Agreements

#### 2.4.2 Remaining Open issues

* RRM core requirements for relay discovery and (re)selection in UE-to-UE relay
* RRM performance requirements for relay discovery and (re)selection in UE-to-UE relay

## 2.5 RAN5

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

NOTE: This can be e.g. a list of all related Tdocs in the affected WGs since last TSG, references to LSs, produced TRs/TSs, the work/study item description or status reports of previous TSGs.

**RAN2#119bis-e**

1. R2-2209357 LS on ProSe Authorization information related to UE-to-UE Relay operation to NG-RAN (S2-2207518; contact: LGE) SA2
2. R2-2209370 Discussion on U2U Relay Discovery and (Re)selection CATT
3. R2-2209371 Consideration on Service Continuity Enhancements for L2 U2N Relay CATT
4. R2-2209372 Discussion on Multi-path for Scenario 1 CATT
5. R2-2209373 Discussion on the Details of Scenario 2 CATT
6. R2-2209375 Discussion on multi-path Relay OPPO
7. R2-2209376 Discussion on SL-DRX for Relay OPPO
8. R2-2209460 Considerations on Service Continuity Enhancement NEC Corporation
9. R2-2209461 Considerations on Multipath of Sidelink Relay NEC Corporation
10. R2-2209498 Discussion on further enhancement of service continuity OPPO
11. R2-2209499 Discussion on NR sidelink UE to UE relay OPPO
12. R2-2209518 Relay discovery and (re)selection for UE-to-UE relay MediaTek Inc.
13. R2-2209519 Connection management and procedures for L2 UE-to-UE relay MediaTek Inc.
14. R2-2209520 Inter-gNB path switch to Relay UE in RRC\_Idle, RRC\_Inactive MediaTek Inc.
15. R2-2209583 Discovery and reselection with UE-to-UE relaying Intel Corporation
16. R2-2209584 Service continuity enhancements for L2 U2N relay Intel Corporation
17. R2-2209585 Discussion on Multi-path Relaying Intel Corporation
18. R2-2209617 Further discussion on the multi-path relaying ZTE, Sanechips
19. R2-2209618 Design consideration on the UE aggregation ZTE, Sanechips
20. R2-2209619 Discussion on U2U relay communication ZTE, Sanechips
21. R2-2209642 Inter-gNB Aspects of Service Continuity for Layer-2 UE-to-Network Relays Ericsson España S.A.
22. R2-2209681 Multipath support for remote UE MediaTek Inc.
23. R2-2209682 Multipath Relaying for Scenario-1 and Scenario-2 Ericsson España S.A.
24. R2-2209730 Service continuity enhancements for L2 U2N relay China Telecom
25. R2-2209731 Discussion on UE-to-UE relay China Telecom
26. R2-2209732 Discussion on RLF handling for multi-path relaying China Telecom
27. R2-2209749 Support of Multi-path Relaying Nokia, Nokia Shanghai Bell
28. R2-2209769 Discussion on U2U Relay Discovery and Relay (Re)-selection Apple
29. R2-2209770 Discussion on Service continuity enhancement of L2 U2N relay Apple
30. R2-2209771 Discussion on multi-path relaying support Apple
31. R2-2209774 Discussion on SL DRX for L2 Relay Apple
32. R2-2209819 Discussion on the common L2/L3 parts for U2U relaying vivo
33. R2-2209820 On service continuity enhancement for L2 U2N relay vivo
34. R2-2209821 Multi-path UE aggregation on PC5 and Ideal-link vivo
35. R2-2209822 Discussion on SL DRX for L2 U2N Remote UE vivo
36. R2-2209839 Discovery and Relay (re-)selection for UE-to-UE relay Qualcomm Incorporated
37. R2-2209840 Discussion on multi-path relay for Scenario 1 and Scenario 2 Qualcomm Incorporated
38. R2-2209841 Service continuity for UE-to-Network relay Qualcomm Incorporated
39. R2-2209842 SL DRX for L2 U2N relay Qualcomm Incorporated
40. R2-2209881 Discussion on multi-path Xiaomi
41. R2-2209882 Discussion on service continuity enhancement Xiaomi
42. R2-2209883 Discussion on SL DRX in U2N relay Xiaomi
43. R2-2209901 Service continuity enhancement for L2 U2N relay ZTE, Sanechips
44. R2-2209922 Further considerations on U2U relay discovery and relay selection Beijing Xiaomi Mobile Software
45. R2-2209943 Service continuity in L2 U2N relay case Lenovo
46. R2-2209944 Discussion on Multi-path relaying Lenovo
47. R2-2209945 Second path establishment for Multi-Path Lenovo
48. R2-2209972 Discussion on relay discovery and (re)selection for U2U relay Spreadtrum Communications
49. R2-2209975 Service continuity enhancements support for L2 U2N relay Spreadtrum Communications
50. R2-2209976 Discussion on multi-path relaying Spreadtrum Communications
51. R2-2210014 Service continuity enhancements for L2 U2N relay Samsung
52. R2-2210027 Report of [Post119-e][408][Relay] Path operations in multi-path relaying LG Electronics France
53. R2-2210031 Multi-path relaying for NR sidelink relay enhancements LG Electronics France
54. R2-2210048 U2U sidelink relay Samsung R&D Institute UK
55. R2-2210063 Discussion on primary path for CP in sidelink relay enhancement Samsung
56. R2-2210064 Discussion on key issues for multipath in sidelink relay enhancement Samsung
57. R2-2210101 Discussion on service continuity enhancement for Inter-gNB path switching of L2 U2N relay Nokia, Nokia Shanghai Bell
58. R2-2210102 Discussion on service continuity enhancement for Inter-gNB path switching via relay UE in RRC\_IDLE/INACTIVE state Nokia, Nokia Shanghai Bell
59. R2-2210112 Discussion on Service Continuity Huawei, HiSilicon
60. R2-2210136 Discussion on U2U relay CMCC
61. R2-2210137 Service continuity on U2N relay CMCC
62. R2-2210138 Primary path for CP in multi-path CMCC
63. R2-2210139 Consideration on UE aggregation CMCC
64. R2-2210221 UE-to-UE relay (re)selection Sony
65. R2-2210222 Discussions on Sidelink Relay DRX Sony
66. R2-2210223 Service continuity enhancements for UE sidelink relay Sony
67. R2-2210224 Multi-path relaying discussion Sony
68. R2-2210232 Basic aspects for U2U Relay work Lenovo
69. R2-2210247 Design aspects of relay selection and reselection for U2U relay Ericsson
70. R2-2210248 Discussion on U2U coverage scenarios and RRC states Ericsson, vivo, InterDigital Inc
71. R2-2210251 Discussion on SL UE-to-UE Relay Discovery and (Re-)Selection Fraunhofer IIS, Fraunhofer HHI
72. R2-2210263 Discovery and Relay Selection for UE-to-UE Relays InterDigital
73. R2-2210264 Open Issues on Service Continuity for Rel18 InterDigital
74. R2-2210265 Architecture Assumptions for Multi-path InterDigital
75. R2-2210266 SRB and DRB Configurations for Multi-path InterDigital
76. R2-2210276 Initial considerations for U2U relay discovery and (re)selection Kyocera
77. R2-2210277 Initial considerations for U2U L2 relay CP operations Kyocera
78. R2-2210278 L2 U2N inter-gNB service continuity Kyocera
79. R2-2210339 On L2 and L3 U2U relays Nokia, Nokia Shanghai Bell
80. R2-2210425 SRB and DRB Configurations for Multi-path InterDigital France R&D, SAS
81. R2-2210442 Open Issues on Service Continuity for Rel18 InterDigital France R&D, SAS
82. R2-2210474 Service Continuity Enhancements for Layer-2 U2N Relay Sharp
83. R2-2210475 UE-to-UE relay discovery and (re)selection Sharp
84. R2-2210476 discussion on multi-path bearer Sharp
85. R2-2210477 resource allocation for multi-path relaying Sharp
86. R2-2210497 Discussion on Rel-18 multi-path via SL relay and UE aggregation Huawei, HiSilicon
87. R2-2210498 Discussion on UE-to-UE relay Huawei, HiSilicon
88. R2-2210499 On sidelink DRX for L2 U2N relay Huawei, HiSilicon
89. R2-2210578 Service continuity enhancements for L2 U2N relay LG Electronics France
90. R2-2210579 SL DRX for L2 U2N relay LG Electronics France
91. R2-2210580 Relay selection and connection establishment LG Electronics France
92. R2-2210780 Discussion on multi-path Relay OPPO
93. R2-2210782 Summary of AI 8.9.3, Service Continuity Enhancements Ericsson
94. R2-2210893 Summary of AI 8.9.2 – UE to UE Relay (InterDigital) InterDigital
95. R2-2210903 [AT119bis-e][415][Relay] LS on authorization for UE-to-UE relay (LG) LG Electronics Inc.
96. R2-2210912 Report of [AT119bis-e][425][Relay] Adaptation layer for scenario 2 (LG) LG Electronics Inc.
97. R2-2210913 Summary of [AT119bis-e][426][Relay] Control plane aspects for multi-path (OPPO) OPPO
98. R2-2210914 "Summary of [AT119bis-e][427][Relay] Remaining proposals on UE-to-UE relay (InterDigital)" InterDigital
99. R2-2210981 "Summary of [AT119bis-e][427][Relay] Remaining proposals on UE-to-UE relay (InterDigital)" InterDigital

**RAN2#120**

1. R2-2211120 LS on ProSe Authorization information related to UE-to-UE Relay operation to NG-RAN (S2-2207518; contact: LGE) SA2
2. R2-2211207 Discussion on multi-path SL relay OPPO
3. R2-2211208 Discussion on PCell location for Multi-path Relay OPPO, ZTE, Huawei, HiSilicon, MediaTek
4. R2-2211279 Discussion on U2U Relay Discovery and (Re)selection CATT
5. R2-2211280 Consideration on Service Continuity Enhancements for L2 U2N Relay CATT
6. R2-2211281 Discussion on Multi-path for Scenario 1 CATT
7. R2-2211282 Leftover issues on Multi-path scenario 2 CATT
8. R2-2211399 Discussion on further enhancement of service continuity OPPO
9. R2-2211400 Discussion on NR sidelink UE to UE relay OPPO
10. R2-2211401 Discovery and reselection with UE-to-UE relaying Intel Corporation
11. R2-2211402 Service continuity enhancements for L2 U2N relay Intel Corporation
12. R2-2211403 Path management for Multi-path Relaying Intel Corporation
13. R2-2211413 Considerations on Service Continuity Enhancement NEC Corporation
14. R2-2211414 Considerations on Multipath of Sidelink Relay NEC Corporation
15. R2-2211534 Remaining Issues on Relay (re)Selection and Discovery Ericsson España S.A.
16. R2-2211535 Further Aspects on Inter-gNB Service Continuity Ericsson España S.A.
17. R2-2211536 Remaining Issues on Multipath Relays for Scenario-1 and Scenario-2 Ericsson España S.A.
18. R2-2211537 PCell and SRB Handling for Multipath Relays in Scenario-1, Scenario-2 Ericsson España S.A.
19. R2-2211607 Discussion on Service Continuity Huawei, HiSilicon
20. R2-2211630 Discovery and Relay Selection for UE-to-UE Relays InterDigital
21. R2-2211631 Open Issues on Service Continuity InterDigital
22. R2-2211632 Lossless path switching from indirect to indirect/direct InterDigital
23. R2-2211633 Design Aspects for Multi-path InterDigital
24. R2-2211675 Discussion on the common L2 L3 parts for U2U relaying vivo
25. R2-2211676 Remaining issues on service continuity enhancement for L2 U2N relay vivo
26. R2-2211677 Remaining Control Plane Issues for Multi-path Scenario 1&2 vivo
27. R2-2211678 Supporting Cases and Detailed Procedures for Multi-path Scenario-1 and Scenario-2 vivo
28. R2-2211697 Discussion on UE-to-UE Relay Apple
29. R2-2211698 Discussion on Service continuity enhancement of L2 U2N relay Apple
30. R2-2211699 Discussion on multi-path relaying support Apple
31. R2-2211700 Discussion on SL DRX for L2 Relay Apple
32. R2-2211752 Discussion on multi-path operation Huawei, HiSilicon
33. R2-2211753 Discussion on UE-to-UE relay Huawei, HiSilicon
34. R2-2211754 On sidelink DRX for L2 U2N relay Huawei, HiSilicon
35. R2-2211781 Discussion on U2U relay China Telecom
36. R2-2211782 Considerations on service continuity enhancements China Telecom
37. R2-2211783 Discussion on multi-path relaying China Telecom
38. R2-2211785 U2U Relay open issues and coexistence with U2N Relay Qualcomm Incorporated
39. R2-2211786 Open issue on service continuity for UE-to-Network relay Qualcomm Incorporated
40. R2-2211787 Multi-path relaying for NR sidelink relay enhancements LG Electronics France
41. R2-2211788 Further discussion on multi-path relay for Scenario 1 and Scenario 2 Qualcomm Incorporated
42. R2-2211789 SL DRX for L2 U2N Relay Qualcomm Incorporated
43. R2-2211814 Discussion on the remaining issues of multi-path relaying ZTE, Sanechips
44. R2-2211815 Further discussion on the UE aggregation ZTE, Sanechips
45. R2-2211816 Discussion on U2U relay communication ZTE, Sanechips
46. R2-2211821 UE to UE relay discovery and (re)selection NEC Corporation
47. R2-2211830 Relay selection and reselection triggers Fujitsu
48. R2-2211849 Relay selection and reselection triggers Fujitsu
49. R2-2211874 Discussion on multi-path Xiaomi
50. R2-2211875 Discussion on service continuity enhancement Xiaomi
51. R2-2211876 Discussion on SL DRX in U2N relay Xiaomi
52. R2-2211897 Service continuity enhancement for L2 U2N relay ZTE, Sanechips
53. R2-2211933 UE-to-UE relay (re)selection Sony
54. R2-2211934 Service continuity enhancements for UE sidelink relay Sony
55. R2-2211935 Multi-path relaying discussion Sony
56. R2-2211936 Discussions on Sidelink Relay DRX Sony
57. R2-2212025 Discussion on L2 UE-to-UE relay Lenovo
58. R2-2212026 Service continuity enhancements for L2 U2N relay Lenovo
59. R2-2212027 Second path addition and failure recovery for Scenario1 Lenovo
60. R2-2212155 Service continuity enhancements support for L2 U2N relay Spreadtrum Communications
61. R2-2212156 Discussion on multi-path relaying Spreadtrum Communications
62. R2-2212159 Remaining issues on relay discovery and (re)selection for U2U relay Spreadtrum Communications
63. R2-2212207 Discussion on integrated U2U relay discovery Samsung
64. R2-2212253 Discussion on service continuity issues for Inter-gNB path switching of L2 U2N relay Nokia, Nokia Shanghai Bell
65. R2-2212254 SL-RSRP and SD-RSRP measurement issues Nokia, Nokia Shanghai Bell
66. R2-2212274 Motivation for SL U2N Relay DRX coordination Fraunhofer IIS, Fraunhofer HHI
67. R2-2212275 SL UE-to-UE Relay Discovery and (Re-)Selection Fraunhofer IIS, Fraunhofer HHI
68. R2-2212276 U2N Relay UE operation Threshold Conditions: Impact of UE Mobility Philips International B.V., FirstNet, ASUSTek, NEC, MediaTek, Lenovo
69. R2-2212301 Considerations for U2U L2 relay operations Kyocera
70. R2-2212307 L2 U2N inter-gNB service continuity Kyocera
71. R2-2212320 Relay discovery and (re)selection for UE-to-UE relay MediaTek Inc.
72. R2-2212321 Connection management and procedures for L2 UE-to-UE relay MediaTek Inc.
73. R2-2212322 Inter-gNB path switch to Relay UE in RRC\_Idle, RRC\_Inactive MediaTek Inc.
74. R2-2212323 MP modelling MediaTek Inc.
75. R2-2212404 Considerations on U2U relay (re)selection Nokia, Nokia Shanghai Bell
76. R2-2212410 Lossless path switching from indirect to indirect/direct InterDigital Inc.
77. R2-2212508 Further discussion on U2U relay discovery and relay selection Beijing Xiaomi Mobile Software
78. R2-2212519 Relay (re-)selection and discovery for UE-to-UE relay LG Electronics France
79. R2-2212520 Service continuity enhancements for L2 U2N relay LG Electronics France
80. R2-2212561 UE-to-UE relay (re)selection Sharp
81. R2-2212562 C-plane aspects of multi-path Sharp
82. R2-2212563 Discussion on scenario 2 of multi-path relaying Sharp
83. R2-2212570 Discussion on remaining issues for i2i path switch Sharp
84. R2-2212610 AS condition for relay discovery message transmission Samsung
85. R2-2212697 Discussion on U2U relay CMCC
86. R2-2212698 Discussion on service continuity CMCC
87. R2-2212699 Control plane issues in multi-path CMCC
88. R2-2212700 Protocol stack for multi-path CMCC
89. R2-2212722 Support of multipath relay Nokia Korea
90. R2-2212737 Control plane aspects for multi-path relaying Intel Corporation
91. R2-2212813 Discussion on common features for scenario 1&2 in sidelink relay enhancement Samsung
92. R2-2212814 Discussion on specific issues for scenario 2 Samsung
93. R2-2212866 Discussion on Multi-path relaying Lenovo
94. R2-2212964 Summary of agenda item 8.9.4 on multi-path relaying (Apple) Apple
95. R2-2213121 Summary of agenda item 8.9.2 on UE-to-UE relay vivo
96. R2-2213122 Summary of agenda item 8.9.4 on multi-path relaying (Apple) Apple
97. R2-2213152 [Draft]LS on Differentiation of Layer2 ID and Coexistence of U2N/U2U CATT
98. R2-2213328 LS on Differentiation of Layer2 ID and Coexistence of U2N/U2U RAN2

**RAN3#117bis-e**

1. R3-225322 LS on ProSe Authorization information related to UE-to-UE Relay operation to NG-RAN SA2
2. R3-225354 Authorization for U2U relay Ericsson
3. R3-225415 Authorization for multi-path and U2U relays Qualcomm Incorporated
4. R3-225466 Discussion on RAN3 impacts on U2U relay ZTE
5. R3-225927 Summary of offline discussion on CB# SLRelay1\_Authorization ZTE
6. R3-225355 Inter-gNB aspects of Service Continuity for L2 U2N Relays Ericsson
7. R3-225416 Service continuity enhancements for L2 relays Qualcomm Incorporated
8. R3-225426 Inter-node path switching for U2N relays China Telecommunication
9. R3-225457 Discussion on Support Service Continuity Enhancements Nokia, Nokia Shanghai Bell
10. R3-225500 Selection of the target relay UE for service continuity InterDigital
11. R3-225546 SL relay: Inter-gNB mobility Huawei
12. R3-225708 (TP to TS 38.401) Further discussion on service continuity enhancement Samsung
13. R3-225755 (TP to TS 38.401) Consideration on service continuity enhancement for L2 U2N relay LG Electronics
14. R3-225794 Discussion on Service Continuity Enhancements for SL relay CATT
15. R3-225802 Service continuity on U2N relay CMCC
16. R3-225928 Summary of Offline Discussion on CB: # SLRelay2\_ServiceContinuity Qualcomm Incorporated
17. R3-225954 Summary of Offline Discussion on CB: # SLRelay2\_ServiceContinuity Qualcomm Incorporated
18. R3-225428 On multi-path support for sidelink relay China Telecommunication
19. R3-225458 Discussion on the support for multi-path Nokia, Nokia Shanghai Bell
20. R3-225467 Further study on multi-path relay and service continuity of L2 U2N relay ZTE
21. R3-225547 SL relay: U2U relay and Multi-path relay Huawei
22. R3-225709 (TP to TS 38.401) Further discussion on multipath for sidelink relay Samsung
23. R3-225756 (TP to TS 38.401) Consideration on multi-path support LG Electronics
24. R3-225795 Discussion on Multi-path Support for SL relay CATT
25. R3-225803 Configurations on multi-path CMCC
26. R3-225929 SoD of CB: # SLRelay3\_Others LG Electronics
27. R3-225955 SoD of CB: # SLRelay3\_Others LG Electronics

**RAN3#118**

1. R3-226656 BL CR Assignment for Rel-18 SL Relay Enhancements WI LG Electronics
2. R3-226354 Further discussion on multi-path authorization ZTE
3. R3-226657 [Draft] Reply LS on ProSe Authorization information related to UE-to-UE Relay operation to NG-RAN LG Electronics
4. R3-226822 Reply LS on ProSe Authorization information related to UE-to-UE Relay operation to NG-RAN LG Electronics
5. R3-226707 Service continuity for U2N relay CMCC
6. R3-226392 Service continuity enhancements for U2N relays China Telecommunication
7. R3-226273 Selection of the target relay UE for service continuity InterDigital
8. R3-226313 Discussion on Support Service Continuity Enhancements Nokia, Nokia Shanghai Bell
9. R3-226523 Service continuity enhancements for L2 relays Qualcomm Incorporated
10. R3-226264 (TPs for BLCRs for TS 38.401 and TS 38.423): SL relay: Inter-gNB mobility Huawei
11. R3-226658 (TP to TS 38.401 and 38.423) Consideration on service continuity enhancement for L2 U2N relay LG Electronics
12. R3-226588 (TP to TS 38.401) Remaining issues on service continuity enhancement Samsung
13. R3-226233 Inter-gNB Service Continuity for L2 U2N Relay Ericsson
14. R3-226284 Discussion on Service Continuity Enhancements for SL relay CATT
15. R3-226850 Summary of Discussion on CB: # 32\_SLRelay\_ServiceContinuity Samsung
16. R3-226708 Considerations on multi-path for SL relay CMCC
17. R3-226234 Multi-path for Sidelink Relay Ericsson
18. R3-226314 Discussion on the support for multi-path Nokia, Nokia Shanghai Bell
19. R3-226285 Discussion on Multi-path Support for SL relay CATT
20. R3-226265 SL relay: U2U relay and Multi-path relay Huawei
21. R3-226355 Remaining issues of multi-path relay and service continuinty for L2 U2N relay ZTE
22. R3-226659 Consideration on multi-path support and U2U relay operation LG Electronics
23. R3-226589 (TP to TS 38.401) Remaining issues on multipath for sidelink relay Samsung
24. R3-226524 Direct path and indirect path addition in multi-path relays Qualcomm Incorporated

 10.01.2022 minor adaptations for RAN #95e

 04.10.2021 minor adaptations for RAN #94e

 08.08.2021 minor adaptations for RAN #93e

 17.05.2021 minor adaptations for RAN #92e

 28.01.2021 minor adaptations for RAN #91e

 09.11.2020 minor adaptations for RAN #90e

 31.08.2020 minor adaptations for RAN #89e

 20.04.2020 minor adaptations for RAN #88e

 18.02.2020 minor adaptations for RAN #87e

 14.11.2019 minor adaptations for RAN #86

 18.08.2019 minor adaptations for RAN #85

 12.05.2019 minor adaptations for RAN #84

 27.02.2019 minor adaptations for RAN #83

 21.11.2018 completion levels with colours added (for RAN #82)

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v04.78 18.11.2017 minor adaptations for RAN #78

v04.77 06.08.2017 minor adaptations for RAN #77

v04.76 15.05.2017 minor adaptations for RAN #76

v04.75 31.01.2017 minor adaptations for RAN #75

v04.74 28.10.2016 minor adaptations for RAN #74

v04.73 01.09.2016 adaptations for RAN #73 (time units in extra Excel table, RAN6 reporting included)

v04.72 26.05.2016 adaptations for RAN #72 (introduction of NR & GERAN TUs)

v04.71 10.02.2016 minor adaptations for RAN #71

v04.70 30.10.2015 minor adaptations for RAN #70

v04.69 12.08.2015 minor adaptations for RAN #69

v04.68 21.05.2015 minor adaptations for RAN #68

v04.67 01.02.2015 minor adaptations for RAN #67

v04.66 16.11.2014 minor adaptations for RAN #66

v04.65 16.08.2014 minor adaptations for RAN #65

v04.64 22.05.2014 minor adaptations for RAN #64

v04.63 24.01.2014 restructuring for RAN #63 to cover Core & Perf. in one doc file

v03.62 11.11.2013 section 1.2.3 adapted for RAN #62

v03 11.08.2013 section 1.2.3 added on time budget

v02 07.05.2010 history added, some spelling corrections

v01 13.11.2009 First version of the template