**3GPP TSG-RAN WG2 Meeting #117 electronic R2-220xxxx**

**Online, February, 2022**

**Agenda item: 8.7.2.2**

**Source: OPPO**

**Title: Summary of [621]**

**Document for: Discussion and Decision**

# Introduction

This document is for the following discussion

* [AT117-e][621][Relay] Additional issues on service continuity (OPPO)

      Scope: Filter the issues raised in company tdocs under agenda item 8.7.2.2, determine if any critical issues need resolution, and attempt to converge on any critical issues.

      Intended outcome: Report to Friday online session

      Deadline:  Thursday 2022-02-24 1200 UTC

# Discussion

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| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 9: Extend the PC5 RRC notification message to include the cause value that relay fails to enter CONNECTED. | Moderator understand it is related to the P8 of [Pre117-e][603].  Proposal 8: When the new T304-like timer is stopped in remote UE but the direct to indirect path switch fails due to IDLE/INACTIVE relay UE fails to establish the connection on Uu hop of indirect path, a similar handling as relay UE’s HO/Uu RLF, i.e.:  -Upon relay UE receives RRCReject or experiences other connection establishment/resume failure, it either triggers PC5-S release or sends notification message indicating Uu RRC connection failure to remote UE.  -PC5-S release or notification message shall trigger remote UE’s RRC reestablishment. But in case of notification, remote UE can choose to keep the current PC5 connection with this target relay, or release the PC5 connection and reselect to other relay.  Yet P8 did not mention the cause value introduction so can be asked here. |

**Q1: For the case where RRC\_IDLE/RRC\_INACTIVE Relay UE fails to enter RRC\_CONNECTED state, do you agree to introduce a cause value into the PC5-RRC notification message?**

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| Company | Yes/No | Comment |
| Qualcomm | Yes | Proponent  The failure to enter CONNECTED state may be due to non-radio reason (e.g., failure to be authorized to act as a L2 Relay in current TA or after TAU), which is different from existing cause (i.e., Uu-RLF/HO/Cell-reselection). And please note it is not restricted to only direct-to-indirect path switch when relay UE is IDLE/INACTIVE state (i.e., it can a general scenario when relay UE failed in TAU). Thus, we think it is reasonable to extend existing PC5 RRC message for notification. |
| ASUSTeK | Yes with comment. | Yes if it is agreed for relay UE to send the notification message in discussion on P8 of [Pre117-e][603]. Otherwise (i.e. triggering PC5-S release is agreed), no new cause value needs to be introduced. |
| Xiaomi |  | We understand this issue has been covered by Pre meeting discussion. We don’t need duplicated discussion. |
| Ericsson | Yes | It can be useful for the Remote UE to identify that the path switch has failed. |

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| [**R2-2202848**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202848.zip) | ASUSTeK | Proposal 1: RAN2 to discuss and decide whether a L2 U2N remote UE can establish multiple unicast links with a L2 U2N relay UE for relaying traffic. | The discussion of whether to support multiple unicast links between a U2N remote UE and relay UE was touched in post-116 discussion, which should be addressed. |
| [**R2-2202341**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202341.zip) | OPPO | Proposal 1: RAN2 not pursue optimization on per-PDU-session RSC in service-continuity. | Related to P1 of R2-2202848, which can be jointly discussed. |
| [**R2-2202848**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202848.zip) | ASUSTeK | Proposal 2: If RAN2 only support single unicast link between the L2 U2N remote UE and the L2 U2N relay UE for relaying traffic, it is suggested that RAN2 sends an LS to inform SA2 about this restriction. Otherwise (i.e. multiple unicast links between the L2 U2N remote UE and the L2 U2N relay UE for relaying traffic are supported), gNB needs to include multiple PC5 configurations (each PC5 configuration is for one unicast link and is associated with one PDU session) in the RRCReconfiguration message sent to the remote UE and the target relay UE for initiating direct to indirect path switching. | Related to P1 of R2-2202848, which can be jointly discussed. |
| [**R2-2202848**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202848.zip) | ASUSTeK | Proposal 3: Extra PDU sessions not supported by the target L2 U2N Relay UE should be released during direct to indirect path switching. | Related to P1 of R2-2202848, which can be jointly discussed. |
| [**R2-2202848**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202848.zip) | ASUSTeK | Proposal 4: A L2 U2N Remote UE includes PDU session ID(s) supported by each candidate L2 U2N relay UE in the measurement report. | Related to P1 of R2-2202848, which can be jointly discussed. |

**Q2-1: Do you agree the RSC definition for L2 Relay is out of RAN2 scope and thus can be left to SA2 decision?**

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| Company | Yes/No | Comment |
| OPPO | Yes | Technically, we hold different view as ASUSTek, i.e., there is no mapping between RSC vs. PDU session for L2 relay. Nevertheless, this is a SA2 issue and thus we do not see the need to dig into it from R2 perspective. Interested companies can go to S2 to raise the proposal (we observed some attempt in this direction already). |
| Qualcomm | Yes | Same view as OPPO. We don’t prefer involve SA2 at this late stage. |
| ASUSTeK | See comment | According to clause 6.3.2.3.1 and clause 6.4.3.6 in TS 23.304, RSC is included in discovery message and Direct Communication Request message to identify a connectivity service.  Besides, clause 6.4.3.6 in TS 23.304 further specifies “A 5G ProSe Remote UE and a 5G ProSe UE-to-Network Relay shall set up a separate PC5 unicast links if an existing unicast link(s) was established with a different Relay Service Code …”.  It seems to us that one RSC corresponds to one connectivity service (i.e. one PDU session). If this is a correct understanding, the related issues raised in R2-2202848 should be addressed to make sure service continuity can work properly. Since the RSC definition may cause impact on RAN2, we suggest to send an LS to ask SA2 whether one RSC corresponds to one PDU session if people have concern on the RSC definition. |
| Xiaomi | Yes |  |
| Ericsson | Yes |  |

**Q2-2: Do you agree that in Rel-17, RAN2 focus on the scenario where remote UE and relay UE establish a single unicast link (instead of multiple uncast links)?**

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| Company | Yes/No | Comment |
| OPPO | Yes | Based on the current design (reflected in the running-CR), remote UE and relay UE would be configured for a single sidelink in-between. Therefore, there seems no particular motivation and mechanism to enable multiple unicast links between one remote and relay UE from R2 perspective. |
| Qualcomm | Yes | Per previous agreement in RAN2#111-e:  Revised Proposal 12: For UE to UE relay, RAN2 assumes the remote UE has an active end to end connection via only a single relay UE at a given time. |
| ASUSTeK | See comment | If one RSC corresponds to one PDU session and it is agreed to support one single unicast link, extra PDU sessions needs to be released during direct to indirect path switching. If we want to keep more than one PDU session, multiple unicast links needs to be supported. |
| Xiaomi | Comments | We understand multiple sidelink unicast connections are not supported for a given pair of destination and source L2 ID pair. Therefore, different source and destination ID pairs would be used if there are multiple unicast links between relay and remote UE. With this understanding, current design can cover this case to switch the path individually.  [Rapp] we do not think this is supported since in this way, multiple IDs have to be allocated to the same remote UE via Uu, and different PC5 RLC channel configuration have to be configured, and a left issue on how to split the Uu connection between the multiple sidelink connection.. do we really have a valid scenario to justify the effort for all these additional work? |
| Ericsson | Yes |  |

**Q2-3: Do you agree to send LS to SA2 to inform RAN2 on the conclusion of Q2-2, if it concludes as a single unicast link is supported by RAN2 in Rel-17?**

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| Company | Yes/No | Comment |
| ASUSTeK | Yes | We think it is better to send an LS to inform SA2 about this restriction to avoid wrong expectation from RAN2 which may result in misaligned designs in SA2 and RAN2. |
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| [**R2-2202821**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202821.zip) | Huawei, HiSilicon | Proposal: The selection of the NCGI (i.e. PLMN ID+Cell Identity) from cellAccessRelateInfo to be included in MR can be left to remote UE implementation. | Need to discuss |

**Q3: What option do you prefer for NCGI reporting in case of RAN-sharing scenario?**

**Option 1: The first PLMN ID associated NCGI**

**Option 2: remote UE’s selected PLMN associated NCGI**

**Option 3: all NCGIs in relay UE’s discovery message**

**Option 4: Up to remote UE implementation to choose one NGCI in *cellAccessRelatedInfo***

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| Company | Option | Comment |
| Qualcomm | Option 2 (can also accept option 3) | In existing Uu RRC, it is Option 3:  3> if the cell indicated by *cellForWhichToReportCGI* is an NR cell:  4> if *plmn-IdentityInfoList* of the *cgi-Info* for the concerned cell has been obtained:  5> include the *plmn-IdentityInfoList* including *plmn-IdentityList*, *trackingAreaCode* (if available), *ranac* (if available), *cellIdentity* and *cellReservedForOperatorUse* for each entry of the *plmn-IdentityInfoList*;  However, the intention of NCGI reporting in Uu is for ANR purpose. While in L2 relay, the intention is just to provide serving cell ID of relay UE included in measurement report. And we don’t think ANR can be supported in this release for L2 relay. Based on this consideration, we think Option 2 is best. However, we can also accept Option 3 for forward compatibility consideration. |
| Xiaomi | Option 3 |  |
| Ericsson | Option 2 | We agree with QC’s comment. |
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# Proposals that have been covered by Pre-117 discussion or can be deprioritized

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| **Tdoc number** | Company | Proposal | Moderator comment |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 1: The stop condition of the new T304-like timer in direct-to-indirect path switch is upon successfully sending RRCReconfigurationComplete (i.e., lower layer acknowledge is received from target relay). | The discussion related to this issue has already been covered in pre-117 [603] |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 2: RAN2 confirm that relay UE in RRC\_CONNECTED reports its source L2 ID for relay discovery to gNB via SUI in the following 3 cases:  Determine to support L2 relaying and initiate discovery  Determine to stop L2 relaying support and suspend discovery  Link layer ID updated due to any reason | The discussion is already been covered in pre-117 [604] |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 3: Remote UE in RRC\_CONNECTED state can perform autonomous relay reselection in below cases:  Upon detection of PC5 RLF towards relay UE  Upon reception of Uu RLF notification in PC5 RRC message from relay UE  Upon reception of relay UE HO notification in PC5 RRC message from relay UE  Upon reception of PC5-S message for release from relay UE | Already covered in spec (300) as follows  The U2N Remote UE may trigger U2N Relay reselection in following cases:  - PC5 signal strength of current U2N Relay UE is below a (pre)configured signal strength threshold;  - Cell (re)selection, handover or Uu RLF has been indicated by U2N Relay UE via PC5-RRC signalling  - When Remote UE receives a PC5-S link release message from U2N Relay UE  - When U2N Remote UE detects PC5 RLF  - Indicated by upper layer. |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 4: RAN2 confirm that gNB sends remote UE local ID in RRC Reconfiguration message towards both remote UE and target relay UE in CONNECTED sate when preparing the direct-to-indirect path switch. And remote UE local ID is included in both Uu and PC5 SRAP header of RRCReconfigurationComplete message | The intention of this proposal is already agreed. |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 5: When target relay UE is in IDLE/INACTIVE state for direct-to-indirect path switch, remote UE local ID is assigned via below procedure:  Remote UE local ID is NOT included in RRC Reconfiguration message towards both remote UE  PC5 SRAP header is absent when remote UE sends RRCReconfigurationComplete message  After target relay UE enters CONNECTED state (upon reception of RRCReconfigurationComplete message), it requests remote UE local ID via SUI message | The discussion is already been covered in pre-117 [604] |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 6: When target relay UE is in IDLE/INACTIVE state for direct-to-indirect path switch, the path switch command can include remote UE’s upper layer configuration (PDCP and above) prepared by target cell. | There is no difference between relay UE in RRC\_CONNECTED and in RRC\_IDLE/INACTIVE, and the signalling in running-CR already allows this. |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 7: If remote UE can’t find the target IDLE/INACTIVE relay UE’s L2 ID after reporting before path switch, it directly declares path switch failure, and triggers RRC re-establishment. | No difference between RRC\_CONNECTED relay UE and RRC\_IDLE/INACTIVE relay UE, and moderator assume it is handled as T304 expiry case. |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 8: If remote UE find that the target IDLE/INACTIVE relay UE has reselected to another cell after reporting before path switch, it directly declares path switch failure, and triggers RRC re-establishment. | No difference between RRC\_CONNECTED relay UE and RRC\_IDLE/INACTIVE relay UE, and it is covered by post-116b 603. |
| [**R2-2202185**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202185.zip) | Qualcomm Incorporated | Proposal 10: Confirm the WA of UE capability for support by the remote UE of handover to idle/inactive UE | The discussion is already been covered in pre-117 [603] |
| [**R2-2202341**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202341.zip) | OPPO | Proposal 2: RAN2 not pursue further optimization on when for remote UE to stop receiving the DL data forwarded by relay-UE, i.e., it can be upon the reception of PC5-RRC signalling (i.e., RRCReconfigurationSidelink) from relay UE which release the bearer. |  |
| [**R2-2202380**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202380.zip) | ZTE, Sanechips | Proposal 1: It is suggested to capture the Figure 1, i.e. the signalling procedure for Remote UE switching to an indirect path via a RRC\_IDLE/INACTIVE Relay UE, into stage 2 specification. | It is a very detailed issue, up to running-CR to handle |
| [**R2-2202545**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202545.zip) | Apple | Proposal 1 L2 U2N Relay UE reports its Src L2 ID to the serving gNB, when one of the following two conditions is satisfied:  Relay UE enters RRC\_CONNETED from IDLE/INACTIVE state; or  RRC\_CONNECTED relay UE change its Src L2 ID. | The discussion is already been covered in pre-117 [604] |
| [**R2-2202545**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202545.zip) | Apple | Proposal 2 L2 Relay UE optionally reports the last used Src L2 ID in SUI message, along with its latest Src L2 ID. | The discussion is already been covered in pre-117 [604] |
| [**R2-2202545**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202545.zip) | Apple | Proposal 3 If a L2 remote UE is directly connected to gNB and has not chosen a Src L2 ID for relay discovery, the UE generates the Src L2 ID to be used in potential SL discovery procedures and report it to gNB.  Proposal 5 RAN2 send LS to SA2/CT1 to inform the requirement of Src L2 ID assignment of Layer 2 remote UE directly connected to gNB. | Moderator suggest to down-prio this one as an optimization. |
| [**R2-2202545**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202545.zip) | Apple | Proposal 4 L2 remote UE triggers the report of remote UE ID whenever the Src L2 ID changes. | The discussion is already been covered in pre-117 [604] |
| [**R2-2202545**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202545.zip) | Apple | Proposal 6 When gNB detects the reported Src L2 ID of L2 U2N relay UE is in conflict with another relay UE connected to the same cell, the gNB either 1) assigns a different Src L2 ID for the relay UE to be used in relay discovery procedure; or 2) triggers relay UE ID to self-choose a different Src L2 ID. | Moderator suggest to down-prio this one as an optimization. |
| [**R2-2202545**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202545.zip) | Apple | Proposal 7 RAN2 to discuss the solution to prevent the establishment of PC5 link to the wrong target relay UE in IDLE/INACIVE state, e.g. with the enhancement of DCR message. | This proposal aims at “the DCR (Direct Communication Request) message is to be amended to contain the “HO target cell” information” - Moderator suggest to down-prio this one as an optimization. |
| [**R2-2202584**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202584.zip) | Lenovo, Motorola Mobility | Proposal 1: The remote UE needs to stop receiving the DL data from the relay after reception of path switching command from gNB. | Moderator understand this issue can be already solved based on the PC5-RRC signalling from relay-UE to remote-UE to release the related RLC channel, i.e., the DL reception is stopped upon that procedure. |
| [**R2-2202584**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202584.zip) | Lenovo, Motorola Mobility | Proposal 2: UE stops T304 when the remote UE receives RRCReconfigurationCompleteSidelink message. | The discussion related to this issue has already been covered in pre-117 [603] |
| [**R2-2202584**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202584.zip) | Lenovo, Motorola Mobility | Proposal 3: Once idle/inactive relay UE is rejected by the serving cell, the relay UE transmits the notification message to the remote UE. Once the remote UE receives the notification, the remote UE initiates re-establishment procedure. | The discussion related to this issue has already been covered in pre-117 [603] |
| [**R2-2202738**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202738.zip) | NEC Corporation | Proposal 1 RAN2 to adopt the Option 1, i.e. remote UE compares the ID of its source SpCell and the ID of the cell serving the target relay UE, i.e. the target SpCell.  Proposal 2 RAN2 to adopt the proposed changes in the Annex below to the running RRC CR for SL Relay. | Moderator understand the related steps are not used for relay-case, i.e., direct-to-indirect switching. |
| [**R2-2203202**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203202.zip) | Sony | Proposal 1: RAN2 to agree that Conditional handover is supported for switching from direct to indirect path as well as switching from indirect to direct path. Rel-16 CHO procedure is the baseline. | Moderator suggest to down-prio this issue before finishing the basic design of normal-HO. |
| [**R2-2203202**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203202.zip) | Sony | Proposal 2: Remote UE’s security contexts should be kept even when it has an associated relay UE. | Moderator assume that is supported based on legacy behaviour at Uu-PDCP layer. |

# Summary

# Reference

1. R2-2202185 Remaining issues on service continuity of L2 U2N relay Qualcomm Incorporated
2. R2-2202341 Left issue on NR sidelink relay service continuity OPPO
3. R2-2202356 Report of [Pre117-e][603][Relay] Open Issues on Relay Service Continuity (CATT) CATT
4. R2-2202380 Remaining issues on service continuity ZTE, Sanechips
5. R2-2202545 Discussion on remaining issues for direct-to-indirect path switch Apple
6. R2-2202584 Path switching in L2 U2N relay case Lenovo, Motorola Mobility
7. R2-2202738 RRC corrections on path switch NEC Corporation
8. R2-2202821 Stage3 issue on NCGI reporting in measurement result Huawei, HiSilicon
9. R2-2202848 Potential issues on multiple PDU sessions handling during U2N direct to indirect path switching ASUSTeK
10. R2-2203202 Service continuity open issues in L2 NR sidelink relay Sony