**3GPP TSG-RAN WG2 Meeting #116bis electronic R2-220xxxx**

**Online, January, 2022**

**Agenda item: 8.7.2.1**

**Source: OPPO**

**Title: Summary of [618]**

**Document for: Discussion and Decision**

# Introduction

This document is for the following discussion

* [AT116bis-e][618][Relay] Remaining issues on relay control plane (OPPO)

Scope: Discuss the remaining proposals from R2-2201407.

Intended outcome: Report to CB session

Deadline: Monday 2022-01-24 1800 UTC

# Discussion

# SI Delivery

During SIB-update, on how for relay UE to decide the SIB(s) to voluntarily forward, there is a proposal from R2#116 which has **not** been solved

Proposal 7: Assuming short message forwarding is not performed, RAN2 discuss which non-PWS SIB the relay UE forwards to the remote UE upon SI update:

a) All updated SI [10/23]

b) A subset of the changed SI that is applicable to the remote UE [14/23]

c) Left to relay UE implementation [2/23]

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| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2200412 | Lenovo, Motorola Mobility | Proposal 4: Updated SIB can be distributed by a U2N relay to interested linked remote UEs. | Given the voting ratio on P7 above, moderator suggest to leave the selection between a) all updated SI, or b) based on previous remote UE request to relay UE implementation, to conclude this issue. |
| R2-2201144 | InterDigital | Proposal 5:Upon SI modification, for a remote UE in IDLE/INACTIVE, the relay UE acquires and forwards the updated SIBs that are of interest to the remote UE. FFS whether a new PC5-RRC message is needed to provide the set of interested SIBs or to rely on relay UE implementation to determine remote UE interest. | See the recommendation to 0412-P4 above. |
| R2-2200796 | Xiaomi | Proposal 3: Relay UE shall only provide updated SI to IDLE/INACTIVE remote UEs, which are interested/capable in receiving corresponding SI. | See the recommendation to 0412-P4 above. |
| R2-2200551 | MediaTek | Proposal-5: A subset of the changed SI that is applicable to the Remote UE should be forwarded during SI update. | See the recommendation to 0412-P4 above.  For P6a/b, new message is proposed, while moderator understand it would be controversial given the status of P7-related discussion last meeting. |
| Proposal-6a: During the establishment of PC5-RRC connection between Relay UE and Remote UE, Remote UE provides his interested SIBs to Relay UE. |
| Proposal-6b: Remote UE provides his interested SIBs to Relay UE within the same PC5-RRC message carrying the Paging Monitoring Request. |
| R2-2201509 | Huawei, HiSilicon | Proposal 4: For SI update, the Relay UE voluntarily forwards the updated SI for which the Remote UE has requested to the Remote UE. | See the recommendation to 0412-P4 above. |
| R2-2200166 | CATT | Proposal 14: The relay UE forwards all updated SI(s) to the remote UE. | See the recommendation to 0412-P4 above. |
| R2-2201218 | LG Electronics France | Proposal 5: The relay UE receiving a short message delivers all updated SIBs to the RRC\_IDLE/INACTIVE remote UE. | See the recommendation to 0412-P4 above. |
| R2-2200653 | Samsung | Proposal 5. Relay UE can forward PWS SIB(s) only to ETWS or CMAS capable Remote UEs according to PWS SIB request by the Remote UE. | See the recommendation to 0412-P4 above. |

During pre-RAN2#116bis discussion, moderator recommend to do further down-selection within the options requiring no new signalling, considering now it is the late stage of the R17 WI.

*Recommendation 1-1: For SIB-update in case of RRC\_IDLE/RRC\_INACTIVE remote UE(s), RAN2 further discuss to select between option-1) to forward either all updated SI, option-2) only the SI(s) requested by remote UE(s), or option-3) leave it to relay-UE implementation to select between option-1 or option-2. RAN2 do not pursue further work on enhance the SI-request signalling by remote UE.*

Based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options (companies are welcome to correct the moderator’s understanding on necessity of new signalling for each option, and in case any new options added during the discussion, please clarify the need of new signalling as well):

**Q1-1: For SIB-update in case of RRC\_IDLE/RRC\_INACTIVE remote UE(s), what is your preference between the following options:**

**option-1) rely on relay UE to forward all updated SI (no new signalling is to be introduced);**

**option-2) rely on relay-UE to forward only the SI(s) requested by remote UE(s) (no new signalling is to be introduced)**

**option-3) leave it to relay-UE implementation to select between option-1 or option-2 (no new signalling is to be introduced)**

**option-4) rely on relay-UE to forward only the SI(s) of which remote UE(s) are interested (new signalling is needed for remote UE to express which SI(s) they are interested of)**

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| **Company** | **Preferred option(s)** | **Comment** |
| OPPO | 2 (and also fine with 1 or 3) | Orignally, we are open to 1 or 2, and tend to see 3 as a compromise way-out if no clear majority view between 1 and 2. (after check with our R4 colleagues, we do not think 3 will always lead to the increase of test case, if there is a need for test case of this, R4 has the flexibility to design a single case focusing on the common aspect of different implementations)  Given the online conclusion  For SIBs that have been requested by the remote UE from the relay UE, the relay UE forwards them in case of SIB update at least for remote UE in idle/inactive (FFS RRC\_CONNECTED).  We understood that it has already concluded on 2.We do not see the need of 4 for the extra spec effort.  Furthermore, there could be another possibility that relay UE only forward SIB1 when it is updated, so that remote UE can derive the SIBs that have been updated by reading valueTag, so use the request-based approach to request the updated SIBs. |
| MediaTek | 4 | It would be beneficial for Remote UE to tell the Relay UE the list of the SIBs that he is interested before Relay UE forwarding. Otherwise, we do not know how Relay UE implementation can handle this.  In the same manner, Remote UE can tell the Relay UE if he needs SIB1 during SIB update, which helps the Relay UE to decide if he needs to forward SIB1. |
| Qualcomm | 1 or 2 with comments | Similar view as OPPO. We are also fine if majority prefer Option-1. But if Option-2 is agreed, we want to clarify that Option-2 does not put a new requirement on relay UE to timely track SIB interest for each remote UE, i.e., RAN2 don’t further specify the validity condition of requested SIB from remote UE (e.g., valid if duration from last SIB request is below one threshold).  [OPPO] We hold the same view here |
| Xiaomi | 4 | Option 2 is technically not be technically correct. Option 2 may result in remote UE can’t receive latest SI, since remote UE may not always request all the interested SIs from relay. Therefore, option 2 and 3 should be precluded.  [OPPO] we do not think so, i.e., do not see why remote UE can do the request in this case.  Option 1 would result in tremendous signalling overhead, since relay UE would forward all updated SI to all remote UEs. Please notice number of SIB would grow due to more features introduced.  [OPPO] Yet so far, we only foresee the usefulness of SIB12 + PWS SIBs, so not see the signalling issue yet at least in this release.  Option 4 would save the signalling, with the cost of remote UE indicating SI interest. But we understand this indication could be carried in the SI request message with separate IE, which could avoid additional signalling as much as possible.  [OPPO] In this case, we do not see the difference compared that remote UE reuse the SI-request signalling + option-2.  Option 4 can bring noticeable gain with limited signalling impact. |
| **vivo** | **2 with comment** | **Option-2) can be the baseline, which has been agreed at RAN2#116bis-e meeting this week.**  For SIBs that have been requested by the remote UE from the relay UE, the relay UE forwards them in case of SIB update at least for remote UE in idle/inactive (FFS RRC\_CONNECTED).    **However, we want to clarify how to handle a special case when the relay UE haven’t yet received the SI request from the remote UE upon reception of Uu Short Message indicating SIB-update. For such case, can the relay UE be allowed to forward all updated SI (i.e., option-1)?** |
| CATT | Option 1 | The stored interested SIBs information of IDLE/ INACTIVE remote UE may be not accurate since the remote UE may transit from CONNECTED to IDLE/ INACTIVE, or the remote UE may perform path switch from other relay UE or gNB. Hence, the remote UE may not acquire SIB from current relay UE. The relay UE can’t aware which SIBs are the remote UE interested. Therefore, relay UE should forward all updated SI(s) to the remote UE. |
| Samsung | 2 | Same view as OPPO that option 2 is aligned with the online conclusion |
| Ericsson | 2 | Same view as OPPO |
| Sony | Option 2 |  |
| Nokia | **2, but comments** | We think that Uu concept may be followed:  1) relay UE shall forward SIB1 if there is any update in SI  2) relay UE may forward any other updated SIBs without request (e.g., they can fit in the same message as SIB1)  3) remote UE should request the updated SIBs that are needed for its operation and not forwarded by relay UE without request |

After concluding on the SIB-update handling for RRC\_IDLE/RRC\_INACTIVE remote-UE, the left issue is on RRC\_CONNECTED remote-UE, as left from R2#116 (not concluded)

Proposal 5: For the remote UE in RRC\_CONNECTED, RAN2 discuss which (if any) of the following is performed by a relay UE when it receives short message a) the relay UE forwards short message to the remote UE for the remote UE to perform dedicatedSIBRequest [8/23] b) the relay UE, forwards SI that the remote UE without sending the short message. [9/23]

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| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2201144 | InterDigital | Proposal 6:Upon SI modification, for a remote UE in CONNECTED, the relay UE forwards the SI modification and the list of updated SIBs. Signaling details are FFS (e.g., whether to provide an explicit list or to simply provide SIB1). | Given the controversial supporting ratio, and considering now it is the late stage of the WI, moderator suggest to go for the same solution as for RRC\_IDLE/RRC\_INACTIVE case, i.e., not forward short-message. |
| R2-2200796 | Xiaomi | Proposal 6: Relay UE forwards short message to CONNECTED remote UEs upon SI modification via PC5 RRC message. Proposal 7: Short message could be forwarded by broadcast/groupcast. | See the analysis on 1144-P6 |
| R2-2201136 | Apple | Proposal 3 Relay UE explicitly notifies the remote UE about which SIBs are updated and let remote UE to initiate SI acquisition based on its need.  Proposal 4 The same SI update solution for U2N relay is applied to both remote UE in IDLE/INACTIVE and remote UE in RRC\_CONENCTED. | Not preferred to revisit the conclusion we made at least for RRC\_IDLE/RRC\_INACTIVE remote-UE. For RRC\_CONNECTED, the proposal is not to go for short message, but prefer a SIB-specific indication. |
| R2-2200551 | MediaTek | Proposal-4: When the Relay UE receives short message, the Relay UE forwards SI to the Remote UE regardless of Remote UE’s RRC state without sending the short message. | Based on the justification text, “A unified solution for Remote UEs regardless of their RRC state should be adopted, otherwise, Relay UE needs to know the RRC state of Remote UE, which may require additional PC5-RRC signaling support.”, moderator tend to interpret the point is a unified solution for RRC\_IDLE/INACTIVE/CONNECTED states. |
| R2-2200173 | Qualcomm Incorporated | Proposal 11: Based on its implementation, relay UE may either forward the indications on PWS and/or SIB update carried in the Short Message (i.e., when either systemInfoModification=1 and/or etwsAndCmasIndication=1) or all updated SIB(s) to remote UE in CONNECTED state via PC5-RRC message. | See the recommendation to 1144-P6.  W.r.t either all updated SIB or only the SIBs that the UE requested, it can be left to NW implementation (i.e., the same recommendation for relay-UE in case of RRC\_IDLE/RRC\_INACTIVE remote-UE) |
| Proposal 12: If short message forwarding is not performed, relay UE forwards all updated SI to remote UE upon SI update. |
| R2-2201345 | ZTE, Sanechips | Proposal 6: Suppose the systemInfoModification or etwsAndCmasIndication in the short message is set to 1, the relay UE need to forward the change indication to associated remote UEs via PC5-RRC. | See the recommendation to 1144-P6. |
| R2-2201509 | Huawei, HiSilicon | Proposal 3: For the Remote UE in RRC\_CONNECTED, short message is not forwarded by the Relay UE to the remote UE, the SI can be updated via remote UE’s dedicated RRC message (the same method for Uu CONNECTED UE not configured with common search space). | W.r.t either all updated SIB or only the SIBs that the UE requested, it can be left to NW implementation (i.e., the same recommendation for relay-UE in case of RRC\_IDLE/RRC\_INACTIVE remote-UE) |
| R2-2200166 | CATT | Proposal 12: For the remote UE in RRC\_CONNECTED, short message is not forwarded by the relay UE to the remote UE. | W.r.t either all updated SIB or only the SIBs that the UE requested, it can be left to NW implementation (i.e., the same recommendation for relay-UE in case of RRC\_IDLE/RRC\_INACTIVE remote-UE) |
| Proposal 13: The relay UE forwards PWS SIs to the remote UE in RRC\_CONNECTED without sending the short message. |
| R2-2200372 | OPPO | Proposal 5For the remote UE in RRC\_CONNECTED, short message is not forwarded by the relay UE to the remote UE, and rely on network to forward SIB to remote UE by NW implementation. |  |
| R2-2201218 | LG Electronics France | Proposal 6: For the remote UE in RRC\_CONNECTED, a short message is not forwarded by the relay UE to the remote UE. |  |
| Proposal 7: The network forwards SIB to each RRC\_CONNECTED remote UE when the SIB changes. |

So during pre-RAN2#116bis discussion, moderator recommend to do further down-selection within the options requiring no new signalling, considering now it is the late stage of the R17 WI.

*Recommendation 1-2: For SIB-update in case of RRC\_CONNECTED remote-UE, no short message forwarding by relay UE, and RAN2 discuss to select between option-1) rely on network implementation to send either all updated SIBs or only the updated SIBs requested by remote UE, and option-2) rely on relay UE to send all updated SIB to remote UE.*

Based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options (companies are welcome to correct the moderator’s understanding on necessity of new signalling for each option, and in case any new options added during the discussion, please clarify the need of new signalling as well):

**Q1-2: For SIB-update in case of RRC\_CONNECTED remote UE(s), what is your preference between the following options:**

**option-1) rely on network to send updated SIB(s) (either all updated SIBs, or only the updated SIBs requested by remote UE, w/o further restriction in specification) (no new signalling is to be introduced);**

**option-2) rely on relay UE to send updated SIB(s) to remote UE (no new signalling is to be introduced)**

**option-3) relay UE forward short-message to remote UE and up to remote UE to request updated SIB(s) via dedicatedSIBRequest to the gNB (new signalling is needed, for short-message forwarding by relay UE)**

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| **Company** | **Preferred option(s)** | **Comment** |
| OPPO | 1 and/or 2 | We do not see the need to design a complicated scheme given only SIB12 + PWS SIBs are meaningful for CONNECTED case, and in legacy PWS SIBs are to be forwarded by NW voluntarily for CONNCTED UE, so only SIB12 the target SIB we talked about here,  1 is already a feasible solution w/o any spec impact, i.e., network can by its implementation to forward the changed SIB12 to UE. For connected UE, now if limited to SIB12, NW can easily know the need / interest of the SIBs via various ways, capability / SUI / UAI..  2 is also feasible given SIB forwarding signalling designed for RRC\_INACTIVE/RRC\_IDLE UE, which can include either forwarding all updated SIBs to remote UE (including at least SIB12, PWS SIBs), or just forwarding updated SIB1 so that remote UE can know which SIBs have been changed (by reading valueTag), and can further rely on remote UE to use *dedicatedSIBRequest* to obtain updated SIB12 as in legacy if needed.  3 requiring short-message forwarding is not needed at all, since  - bit-1 of short-message only contain signalling bit for all non-PWS SIBs, considering only SIB12 is interested for CONNCTED UE, it is quite likely the bit-1 of short-message is a false alarm, i.e., indicating the change of other SIBs but *not* SIB12, so the UE may request SIB12 yet find it is not changed actually  - Considering that UE can rely on SIB1 content (*valueTag*) to check if the interested SIB is changed or not, so that can be already achieved by option-2 via forwarding SIB1 voluntarily.  - Without SFN info in MIB, remote UE does not know when is the MP boundary, and when can start acquire SIB1 and interested SIB, so it may keep trying for a MP long time in the worst case, wasting resource and power.  So there is no additional gain from solution-3 compared to option-1 and 2 above, with the additional effort on short-message forwarding design. |
| MediaTek | Option1 with extension | We prefer the Relay UE to send the SIBs, instead of the short message itself. Meanwhile, we think it would be helpful if the Relay UE knows the SIB interests of the Remote UE before blind SIB forwarding. |
| Qualcomm | Option-1 | Option-1 is same as legacy Uu procedure for CONNECTED UE, which doesn’t have spec impact.  For Option-2, it is not clear whether “updated SIBs” is all updated SIBs or only SIBs requested by remote UE. If it is only SIBs requested by remote UE, it can’t work if no new signalling is introduced because dedicatedSIBRequest message is transparent to relay UE. If it is all updated SIBs, it can work but it is not preferred because it may cause redundant SIB forwarding from both relay and gNB (i.e., gNB may also forward SIBs which is also transparent to relay UE).  [OPPO] yes option-2 would be not be feasible if limited to updated SIBs. It could be all updated SIB, in that case, gNB would not do the forwarding to avoid the redundancy. Or a third possibility (as clarified in OPPO comment above) is that relay UE only forward SIB1, so that remote UE can know which SIBs are changed based on valueTag (and etc.), and thus dedicatedSIBRequest can be used. |
| Xiaomi | Option 3 | For option 1, we understand in Uu. NW could choose either provide SIB by dedicated signalling or provide SIB by broadcast. Different NW may have different implementation choice. Option 1 would restrict NW implementation, which may not be feasible in practice.  For option 2, relay UE is not aware of the remote UE’s interest in SI. Therefore, relay UE can only provide all the updated SI to all remote UE, which is extremely low efficient.  [OPPO] As clarified, in this release, we only foresee the usefulness of SIB12 and PWS SIBs, so no problem of signalling overhead in this release.  Option 3 aligns with legacy SIB update procedure on Uu. Remote UE can reuse the SI request mechanism, which has no new UE behaviour. |
| **vivo** | **1** | **From technical point of view, both option 1) and option 2) are feasible. To simplify the solution, option -1) is slightly preferred since RRC\_CONNECTED remote UE(s) shall be under NW control by dedicated RRC signalling.** |
| CATT | Option 2 | When the relay UE receives short message, its behavior should unified for IDLE/INACTIVE/ CONNECTED remote UEs. |
| Samsung | 1 | For RRC\_CONNECTED Remote UE, SI forwarding should rely on NW control. |
| Ericsson | 1 | We agree with Samsung and Qualcomm. For the remote UE in RRC\_CONNECTED we can fully rely on network. |
| Sony | Option 1 |  |
| Nokia | **option 2, but comments** | We think that the same approach as Q1 can be applied:  1) relay UE shall forward SIB1 if there is any update in the SI  2) relay UE may forward any other updated SIBs without request  3) remote UE should request the updated SIBs that are needed for its operation and not forwarded by relay UE without request |

**Q1-2a: If option-3 is selected for Q1-2 (or any options requires short-message (or similar signalling) forwarding by relay UE), how for remote UE to understand the modification period boundary, and thus request SI in the next modification period?**

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| **Company** | **Comment** |
| **Xiaomi** | DFN is synchronized with SFN. Remote UE is able to understand modification period boundary derived from DFN.  [OPPO] we hold different understanding, logically, only the GNSS-based sync is feasible in NR SL, and thus no alignment between SFN and DFN. |
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And then on how to deliver the *cellAccessRelatedInfo*.

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| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2200372 | OPPO | Proposal 1If the WA on cellAccessRelatedInfo forwarding before PC5-RRC connection is confirmed, RRC container in discovery is used to carry the SI before PC5-RRC connection. |  |
| R2-2201345 | ZTE, Sanechips | Proposal 4: cellAccessRelatedInfo from SIB1 is forwarded in ‘Relay Discovery Additional Information’ before PC5-RRC connection. | Which discovery message to use can be left to S2 |
| R2-2200173 | Qualcomm Incorporated | Proposal 10: cellAccessRelatedInfo from SIB1 is included in a RRC container of primary discovery message (i.e., not in “Relay Discovery Additional Information”) | Which discovery message to use can be left to S2 |
| R2-2201509 | Huawei, HiSilicon | Proposal 1: MIB is not forwarded by Relay UE, and the cellBarred from MIB should be included in the discovery message. | We can discuss whether cellBarred should be included as well. |

*Recommendation 1-3: Carry cellAccessRelatedInfo from SIB1 in discovery message using RRC container.*

*Recommendation 1-3a: RAN2 further discuss to select 1) rely on SA2 to decide which discovery message (primary message or the additional information message), or 2) decide it in RAN2 (if so, discuss to make the selection). FFS on whether cellBarred should be included as well.*

For 1-3, based on the online discussion result

Carry cellAccessRelatedInfo from SIB1 in discovery message using RRC container.

For 1-3a, based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options

**Q1-3: For which discovery message to use to carry cellAccessRelatedInfo, what is your preference between the following options:**

**option-1) rely on SA2 to decide which discovery message;**

**option-2) RAN2 decide to use “UE-to-network relay discovery announcement” message for model-A discovery, and “UE-to-network relay discovery response” message for model-B discovery**

**option-3) RAN2 decide to use “relay discovery additional information” message**

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| **Company** | **Preferred option(s)** | **Comment** |
| OPPO | 1 or 2 | Our preference is 1, based on the confirmation of our S2 colleagues  If R2 like to do a clear selection, 2 is technically the right selection.  3 is technically wrong, since additional-info is only available after PC5 connection establishment, so against the motivation to put the info into discovery message, i.e., to reduce the latency due to PC5 link establishment. I.e., 3 has not difference comparing with putting it into PC5-RRC. |
| MediaTek | 1 |  |
| Qualcomm | 1 or 2 | Same view as OPPO. We slightly prefer 1. |
| Xiaomi | 1 |  |
| **vivo** | **1** | **Discovery messages are up to upper layers, it’s better to rely on SA2 decision.** |
| CATT | 1 | We respect the work procedure. Although it can be decided by RAN2. |
| Samsung | 1 | Same view as vivo |
| Ericsson | 1 | This is SA2 competence and it good to let the decision to SA2. |
| Sony | 1 |  |
| Nokia | 2 | As there is no size problem to add this information into the Discovery message, we do not see any motivations to use-a separate message |

Considering that the delivery all SIBs expect SIB1 has been supported by PC5-RRC message (according to the running RRC-CR) from relay-UE to remote-UE, the only left issue is how to deliver SIB1.

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| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2200412 | Lenovo, Motorola Mobility | Proposal 5: A groupcast destination ID can be used to distribute SIs and the updated SIs to the linked remote UEs by a U2N relay. | Given the existing agreement which has been captured in the running-CR  Proposal 14: PC5-RRC message is used to deliver SI to remote UE after PC5 connection establishment. FFS whether to use new or existing PC5-RRC message.  No need to revisit on the GC-based SI delivery. |
| R2-2200412 | Lenovo, Motorola Mobility | Proposal 8: A list of SIBs supported and provided by the serving cell is included in the Discovery message e.g., including a BITMAP. | Moderator understand it points to si-SchedulingInfo. See the analysis to 1144-P7/8 |
| R2-2201144 | InterDigital | Proposal 7:At least some parts of SI (e.g. si-SchedulingInfo) can be forwarded by the relay UE to the remote UE upon establishing a PC5-RRC connection. FFS details of signalling. | Given the recommendation above on “Voluntary **SIB1** forwarding, aside from SIB update and SIB request, is left to relay UE implementation.”, moderator suggest to discussion SIB1 as a whole for simplicity.  And it is suggested to discuss the two key options on the table, either in discovery message, i.e., to adopt the same manner as for cellAccessRelatedInfo, or via unicast-based PC5-RRC message, i.e., to adopt the same manner as for other SIBs. |
| Proposal 8:At least some parts of SI (e.g. si-SchedulingInfo) can be forwarded by the relay UE to the remote UE upon mobility (HO/reselection) by the relay UE. FFS details of signalling. |
| R2-2200796 | Xiaomi | Proposal 1: SI, e.g. SIB1 and MIB, could be delivered by broadcast/groupcast to remote UE to reduce signaling. | For GC, see the analysis on 0412-P5  For BC, moderator understand discovery message can achieve the effect. |
| R2-2200625 | Spreadtrum Communications | Proposal 2: Broadcast as baseline for SI forwarding before PC5 connection establishment with Relay UE. | For BC, moderator understand discovery message can achieve the effect. |
| R2-2201509 | Huawei, HiSilicon | Proposal 2: Relay UE is expected to directly forward the SIB1 to Remote UE via PC5 RRC after PC5 RRC connection establishment without the SIB request from the Remote UE; the Remote UE can request SIB1 in case of no voluntary SIB1 forwarding from the Relay UE. | For PC5-RRC, moderator understand it can reuse the same way as for the other SIBs. |
| R2-2200372 | OPPO | Proposal 2Unicast is used to forward SIB1 after PC5-RRC establishment between remote UE and relay UE. |  |
| Proposal 3The whole SIB1 should be forwarded after PC5-RRC establishment between remote UE and relay UE. |
| Proposal 4SIB1 can be forwarded by relay UE voluntarily. |

*Recommendation 1-4: For SIB1, RAN2 discuss how to deliver it, between 1) using discovery message, reuse the conclusion for cellAccessRelatedInfo, or 2) using PC5-RRC message, in the same way as for other SIBs.*

Based on the online discussion,

The relay UE always forwards SIB1 if SIB1 changes at least for remote UE in idle/inactive (FFS RRC\_CONNECTED). The remote UE always is considered to request SIB1 if it has not received it directly from the gNB; FFS if the request is explicit or implicit.

FFS (for further offline discussion this meeting) unsolicited SIB1 forwarding or whether the request-based solution is always used.

The key left issue for SIB1 delivery is 1) whether there is a need for request signalling by remote UE, 2) whether unsolicited forwarding is supported, 3) in which message to deliver it. Although the issues have some coupling in-between, moderator suggest to use separate questions to collect companies view.

**Q1-4a: For SIB1, should request signalling from remote UE be supported?**

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| **Company** | **Yes / No** | **Comment** |
| OPPO | Slightly prefer No, can accept Yes | We understand there is a strong wish in companies to support unsolicited SIB1 forwarding only, i.e., no request message by remote UE needed, which we tend to agree technically, so NO as a first preference.  On the other hand, considering with the request signalling introduced, it does not prevent the relay UE implementation to do unsolicited SIB1 forwarding before request, i.e., it can be a compromise way-out as well, so YES can be a compromise way-out finally if no clear majority. |
| MediaTek | Yes | We did not see the possibility for Relay UE to be aware of the need of SIB1 from Remote UE if there is no explicit request.  We support to introduce a request signalling over PC5 from Remote UE to Relay UE |
| Qualcomm | Yes | Our concern is that if request siganling for SIB1 is not allowed, how RAN2 can specify the timing for relay UE to send SIB1 for remote UE’s initial access (to ensure remote UE always get SIB1)? We may have below options but all of them have issues:   * Option 1: Upon complete of unicast PC5 connection with remote UE. The issue is how relay UE can decide this remote UE connection is for L2 relay but not for V2X? * Option 2: Upon reception SRB0 message from remote UE with default PC5 channel. The issue is that remote UE needs to get UAC parameter and T300/T319 from SIB1 before it can initiate its SRB0 message transmission.   From other aspects, we think the cost to allow request signaling for SIB1 is marginal:   * Signaling overhead: we only need to add type of SIB1 in the candidate list of SIB request of remote UE. It is marginal * Latency to get SIB1 in initial access: The latency will only happen in initial access. Please note the timing to send SIB update (including SIB1) is clear.   In all, allowing the request signaling is to ensure that remote UE can always get SIB1. Please note that unlike periodically broadcasting SIB1 in legacy Uu, we can’t mandate relay UE to periodically broadcast SIB1 before PC5 connection. |
| Xiaomi | Yes | It doesn’t make sense to prohibit remote UE to request SIB1, while remote UE can request any other SIs. Note on Uu, even if UE had acquired SIB1 and SIB1 doesn’t change, UE may still try to acquire request SIB1 since some content of SIB1 may change without SI modification indication. Remote UE is not able to acquire SIB1 on its own, so should be allowed to request SIB1. |
| **vivo** | **No** | **Firstly, in legacy Uu, the SI request based solution is only applicable for other SI (i.e., excluding MIB and SIB1).**  **Secondly, as RAN2 has agreed that the remote UE’ s serving cell follows the same cell of its PC5-RRC connected relay UE, it is straightforward that remote UE should be able to acquire the SIB1 of relay UE’s serving cell once the PC5 RRC connection is established.**  **Especially considering that the SIB1 requirement is common to all remote UE(s) served by a relay UE, we prefer SIB1 delivery is done without explicit request.** |
| CATT | Yes | Both unsolicited and request-based SIB1 forwarding are needed. For the case updated SI, relay UE can unsolicited forward SIB1 to remote UE. For the case remote UE establishes PC5-RRC connection with a relay UE, it can request SIB1 from the relay UE. |
| Samsung | Yes | With this “The remote UE always is considered to request SIB1 if it has not received it directly from the gNB;” an explicit signalling for SIB1 request is needed since Relay UE has no knowledge on Remote UE’s situation. |
| Ericsson | Yes with comment | We think that the remote UE should request SIB1 only if is not able to acquire it directly from the gNB and if the remote UE is about to establish the relay connection (i.e., meaning does not have any SIB1 saved yet). Under these conditions, the request of SIB1 is needed from the remote UE to the relay UE.  However, if the remote UE has already SIB1 saved, the explicit request of SIB1 is not needed and we can fully rely on the agreement we just took that the relay UE always forward SIB1 when this changes. |
| Sony | No |  |
| Nokia | Yes | The option that SIB1 can be sent without request should not mean that the remote UE cannot request it |

**Q1-4b: For SIB1, should unsolicited SIB1 forwarding (without request from remote UE) be supported?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes / No** | **Comment** |
| OPPO | Yes | It has to be supported since SIB1 is the start point of reception of other SIBs.  In case both request-based and unsolicited approach are supported, the usage of the two approach can be left to UE implementation, i.e., relay UE can do the forwarding w/ or w/o request, and remote UE can send the request w/o receiving the forwarded SIB1, or not send the request if the SIB1 has already been forwarded by relay UE. |
| MediaTek | No | We assume request-based is enough |
| Qualcomm | No strong view, as long as request signaling is agreed | If it is agreed, we agree with OPPO’s point in 2nd paragraph.  The key point is that we don’t need to specify the timing to send unsolicited SIB1 for remote UE’s initial access. And the timing to send SIB update (including SIB1) is clear. |
| Xiaomi | Up to UE implementation | We understand it’s unnecessary to prohibit this UE behaviour. However, to make progress, we can leave it unspecified. |
| **vivo** | **Yes** | **Same comment as in Q1-4a.** |
| CATT | Yes |  |
| Samsung | See comment | If SIB1 is transmitted based on request as Q1-4a, then unsolicited SIB1 forwarding seems not necessary. But the unsolicited SIB1 forwarding can be up to Relay UE implementation. |
| Ericsson | Yes | See comment in previous question. |
| Sony | Yes |  |
| Nokia | Yes |  |

Based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options

**Q1-4c: For SIB1, what is your preference on how to deliver it:**

**option-1) using discovery message, i.e., reuse the conclusion for *cellAccessRelatedInfo*;**

**option-2) using PC5-RRC message of *UuMessageTransferSidelink*, i.e., in the same way as for other SIBs**

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| --- | --- | --- |
| **Company** | **Preferred option(s)** | **Comment** |
| OPPO | 2 | Option-1 would put a lot of burden onto discovery message, i.e., although it helps to reduce the latency for remote UE to acquire the information, it would consume too many resources if model-A discovery (periodically sent) is adopted.  Furthermore, option-1 seems more reasonable if request-based approach is NOT adopted, otherwise, option-2 seems more reasonable. |
| MediaTek | 2 | This can be the same way as for other SIBs |
| Qualcomm | 2 | For Option-1, the T300/T319 timer and UAC config are missed in current agreement (they are not included in ***cellAccessRelatedInfo).*** So, remote UE can’t initiate its RRC setup just based on ***cellAccessRelatedInfo*** included in discovery message from relay UE. |
| Xiaomi | Option 2 |  |
| **vivo** | **2** | **SIB1 delivery via a relay UE is performed after the successfull PC5 RRC establishment with the relay UE.** |
| CATT | 2 | There is no clear benefit that we need to forward other SIB1(except cellAccessRelatedInfo) before the PC5 connection. Hence we prefer to use PC5-RRC message. |
| Samsung | 2 |  |
| Ericsson | 2 |  |
| Sony | 2 |  |
| Nokia | 2 | The delivery of SIB1 may also be necessary at any time after PC5 RRC connection has been established (e.g., due to validity expiry in the remote UE) |

After all the discussion above, do you think there is a need to send LS to SA2 to notify the RAN2 progress that may have an impact to discovery message (e.g., at least for *cellAccessRelatedInfo*, and depending on the discussion output for SIB1)?

**Q1: Do you agree to send a LS to SA2 to notify the RAN2 agreement that have an impact to discovery message?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comment** |
| OPPO | Agree |  |
| MediaTek | Agree |  |
| Qualcomm | Agree |  |
| **Xiaomi** | **Agree** |  |
| **vivo** | **Agree** |  |
| CATT | Agree | It is good to keep information sharing timely. |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Sony | Agree |  |
| Nokia | Agree |  |

# Paging

On the related FFS points from last RAN2 meeting (not concluded):

Proposal 8: RAN2 discusses whether the paging message sent over PC5-RRC contains:

a) The entire paging record received by the relay UE [9/23]

b) Only information relevant to that remote UE (i.e. UE ID and/or paging type) [13/23]

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| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2200784 | Nokia, Nokia Shanghai Bell | Proposal 4: The relay UE sends the full PagingRecord of the remote UE to the remote UE over PC5. | Moderator understand this proposal can be interpreted as option b) in the P8 above from last RAN2 meeting.  Considering the discussion result from last meeting, moderator would like to suggest an implementation allowing both option-a/b, i.e., to rely on relay UE implementation to select between option-a and option-b, e.g., to send the pagingRecordList to remote UE, while allowing relay UE to include a single entry for the target remote UE in this list. |
| Proposal 5: The network sends the full PagingRecord of the paged remote UE to the relay UE when the paging is sent in a dedicated signalling over Uu. | Moderator understand this can be discussed in RAN2 |
| Proposal 6: The network may send multiple PagingRecords of paged remote UEs in a single message using the existing PagingRecordList. | Moderator understand multiple UE paging will be supported since the following agreements:  Proposal 5: The dedicated RRC message for delivering remote UE following to the RRC\_CONNECTED relay UE may contain one or more remote UE IDs (5G-S-TMSI or I-RNTI). [23/23] |
| R2-2201144 | Intedigital | Proposal 14:The relay UE includes the paging type (RAN paging or CN paging) in the PC5-RRC message delivering paging to the remote UE. | considering there are more voice on using the legacy UE-ID based method, moderator suggest to go with the majority view on this. |
| R2-2200551 | MediaTek Inc. | Proposal-2c: Only the information relevant to the Remote UE should be forwarded to the Remote UE during paging forwarding. | This can be discussed together with 0784-P4 |
| R2-2200173 | Qualcomm Incorporated | Proposal 6: For future-proof consideration, the paging message sent over PC5-RRC contains the entire paging record received by the relay UE | This can be discussed together with 0784-P4 |
| R2-2201345 | ZTE, Sanechips | Proposal 9: For paging due to the arrival of remote UE DL data at the gNB, UE ID of the remote UE only (5G-S-TMSI or I-RNTI) or Type of paging only (RAN paging or CN paging) should be included in the PC5-RRC message from the relay UE to the remote UE. | This can be discussed together with 0784-P4 |
| R2-2201509 | Huawei, HiSilicon | Proposal 6: The PC5 RRC message for paging forwarding is the OCT STRING of paging message. | Moderator understand the proposal is to avoid filtering operation by relay UE. |
| R2-2200166 | CATT | Proposal 19: Relay UE only relay the PagingRecord of the remote UE to the remote UE by PC5-RRC paging message. | This can be discussed together with 0784-P4 |

*Recommendation 2-1: RAN2 further discuss to select between option-1) Paging message sent over PC5-RRC uses PagingRecordList IE and rely on relay UE implementation to select between either sending the entire paging record received by the relay UE or sending only information relevant to that remote UE, option-2) Sending the entire PagingRecordList received by the relay UE, and option-3) sending only PagingRecord relevant to that remote UE.*

Based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options

**Q2-1: For paging message forwarding by relay UE to remote UE, what is your preference on how to deliver it:**

**option-1) Paging message sent over PC5-RRC uses PagingRecordList IE and rely on relay UE implementation to select between either sending the entire paging record received by the relay UE or sending only information relevant to that remote UE (i.e., only a single PagingRecord within PagingRecordList);**

**option-2) Sending the entire PagingRecordList received by the relay UE;**

**option-3) sending only PagingRecord relevant to that remote UE (i.e. only a single complete PagingRecord within PagingRecordList)**

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| --- | --- | --- |
| **Company** | **Preferred option(s)** | **Comment** |
| OPPO | 1, 2 or 3 | We are open to 2 or 3.  And consider 1 is a compromise way-out if there is no clear majority between 3 and 2. (after check with our R4 colleagues, we do not think 1 will always lead to the increase of test case, if there is a need for test case of this, R4 has the flexibility to design a single case focusing on the common aspect of different implementations) |
| MediaTek | 3 | We need consider to remove the non-relevant information over PC5 to save the resources. |
| Qualcomm | Option-3 with clarification | We have below agreement in RAN2#114-e:  [Easy]Proposal 5: RRC\_IDLE/RRC\_INACTIVE Relay UE decodes received paging message to derive the 5G-S-TSMI/I-RNTI and forward the paging message accordingly. (17/20) |
| Xiaomi | 3 | Option 3 is more efficient. |
| **vivo** | **3** | **Option-3 has better signaling efficiency.** |
| CATT | Optioin 3 or 1 | It is unnecessary to include the entire PagingRecordList of paging message received in Uu in PC5-RRC paging message. Only the PagingRecord of the remote UE is enough. Prefer 3, and we can agree with 1. |
| Samsung | 3 |  |
| Ericsson | 3 | The relay UE needs anyway to check the paging message that is received from the network. In this case it make sense to reduce the signaling overhead and send only what is needed by the remote UE. |
| Sony | 3 |  |
| Nokia | 3 |  |

On how does relay UE determine whether monitor PO for a remote UE or not, the related proposals/FFS points from last RAN2 meeting:

|  |
| --- |
| Proposal 1 (modified): Relay UE in RRC\_CONNECTED, if configured with paging CSS, can determine whether to monitor POs for a remote UE based on PC5-RRC signalling received from the remote UE. FFS on the signalling contents and for the case of idle/inactive relay UE. [18/23] |

|  |  |  |  |
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| **Tdoc** | **Company** | **Proposals** | **Moderator‘s remark and recommendation** |
| R2-2200410 | Lenovo, Motorola Mobility | Proposal 1: A U2N relay concludes that it needs to monitor paging for the requesting remote UE when remote UE sends information (like Paging DRX Cycle, 5g-TMSI etc.) enabling a U2N relay to monitor remote Pos. | Moderator understand this proposal supports an implicit info to start the assisted paging monitoring operation. |
| R2-2201144 | Nokia, Nokia Shanghai Bell | Proposal 11:The remote UE provides the relay UE the RRC state and the paging UE ID for that RRC state (if applicable) when either of these changes at the remote UE. FFS if additional indication (e.g., enable/disable) can be provided to inform the relay when to start/stop monitoring remote UE’s Pos. | Moderator understand this proposal supports an implicit / explicit RRC-state info to start/stop the assisted paging monitoring operation. |
| Proposal 12:A relay UE can skip monitoring of Pos of a remote Ues based on the remote UE’s RRC state and (if supported) the additional indication. |  |
| Proposal 13:A relay UE can skip monitoring of Pos of one or more remote Ues based on network indication. | Moderator understand this is mostly concluded according to the following agreement, i.e., the configuration of BWP with CSS is used by RRC\_CONNECTED relay UE to decide whether PO of remote UE need to be monitored.  For L2 relay UE in RRC\_CONNECTED and L2 remote UE(s) in RRC\_IDLE/RRC\_INACTIVE, we specify signalling for delivery of the remote UE’s paging through dedicated RRC message. Network implementation decision whether to use it (or keep the relay UE on BWP with CSS). Can be revisited if a problem is found with network knowledge of which paging to forward. |
| R2-2200226 | Intel Corporation | Proposal 1. Remote UE provides paging start/stop trigger along with UE specific DRX cycle and UE ID as well as optionally, RAN paging cycle to Relay UE using PC5-RRC signalling for paging monitoring. | Moderator understand this proposal supports an implicit (no RRC state indication) indication over PC5. |
| R2-2200551 | MediaTek Inc. | Proposal-2a: A pair of PC5-RRC messages is defined: Paging Monitoring Request and Paging Monitoring Cancellation:  PC5 Paging Monitoring Request: UE ID (5G-S-TMSI or I-RNTI), UE specific DRX cycle PC5 Paging Monitoring Cancellation: UE ID (5G-S-TMSI or I-RNTI) | Moderator understand this proposal is to add new field / message to start / stop the assisted paging monitoring operation. |
| Proposal-2b: No RRC state is notified from Remote UE to Relay UE |  |
| R2-2200173 | Qualcomm Incorporated | Proposal 3: Because relay UE’s paging monitoring behaviors depends on remote UE’s RRC states, RRC state of remote UE is required to be known by relay UE. | Moderator understand this proposal supports an RRC-state info to start / stop the assisted paging monitoring operation. |
| Proposal 4: Introduce a 2-bit indication of remote UE’s RRC state in PC5 RRC message, where “00” is IDLE; “01” is INACTIVE, “10” is CONNECTED, “11” is stopping paging monitoring. |
| Proposal 5: Upon change of either UE-ID (5G-S-TMSI and/or I-RNTI), or paging cycle, or RRC state transition, the remote UE sends the updated info to relay UE via PC5 RRC message. |
| R2-2201345 | ZTE, Sanechips | Proposal 7: Relay UE can determine whether to monitor Pos for a remote UE based on whether the 5G-S-TMSI/I-RNTI received from the remote UE. | Moderator understand this proposal supports an implicit info to start the assisted paging monitoring operation. |
| R2-2200471 | vivo | Proposal 7: The Relay UE decides to start/stop Paging monitoring and delivery for a Remote UE in an implicit way, e.g., based on the presence or absence of the PO calculation parameters in the PC5-RRC signalling received from the Remote UE. | Moderator understand this proposal supports an implicit info to start the assisted paging monitoring operation. |
| Proposal 8: No RRC state exchange between Remote UE and Relay UE for the Paging monitoring and delivery procedure. |
| R2-2200166 | CATT | Proposal 17: Relay UE in RRC\_IDLE/INACTIVE can determine whether to monitor Pos for a remote UE based on PC5-RRC signalling received from the remote UE. |  |
| R2-2200372 | OPPO | Proposal 9: RAN2 not pursue new solution (i.e., new PC5-RRC message or remote UE’s RRC state indication)to add/modification/release paging monitoring operation for a remote UE by the relay UE, but rely on legacy ASN.1 solution (i.e., need code + SetupRelease struncture). |  |
| R2-2201218 | LG Electronics France | Proposal 8: When relay UE in RRC\_CONNECTED, if configured with paging CSS, determines to monitor Pos for a remote UE, the relay UE monitors Pos only RRC\_IDLE/INACTIVE remote Ues. | Moderator understand this proposal supports an RRC-state info to start / stop the assisted paging monitoring operation. |
| Proposal 9: When RRC\_IDLE/INACTIVE remote UE becomes RRC\_CONNECTED, the remote UE informs the RRC state change to relay UE to make stop monitoring for remote UE’s PO. |
| Proposal 10: When RRC\_CONNECTED remote UE becomes RRC\_ILDE/INACTIVE, the remote UE informs the RRC state change to relay UE to make start monitoring for remote UE’s PO. |

*Recommendation 2-2: RAN2 further discuss the PC5-RRC signalling content, which is used for Relay UE in RRC\_CONNECTED configured with paging CSS, to determine whether to monitor Pos for a remote UE, between 1) using explicit signalling indicating RRC-state of remote-UE, 2) not using explicit signalling indicating RRC-state of remote-UE.*

Based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options

**Q2-2: For Relay UE in RRC\_CONNECTED configured with paging CSS, in order to determine whether to monitor Pos for a remote UE, what is your preference on how for remote UE to notify relay UE using PC5-RRC message (*RemoteUEInformationSidelink*):**

**option-1) using explicit signalling to indicate RRC-state of remote-UE;**

**option-2) not using explicit signalling to indicate RRC-state of remote-UE;**

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| --- | --- | --- |
| **Company** | **Preferred option(s)** | **Comment** |
| OPPO | 2 | Essentially, the issue is how for remote UE to configure / de-configure relay UE to do paging monitoring, which is clearly quite a normal work that can be handled by ASN.1, by using need code, setuprelease structure.  E.g., we can use setuprelease for the paging related parameter (5G-S-TMSI, DRX cycle) to either setup (i.e., to start the paging monitoring by relay UE, for RRC\_IDLE/RRC\_INACTIVE) or release (i.e., to stop the paging monitoring by relay UE, for RRC\_CONNECTED). Where further the RRC\_IDLE/ RRC\_INACTIVE can be differentiated via whether I-RNTI is configured or not. E.g., |
| MediaTek | 2 |  |
| Qualcomm | 1 | Essentially, we agreed different UE behaviors on paging forwarding of relay UE when remote UE is in IDLE, INACTIVE or CONNECTED (e.g. relay UE needs to know whether remote UE is in IDLE or INACTIVE state so that it can determine whether to monitor remote UE’s RAN paging).  Meanwhile, from Q1-1 and Q1-2, we understand that remote UE’s RRC state is also needed to be known by relay UE on correct SIB forwarding ehaviour (i.e., whether to rely on gNB or not to forward SIB update). |
| Xiaomi | 2 | Implicit indication is enough. |
| **Vivo** | **2** | **Agree with rapporteur. The RRC-state of remote-UE can be derived based on the PO calculation parameters configuration from the remote UE.** |
| CATT | Option 2 | Relay UE can aware remote UE’s RRC-state via 5G-S-TMSI/ I-RNTI in paging monitor request message. It is unnecessary to using explicit signalling to indicate RRC-state of remote-UE. |
| Samsung | 2 | The paging information by Remote UE can be used. |
| Ericsson | 2 |  |
| Sony | 2 |  |
| Nokia | 2 |  |

On signalling to send paging of remote UE to RRC\_CONNECTED relay UE, the related proposals/FFS points from last RAN2 meeting (not concluded):

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| Proposal 6: RRCReconfiguration is used to deliver remote UE paging to the RRC\_CONNECTED relay UE in dedicated fashion. [16/23] |

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| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2200784 | Nokia, Nokia Shanghai Bell | Proposal 7: If dedicated signalling is used to send paging of remote UE(s) to the relay UE in RRC\_CONNECTED, then DLInformationTransfer message is used. | Given the discussion result from last meeting, moderator suggest to go for RRCReconfiguration of majority support |
| R2-2200372 | OPPO | Proposal 11: RAN2 confirm that RRCReconfiguration is used to deliver remote UE paging to the RRC\_CONNECTED relay UE in dedicated manner. |  |
| R2-2200173 | Qualcomm Incorporated | Proposal 7: Similar to dedicated SIB(s), existing RRCReconfiguration message is reused to include paging message as transparent container for remote UE |  |

*Recommendation 2-5: Network uses RRCReconfiguration, to carry remote UE paging message to the RRC\_CONNECTED relay UE in dedicated fashion.*

Based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options

**Q2-5: In order for Network to carry paging message to the RRC\_CONNECTED relay UE in dedicated fashion, which message should be used**

**Option-1) RRCReconfiguration;**

**Option-2) DLInformationTransfer;**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option(s)** | **Comment** |
| OPPO | 1 | No strong view, yet based on the previous email discussion in [POST115-e][610], there are 16/23 supporting ratio, so suggest to conclude based on majority view directly. |
| MediaTek | **1** |  |
| Qualcomm | 1 | Please note that the existing *RRCReconfiguration* message already includes dedicated SIB in two transparent containers (*dedicatedSIB1-Delivery* and *dedicatedSystemInformationDelivery*). It is similar to paging forwarding in dedicated RRC message |
| Xiaomi | 1 | We understand DLInformationTransfer is used to transfer NAS information. Paging message is AS information. Therefore, RRCReconfiguration seems more reasonable. |
| **vivo** |  | **No strong view. We can go for majorities as the baseline to implement the running CR.** |
| CATT | 1 | No strong view, we can follow the majority view. |
| Samsung | 1 |  |
| Ericsson | See comment | The DLInformationTransfer message is used to deliver NAS information and thus is not really suitable for the cause. On the other hand, deliver paging in the RRCReconfiguration message it also an overkill and thus not really our preference.  Our preference would be to have a brand new message for it but we can go with majority view in this case. |
| Sony | 1 |  |
| Nokia | 2 | The drawback of RRCReconfiguration is that the relay UE shall send a response message (RRCReconfigurationComplete) |

# Access Control

On new or existing cause value

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| --- | --- | --- | --- |
| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2200794 | Xiaomi, Lenovo, Motorola Mobility, Apple | Proposal: Reuse existing establishment/resume cause value for relay UE when relay UE enter RRC\_CONNECTED only for relaying purpose. | Moderator observe this proposal is to use old cause value. |
| R2-2200551 | MediaTek Inc. | Proposal-3: No new establishment cause for relay UE entering RRC\_CONNECTED only for relaying purposes is introduced. | Moderator observe this proposal is to use old cause value. |
| R2-2201145 | InterDigital | A new Establishment/Resume cause value is introduced for a relay UE access triggered by a remote UE access. | Moderator observe this proposal is to use new cause value. |
| R2-2201345 | ZTE, Sanechips | Proposal 1: Existing establishment/resume cause provided by upper layer is reused when relay UE initiates the RRC establishment/resume only for the purpose of relaying. The interaction with NAS can be left to UE implementation. | Moderator observe this proposal is to use old cause value. |
| R2-2200471 | vivo | Proposal 1: RAN2 to agree that existing establishment/resume cause values are re-used for Relay UE to enter RRC\_CONNECTED only for relaying purpose. | Moderator observe this proposal is to use old cause value. |
| R2-2200172 | Qualcomm Incorporated | Proposal 11: To minimize spec impact, introduce a new cause value (e.g., “relaying”) when Relay UE enters RRC\_CONNECTED only for relaying purpose | Moderator observe this proposal is to use new cause value. |
| R2-2200372 | OPPO | Proposal 12: New cause value should be defined for relay UE to establish/resume an RRC connection due to a connection of remote UE. | Moderator observe this proposal is to use new cause value. |
| R2-2201510 | Huawei, HiSilicon | Proposal 1: In case the Relay UE’s RRC establishment/resume procedure is triggered by the Remote UE’s Msg3: For Remote UE’s rna-Update case, Relay UE will use new cause value (e.g. rna-UpdateRemote-UE); For other cases, Relay UE reuses the existing cause values by copying the one in Remote UE’s Msg3. | Moderator observe this proposal is to use old cause value, with adding RNA update cause value. |

On the way to acquire cause value if using the existing values

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| --- | --- | --- | --- |
| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2201294 | Intel Corporation | Proposal 2: Remote UE provides the establishment/resume cause value to the Relay UE using existing or new PC5-RRC message. | Moderator observe that the key proposal is to send cause value from remote UE to relay UE, w/o touching how to handle the issue of different values / RRC-state from different remote UE. |
| Proposal 3: Relay UE uses remote UE’s establishment/resume cause when the Relay UE establishes/resumes an RRC connection due to a relaying connection from remote UE. |
| R2-2200795 | Xiaomi | Proposal 1: Remote UE indicate its cause value to relay UE via PC5-RRC. | Moderator observe that the key proposal is to send cause value from remote UE to relay UE,  And to handle RAN-update, the proposal is to use mo-Signliang.  And to handle different cause value from different remote UE, the proposal is to rely on relay UE implementation.  And to handle the reestablishment cause value which is not included in the cause value for establishment / resume, the proposal is to use mt-Access.  Given all the spec effort required for this direction, + the split view and the limited time left to finish this WI, moderator suggest not to go with this direction, but further down-select between using either new or old value, without introducing additional AS signalling between remote and relay UE. |
| Proposal 2: Relay UE set EstablishmentCause as mo-Signalling if RRC establishment is triggered by remote UE whose ResumeCause is rna-Update. |
| Proposal 3: It’s up to relay UE to select which cause value to use from the multiple remote UEs, if messages from multiple remote UEs arrive at relay UE at the same time. |
| Proposal 4: Relay UE set EstablishmentCause or ResumeCause as mt-Access if RRC establishment or resume is triggered by remote UE’s reestablishment. |
| R2-2201145 | InterDigital | The remote UE can inform the relay UE via PC5 of when the relay UE should use a higher priority (e.g., emergency) cause value for its establishment/resume. | Moderator observe that “The remote UE can either provide its entire cause value, or provide simply an indication when high priority access is needed.”, i.e., the proposal is to add signalling from remote UE to relay UE, with different preference on the signalling content.  See the reply to 0795-P1/2/3/4 above. |
| The relay UE uses a high priority cause value for its own establishment/resume (e.g., emergency, highPriorityAccess, etc.) when it receives an indication that the remote UE’s access is also high priority. Details are FFS. |
| R2-2201345 | ZTE, Sanechips | Proposal 1: Existing establishment/resume cause provided by upper layer is reused when relay UE initiates the RRC establishment/resume only for the purpose of relaying. The interaction with NAS can be left to UE implementation. | Moderator observe that this proposal does not require additional AS signalling from remote UE to relay UE. |
| R2-2200471 | vivo | Proposal 2: The Relay UE’s NAS layer provides the establishment/resume cause value to AS layer when Relay UE initiates RRC establish/resume procedure only for relaying purpose. | Moderator observe that this proposal does not require additional AS signalling from remote UE to relay UE. |
| R2-2200166 | CATT | Proposal 1: For relay UE in RRC\_IDLE, AS layer sends an indication to upper layer for service request upon reception of a message via SL-RLC0. | Moderator observe that this proposal does not require additional AS signalling from remote UE to relay UE. |
| Proposal 7: RRC\_IDLE/RRC\_INACTIVE relay UE initiates RRC establishment/resume procedure upon service request procedure from NAS. |
| Proposal 8: The establishment/resume cause value is provided by upper layer when Relay UE enters RRC\_CONNECTED only for relaying purpose. |
| Proposal 9: RAN2 sends LS to CT1 and CC SA2 to inform the agreement that RRC\_IDLE/ RRC\_INACTIVE relay UE initiates RRC establishment/resume procedure upon service request procedure from NAS. |
| R2-2200372 | OPPO | Proposal 13: RAN2 not pursue remote UE sending cause value to relay UE for RRC connection establishment /resumption. |  |

For 3-1, it was touched in [AT-116][622], [R2-2111373](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202111%20-%20RAN2_116-e,%20Online\Docs\R2-2111373.zip), Q5.2, with the result as follows

New cause value supported: 9/23

New cause value not supported: 12/23

No strong view: 2/23

Furthermore, within the companies who prefer old cause value, there are further split between requiring new signalling from remote-UE to relay-UE and requiring no new signalling (e.g., CATT, vivo, ZTE), although it cannot tell clearly since there is no clear options for the two directions. Therefore, moderator understand there is no clear majority to pursue new signalling for remote UE to forward the cause value related information to relay UE.

So moderator recommend to do further down-selection within the options requiring no new signalling, considering now it is the late stage of the R17 WI.

*Recommendation 3-1: RAN2 further discuss to select between using existing or new cause value for relay UE to establish/resume an RRC connection due to a connection of remote UE, without introducing new AS-layer signalling from remote UE to relay UE.*

Based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options (companies are welcome to correct the moderator’s understanding on necessity of new signalling for each option, and in case any new options added during the discussion, please clarify the need of new signalling as well)

**Q3-1: In order for a RRC\_IDLE/RRC\_INACTIVE relay UE to establish/resume an RRC connection due to a RRC connection setup/resume/reestablishment by remote UE, what is your preference w.r.t the following options**

**Option-1) reuse existing cause value for RRC connection setup/resume by relay-UE (no new signalling on Uu interface) + without introducing new AS-layer signalling from remote UE to relay UE (no new signalling on PC5 interface)**

**Option-2) use one new cause value for RRC connection setup/resume by relay UE (new signalling on Uu interface) + without introducing new AS-layer signalling from remote UE to relay UE (no new signalling on PC5 interface)**

**Option-3) reuse existing cause value for RRC connection setup/resume by relay-UE (no new signalling on Uu interface) + introducing new AS-layer signalling from remote UE to relay UE to notify the cause value for RRC connection setup/resume/reestablishment by remote UE (new signalling on PC5 interface)**

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| --- | --- | --- |
| **Company** | **Preferred option(s)** | **Comment** |
| OPPO | 1 or 2 | 1 is feasible since it is the approach adopted by IAB.  2 is weaker than 1 due to the required new cause signalling, yet good in a way that the single cause value adding helps to close this issue + allowing gNB to differentiate between relay / non-relay access, the former one requires no UAC but the latter requires UAC (as concluded by CT1).  3 is feasible but requires too much effort without justified benefit, i.e.,  - the effort is the AS-layer signalling for remote UE to notify relay UE on the cause value, plus various criterion for relay-UE to decide how to handle a) what if multiple remote UE have different cause value and relay UE how to pick up one from them, b) what if remote UE cause value cannot be expressed via existing cause value of relay UE (e.g., remote UE is doing resume/re-establishment, yet relay UE is doing setup).  - And there is no much gain / benefit since gNB in this case cannot differentiate between whether the relay UE access is due to the traffic of itself (so UAC is needed) or due to the traffic of remote UE (so UAC is not needed). |
| MediaTek | **1** |  |
| Qualcomm | 1 or 2 | No strong view, as long as we don’t trigger too much discussion in CT1/SA2 |
| Xiaomi | 3 | For option 1, it’s unclear how relay UE can set the cause value. Legacy NAS connection over PC5 can’t provide remote UE’s cause value.  For option 2, gNB can’t tell the real cause value. To not reject possible emergency service, gNB has to accept all the request with cause value set as relay. However, the real service from remote UE may not be emergency. Then gNB may choose to release the connection, which cause more signalling than option 3 and resource wasting.  Option 3 can provide the real cause value for gNB to make decision, which aligns with the design principle in Uu. |
| **vivo** | **1** | **For option-2) we do not see clear benefit. Because even if the gNB accepts the RRC setup/resume request of Relay UE based on a new cause value, the RRC setup/resume request of Remote UE based on legacy cause values may still be rejected. Consequently, the relaying service via Relay UE could be rejected by gNB. It’s more fairer to use legacy cause values for both remote UE and relay UE.**  **For option-3), we don’t think new AS-layer signaling over PC5 is needed. The RRC setup/resume request message of remote UE has already been delivered via PC5 RLC channel to the relay UE. The relay UE is able to know the cause values within the received RRC setup/resume request message, which only requires some cross-layer interaction between PC5 SRAP and Uu RRC by relay UE implementation.** |
| CATT | 1 or 2 | Relay UE can use the cause value from upper layer. |
| Samsung | 1 |  |
| Ericsson | 1 |  |
| Sony | 1 |  |
| Nokia | 1 or 2 | Option 2 if there are cases when option 1 is not feasible, otherwise option 1 is preferred. Our understanding is that CT1 has not made any decision on this. |

**Q3-1a: If option-3 is selected in Q2-5 (or any option requiring to add new AS-layer signalling from remote UE to relay UE), how to handle the case where remote UE is doing a RRC Re-establishment (where in legacy, the cause value could be** ENUMERATED {reconfigurationFailure, handoverFailure, otherFailure, spare1}) **while relay-UE is to do a RRC setup** (**where none of the value used by remote UE can be expressed by legacy** EstablishmentCause**, which so far only include** {emergency, highPriorityAccess, mt-Access, mo-Signalling, mo-Data, mo-VoiceCall, mo-VideoCall, mo-SMS, mps-PriorityAccess, mcs-PriorityAccess }**) or relay\_UE is to do a RRC resume (the issue is the same as RRC-setup**)

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| --- | --- |
| **Company** | **Comment** |
| **Xiaomi** | **We discussed this issue in R2-2200795, following proposals are given. We are open to other opinions as long as UE behaviour is clear.**  Another case is remote UE initiates reestablishment procedure and relay UE initiates establishment/resume procedure, there is no corresponding *EstablishmentCause* or *ResumeCasue* for reestablishment. gNB is not expected to reject the reestablishment request. To ensure the successful access, relay UE shall set the *EstablishmentCause* or *ResumeCasue* by a high priority value. Also, there may be service terminated at remote UE before reestablishment. We propose to use *mt-Access* as cause value in this case.  **Proposal 4: Relay UE set *EstablishmentCause* or *ResumeCause* as *mt-Access* if RRC establishment or resume is triggered by remote UE’s reestablishment.** |
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**Q3-1b: If option-3 is selected in Q2-5 (or any option requiring to add new AS-layer signalling from remote UE to relay UE), how to handle the case where remote UE is doing a RRC Resume for RNAU while relay UE is to do a RRC setup (where the cause value used by remote UE could be** rna-Update**, which cannot be expressed by legacy** EstablishmentCause **for RRC-setup, which so far only include** {emergency, highPriorityAccess, mt-Access, mo-Signalling, mo-Data, mo-VoiceCall, mo-VideoCall, mo-SMS, mps-PriorityAccess, mcs-PriorityAccess }**)**

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| --- | --- |
| **Company** | **Comment** |
| **Xiaomi** | **We discussed this issue in R2-2200795, following proposals are given. We are open to other opinions as long as UE behaviour is clear.**  In this case, we should further discuss how to set the *EstablishmentCause*. RRC resume initiated by remote UE is due to RAN area update. If the request is rejected by gNB, remote UE is not reachable by RAN paging, but could still reachable by legacy paging. There is no critical issue to reject the connection establishment request from relay UE. We propose relay UE to set *EstablishmentCause* as *mo-Signalling* in this case.  **Proposal 2: Relay UE set *EstablishmentCause* as *mo-Signalling* if RRC establishment is triggered by remote UE whose *ResumeCause* is *rna-Update*.** |
|  |  |
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**Q3-1c: if option-3 is selected in Q2-5 (or any option requiring to add new AS-layer signalling from remote UE to relay UE), how to handle the case where different remote UE is doing different RRC procedure (re-establishment, resume, setup), or same RRC procedure but different cause value?**

|  |  |
| --- | --- |
| **Company** | **Comment** |
| **Xiaomi** | **We discussed this issue in R2-2200795, following proposals are given. We are open to other opinions as long as UE behaviour is clear.**  Furthermore, companies ask how to set cause value if multiple remote UEs trigger relay UE’s establishment/resume. We understand it is rare case that messages from multiple remote UEs arrive at relay UE at the same time. Relay UE set the cause value according to the earliest message from remote UE. Even if this corner case happens, it’s up to relay UE to select which cause value to use from the multiple remote UEs.  **Proposal 3: It’s up to relay UE to select which cause value to use from the multiple remote UEs, if messages from multiple remote UEs arrive at relay UE at the same time.** |
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# Others

There is one proposal on complementary part of C-RNTI value delivery

|  |  |  |  |
| --- | --- | --- | --- |
| **Tdoc** | **Company** | **Proposals** | **Moderator’s remark and recommendation** |
| R2-2200741 | ASUSTeK | Proposal 2: The RRCRelease message includes the UE-IdentityRemote IE for Remote UE. | Moderator understand it is a feasible point. |

*Recommendation 4-4: RAN2 discuss whether to deliver C-RNTI value via RRCRelease message.*

The reason behind 0741-P2 is described as follows:

Based on the current RRC spec, the UE initiates the RRC connection resume procedure when the UE performs RNAU. In order to send the *RRCResumeRequest* message to gNB, the UE performs random access procedure on a cell and acquires a temporary C-RNTI from the cell when the random access procedure is successful. In case gNB returns the UE back to RRC\_INACTIVE, gNB sends the *RRCRelease* message with suspend configuration to the UE. Before completing the RRC connection resume procedure, the UE replaces its C-RNTI with the temporary C-RNTI.

[…]

In the scenario of the remote UE connecting with the relay UE, the remote UE could perform RNAU via the relay UE. Similarly, the remote UE may receive the *RRCRelease* message with suspend configuration from gNB via the relay UE. But, in the RRC running CR [1], the *UE-IdentityRemote* IE is not captured in the *RRCRelease* message. We think the *RRCRelease* message should also include the *UE-IdentityRemote* IE as the *RRCSetup* message, the *RRCResuem* message and the *RRCReestablishment* message.

Based on the scope of [AT-RAN2#116bis][618], the following question is to check companies view on the options

**Q4-4: Do you agree to deliver C-RNTI value via RRC Release message?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comment** |
| OPPO | Agree | We see the point/need, but not strong view. |
| Qualcomm | Agree |  |
| **vivo** | **Agree with comment** | **C-RNTI is only used by RRC\_CONNECTD and RRC\_INACTIVE UEsin relay scenario. But C-RNTI is not used by RRC\_IDLE UEs. Therefore, we suggest to agree it with some modification as highlighted“deliver C-RNTI value via RRC Release message with *suspendConfig*”.** |
| CATT | Agree with comments | We share the same view as vivo. |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Sony | Agree |  |
| Nokia | Agree |  |

# Conclusions

The contributions submitted to AI 8.7.2.1 are summarized above, with moderator comments. Moderator recommendations are as follows.

# Reference

1. R2-2200166 Control Plane Procedures of L2 Relay CATT discussion Rel-17 NR\_SL\_relay-Core
2. R2-2200172 Remaining issues on RRC connection management of L2 U2N relay Qualcomm Incorporated discussion NR\_SL\_relay-Core
3. R2-2200173 Remaining issues on paging and SIB forwarding in L2 U2N relay Qualcomm Incorporated discussion NR\_SL\_relay-Core
4. R2-2200226 Leftover issues of Control plane procedures for L2 U2N relaying Intel Corporation discussion Rel-17 NR\_SL\_relay-Core
5. R2-2200367 Remaining WA for R17 SL Relay OPPO, Qualcomm Incorporated, Samsung, Intel Corporation, Apple, Huawei, HiSilicon, MediaTek Inc., Xiaomi, Nokia, Nokia Shanghai Bell, Ericsson discussion Rel-17 NR\_SL\_relay-Core
6. R2-2200372 Left Issues on Control Plane Aspects for L2 Relay OPPO discussion Rel-17 NR\_SL\_relay-Core
7. R2-2200410 Monitoring Paging by a U2N Relay Lenovo, Motorola Mobility discussion NR\_SL\_relay-Core
8. R2-2200412 SI acquisition by a remote UE Lenovo, Motorola Mobility discussion NR\_SL\_relay-Core
9. R2-2200471 Open issues on L2 Control Plane Procedures vivo discussion
10. R2-2200512 Discussion on RRC reestablishment related parameters for L2 sidelink relay China Telecom discussion Rel-17 NR\_SL\_relay-Core
11. R2-2200551 Remaining issues for Control plane MediaTek Inc. discussion Rel-17
12. R2-2200552 RAN sharing MediaTek Inc., CATT, OPPO, Qualcomm Incorporated, ZTE, Huawei, HiSilicon, Apple, InterDigital discussion Rel-17
13. R2-2200625 Left issues on control plane procedures for L2 U2N relay Spreadtrum Communications discussion Rel-17
14. R2-2200653 Remaining issues for paging and SI delivery Samsung discussion Rel-17 NR\_SL\_relay-Core
15. R2-2200740 Discussion on sidelink RLC bearer management for L2 U2N relay ASUSTeK discussion Rel-17 38.331 NR\_SL\_relay-Core
16. R2-2200741 Discussion on missing procedural text for applying C-RNTI of Remote UE ASUSTeK discussion Rel-17 38.331 NR\_SL\_relay-Core
17. R2-2200742 Discussion on missing procedural text for Relay UE to apply SL-RLC0 configuration ASUSTeK discussion Rel-17 38.331 NR\_SL\_relay-Core
18. R2-2200743 Reflecting Stage 2 agreement on sidelink resource allocation mode for U2N relay ASUSTeK discussion Rel-17 38.331 NR\_SL\_relay-Core
19. R2-2200776 Considerations on CP issues Lenovo, Motorola Mobility discussion Rel-17
20. R2-2200784 Further Issues on Paging in NR Sidelink Relay Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_SL\_relay-Core
21. R2-2200794 Discussion on establishment cause of relay UE Xiaomi, Lenovo, Motorola Mobility, Apple discussion
22. R2-2200795 Discussion on connection control Xiaomi discussion
23. R2-2200796 Discusson on SI delivery Xiaomi discussion
24. R2-2200855 Control plane procedure CMCC discussion Rel-17 NR\_SL\_relay-Core
25. R2-2200908 Area specific SI issue in L2 relay Sony discussion Rel-17 NR\_SL\_relay-Core
26. R2-2200946 Discussion on RAN sharing with L2 U2N relays Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_SL\_relay-Core
27. R2-2201136 Discussion on remaining issues on control plane procedures Apple discussion Rel-17 NR\_SL\_relay-Core
28. R2-2201144 Remaining Aspects of Paging and System Information for L2 UE to NW Relays InterDigital discussion Rel-17 FS\_NR\_SL\_relay
29. R2-2201145 Open Issues on Connection Establishment for UE to NW Relays InterDigital discussion Rel-17 FS\_NR\_SL\_relay
30. R2-2201146 IDLE/INACTIVE Remote UE Behaviour during Remote and Relay UE Mobility InterDigital discussion Rel-17 FS\_NR\_SL\_relay
31. R2-2201158 Remaining issues on control plane for L2 sidelink relay Ericsson discussion Rel-17 NR\_SL\_relay-Core
32. R2-2201218 Consideration on the remain issues for control plane procedures LG Electronics France discussion Rel-17
33. R2-2201294 Access control support for U2N relaying Intel Corporation discussion Rel-17 NR\_SL\_relay-Core
34. R2-2201345 Consideration on the control plane procedure of SL relay ZTE, Sanechips discussion Rel-17
35. R2-2201407 Summary of AI 8.7.2.1 on CP procedure OPPO discussion Rel-17 NR\_SL\_relay-Core Late
36. R2-2201509 SI forwarding and paging for L2 sidelink relay Huawei, HiSilicon discussion Rel-17 NR\_SL\_relay-Core
37. R2-2201510 RRC connection management for L2 sidelink relay Huawei, HiSilicon discussion Rel-17 NR\_SL\_relay-Core