3GPP TSG-RAN WG2 Meeting #113e R2-210xxxx

Electronic Meeting, 25th January – 5th February 2021

Agenda: 8.7.2.1

Source: InterDigital

Title: Summary of [AT113-e][605][Relay] Continuation of L2 architecture issues (InterDigital)

Document for: Discussion, Decision

# 1 Introduction

The following email discussion was triggered at RAN2#113:

* [AT113-e][605][Relay] Continuation of L2 architecture issues (InterDigital)

Scope: Discuss the priority 2 proposals P6, P15-P19 from R2-2102091 and implement the agreements on the priority 1 proposals. Work towards conclusions if possible.

Intended outcome: Endorsable TP

Deadline: Tuesday 2021-02-02 1200 UTC (for TP availability)

The summary document summarizes the portion of the scope related to “work towards conclusions if possible”

# 2 Conclusion Section

## 2.1 Conclusions for L2 U2N Relay

Rapporteur suggests the following text for conclusion section for L2 UE to NW Relay, which was generated by considering input in the following contributions [3][25][26][27][28] while avoiding overlaps and discussion of L2/L3 comparison material.

*---------------------------------------------------------- TR 38.836 ----------------------------------------------------------*

## 6.1 Evaluation and Conclusion of UE-to-Network Relay

### 6.1.1 Layer-2 Relay

RAN2 has studied L2 UE-to-Network relay and has reached the following conclusions:

#### 6.1.1.1 Relay discovery and (re)selection

Discovery was studied for L2 UE-to-Network Relay and the baseline solution for L2 relay is the same as for L3 relay. For L2 U2N Relay, the Relay UE should always be connected to a SL capable gNB. Further details of discovery configuration for the remote UE can be discussed in the normative phase.

Relay (Re)selection was studied for L2 UE-to-Network Relay and the baseline solution for L2 relay is the same as for L3 relay. In addition, for RRC\_CONNECTED remote UE in L2 UE-to-Network Relay, gNB decision on relay (re)selection is considered in the normative phase.

#### 6.1.1.2 Relay and remote UE authorization

Both Relay and Remote UE separately follow Rel-16 V2X design (TS 23.287), and no RAN2 impact is expected.

#### 6.1.1.3 QoS management

The general QoS handling for L2 UE-to-Network Relay was studied. The gNB implementation can handle the QoS breakdown over Uu and PC5 for end-to-end QoS enforcement. Details of handling in case PC5 RLC channels with different e2e QoS are mapped to the same Uu RLC channel can be discussed in the normative phase. The end-to-end QoS enforcement can be supported. The gNB is aware of AS conditions of sidelink and Uu link, based on which the QoS breakdown can be flexible and tailored to such conditions (e.g. can be used to adapt the QoS breakdown when there is congestion on sidelink). In case of OOC, remote UE operates using the configuration provided in SIB or dedicated RRC signaling with overall better QoS performance than using pre-configuration. QoS can be enforced for each bearer as the gNB can decide whether an E2E bearer is admitted or not depending on the current congestion.

#### 6.1.1.4 Service continuity

L2 UE-to-Network Relay uses RAN2 aspects of Rel-15 NR handover procedure as a baseline. The AS layer service continuity (i.e. lossless and in-sequence delivery of PDCP PDU with similar performance like legacy HO) can be guaranteed during path switch in L2 U2N relay by involving also relay UEs (e.g. PDCP PDUs packet forwarding between relay UE and gNB and between serving and target relay UEs) in the path switch procedure.

#### 6.1.1.5 Security

In case of L2 UE-to-Network Relay, at AS layer, the security (confidentiality and integrity protection) is enforced end to end by legacy PDCP layer between the endpoints at the Remote UE and the gNB.

#### 6.1.1.6 Protocol stack design

The protocol stack and Uu adaptation layer function were studied for L2 UE-to-Network Relay. Whether the adaptation layer is also supported at the PC5 interface between Remote UE and Relay UE can be discussed in the normative phase. In L2 U2N Relay architecture, the remote UE is visible to the gNB, and the remote UE has its own PDU sessions. It supports the gNB configured/controlled bearer mapping at the relay UE between multiple E2E bearers of a remote UE and/or different remote UEs to one Uu RLC channel, which could also save on the RLC bearers in Uu.

#### 6.1.1.7 CP procedures

Both connection establishment procedure and path switching procedures were captured for L2 UE-to-Network Relay. The establishment of Uu SRB1/SRB2 and DRB of the remote UE is subject to legacy Uu configuration procedures. It supports the remote UE’s RRC connection management, which can provide dedicated RRC configuration to remote UE, reduce the interruption/avoid data loss due to RLF recovery, and speed up RRC connection and data resume, etc. Further details of the steps for path switch procedure (e.g. measurements, message content) and potential differences on the Uu interface for inter-gNB cases may be discussed in the normative phase.

The Option 2 as studied in TR36.746 for FeD2D paging is selected as the baseline paging relaying solution for L2 UE-to-Network Relay. By supporting paging, for remote UE in RRC\_IDLE/RRC\_INACTIVE, the DL data reachability can be supported during remote UE’s mobility.

The system information (i.e SI) request from remote UE and forwarding mechanism from Relay UE to Remote UE was studied L2 UE-to-Network Relay. Specifically, the relay UE can forward system information to the remote UE via broadcast, groupcast or unicast. On-demand SI request is supported for all RRC states. The detailed mechanism for such SI request and forwarding and the exact system information that can be relayed to Remote UEs can be discussed at normative phase. It supports the SI delivery in case remote UE is OCC, which supports remote UE using SIB provided configuration.

For L2 UE-to- Network relay, the Relay UE may provide UAC parameters to Remote UE for performing remote UE access control and RAN overload control. The access control check is performed at Remote UE using the parameters of the cell it intends to access. Remote UE access control can take into account SL congestion as the gNB is aware of the remote UE.

#### 6.1.1.8 Standards impact

Standardization impact from RAN2 perspective to support the operations of L2 UE-to-NW relay can be inferred from discussion in section 4.5, and in this conclusion. From RAN2 perspective, the standard support of L2 UE-to-Network Relay is mainly at RAN.

*---------------------------------------------------------- TR 38.836 ----------------------------------------------------------*

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**Q3.1 Do companies have any major concern with the above suggested text. If so, please provide the suggested changes in the comments section.**

|  |  |  |
| --- | --- | --- |
| Company | Response (Y/N) | Comments |
| MediaTek | No | We agree with the current wording.  If we wish to polish the wording, the order of the bullets can be adjust to follow the order of the objectives as listed in SID of SL relay.  [Rapporteur]: Will change the order in the final TP submitted to the reflector on Tuesday (to avoid excessive track changes in the above) |
| Apple | No | We have no concern. |
| Huawei, HiSilicon | No | We agree with the current wording. |
| Orange | No | We have no concern. |
| LG | No | We have no concern. |
| Ericsson | Yes | 1. For control plane procedure, the wording ”speed up RRC connection and data resum” is not true, how outcomes this conclusion? Suggest to remove the wording.   [Rapporteur]: This is referring to faster transition to CONNECTED via INACTIVE state – which is part of connection managment procedures.   1. For control plane procedure, the below text   “Remote UE access control can take into account SL congestion as the gNB is aware of the remote UE.“ needs to be removed, since it has not been discussed during the SI phase yet.  [Rapporteur]: No need for discussion of this, as the assumption is that CBR reporting as in Legacy NR V2X/LTE V2X is supported for sidelink.   1. For service continuity, the text   “The AS layer service continuity (i.e. lossless and in-sequence delivery of PDCP PDU with similar performance like legacy HO) can be guaranteed during path switch in L2 U2N relay“.  It not fully true, since the packet forwarding procedure would not only require the gNBs to be involved, but also involve relay UEs, purely reusing legacy HO mechanism will not work. Therefore suggest to reword the text as  “In order to achieve lossless and in-sequence delivery of PDCP PDU with similar performance like legacy HO during path switch in L2 U2N relay, the AS layer service continuity mechanisms need to be studied invoving serving and target gNBs, but also invoving relay UEs (e.g., PDCP PDUs packet forwarding between relay UE and gNB, and between serving and target relay UEs) during path switch in L2 U2N relay.“  [Rapporteur]: Added the suggested parts to the sentence. |
| Qualcomm | Yes  (we provides suggested change, please check in “No Markup“ view) | **Relay (Re)selection:**  Wording suggestion:  “In addition, for RRC\_CONNECTED remote UE in L2 UE-to-Network Relay, gNB decision on relay (re)selection is considered in WI phase.“  [Rapporteur]: Changed as suggested.  **Protocol Stack Design:**  The last sentence is confusing to us. It refers to Remote UE or relay UE? Using N:1 mapping from E2E bearers is not accurate, as we did not conclude on PC5 AL functions yet. N:1 mapping is only relevant for PC5 <->Uu CHs for Uu AL. We suggest to change it to:  “It supports the gNB configured/controlled N:1 bearer mapping for relay UE between multiple E2E Bearers of a Remote UE and/or different Remote UEs and one Uu RLC channel over the Relay UE Uu path~~for relayed traffic, which could also save the RLC bearer number by supporting the N:1 mapping from E2E bearers.“~~  [Rapporteur]: Changed the sentence to clarify that it is referring to PC5->Uu bearer mapping, as suggested.  **QoS management:**  2nd sentence should be aligned with the wording in section 4.5.2, i.e.  ~~The gNB can handle the QoS breakdown over Uu and PC5 for end-to-end QoS enforcement.~~ gNB implementation can handle the QoS breakdown over Uu and PC5 for the end-to-end QoS enforcement of a particular session established between Remote UE and network in case of L2 UE-to-Network Relay.  [Rapporteur]: Added the word "implementation“ – no need to repeat the entire sentence in the TR in the conclusion.  *“The gNB is aware of* ***AS conditions of sidelink*** *and Uu link, based on which the QoS breakdown can be flexible and tailored to such conditions (e.g. can be used to adapt the QoS breakdown when there is congestion on sidelink).“*  We are not sure how gNB is aware of AS conditions of sidelink because we has not discussed measurement enhancement for sidelink in relay. Note that in existing event S1/S2 of TS38.331, the measurement is reported to peer UE but NOT report to gNB. And how the “congestion“ can be used for QoS enforcement was not discussed in RAN2. Anyway, we request to remove this sentence because it has been covered by the 2nd sentence (i.e. gNB implementation break down)  [Rapporteur]: R16 CBR measurements (from the relay) and R15 legacy measurements (from the remote UE or relay UE) are assumed to be allowed. No need to have to discuss whether they are supported.  *“In case of OOC, remote UE operates using the configuration provided in SIB or dedicated RRC signaling with overall better QoS performance than using pre-configuration. QoS can be enforced for each bearer as the gNB can decide whether an E2E bearer is admitted or not depending on the current congestion.“*  We didn’t discuss why config in SIB/RRC has better QoS performance than pre-configuration for L2 relay, and this issue had been extensively discussed in LTE/NR V2X. Thus, we request to remove it because it doesn’t provide new value. Finally, last sentence (“QoS can be..“) is not necessary as it adds no value and is default behavior on adminition control.  [Rapporteur]: This is well known in LTE/NR V2X so no need to motivate/discuss – it is the main reason why we impose dedicated configuration in CONNECTED, SIB when IC (IDLE/INACTIVE), rather than allowing pre-configuration for all cases. And QoS performance will likely be better because configuration can be changed dynamically rather than having to follow static pre-configuration.  **Security:**  We are not sure what “already“ means. Suggest to remove it.  [Rapporteur]: I believe the intent from the company contribution was to indicate that security is supported with no additional specification impact. Added "legacy“ instead.  **Control Plane Procedures**  For the last sentence of SIB paragraph, we don’t think it needs to emphasize “rather than only using pre-configuraiton“ which is obvious given the 1st half sentence. We don’t think conclusion needs to capture in detail to this level and we have removed the comparison section. So, we request Rapporteur to remove it (“rather than only using pre-configuration“).  [Rapporteur]: Removed as suggested.  For UAC parapragh, we request to remove last two sentences:   * for last 2nd sentence, it adds no value and is default behavior   [Rapporteur]: It is somewhat redundant with the first sentence, so I have tried to consolidate.   * for last 1st sentence, we agree with Ericsson. What does “SL congestion“ mean? Who takes the SL Congestion into account? The Remote UE or the gNB? And, how is the SL Congestion detected. Anyway, we think it should be removed.   [Rapporteur]: Similar to the comment on QoS management, it is assumed the gNB has access to legacy CBR measurements. There is no need to further discuss as it is legacy sidelink behavior.  **Service Continuity**  We agree with Ericsson suggested change, which is more accurately reflected what RAN2 discussion status  [Rapporteur]: See response to Ericsson comment. |
| Samsung | Yes | Relay (Re)Selection  Relay (Re)selection was studied for both L2 and L3 UE-to-Network Relay and the baseline solution is applied to both. In addition, for RRC\_CONNECTED remote UE in L2 UE-to-Network Relay, gNB decision on relay (re)selection **is consideredmay be considered in the normative phase**.  Discovery  Discovery was studied for both L2 and L3 UE-to-Network Relay and the baseline solution is applied to both. For L2 U2N Relay, the Relay UE should always be connected to a SL capable gNB. Further details of discovery configuration for the remote UE **mayneeds to** be discussed in the normative phase. *[‚may‘ does not give a realistic picture as it implies further details need not be studied and the L2 design would still be complete, which is incorrect]*  Protocol Stack Design  The protocol stack and Uu adaptation layer function were studied for L2 UE-to-Network Relay. Whether the adaptation layer is also supported at the PC5 interface between Remote UE and Relay UE **mayneeds to** be discussed in the normative phase. In L2 U2N Relay architecture, the remote UE is visible to the gNB, and the remote UE has its own PDU sessions. It supports the gNB configured/controlled bearer mapping for relayed traffic, which could also save the RLC bearer number by supporting the N:1 mapping from E2E bearers *[this is superfluous, unless further work is also mentioned that needs to be done to make this happen]*.  [Rapporteur]: See change made from QC comment. This is inherent in the architecture choice, so should be mentioned somehow.  QoS Management  The general QoS handling for L2 UE-to-Network Relay was studied. The gNB can handle the QoS breakdown over Uu and PC5 for end-to-end QoS enforcement. Details of handling in case PC5 RLC channels with different e2e QoS are mapped to the same Uu RLC channel **canneeds to be** be discussed in the normative phase. The end-to-end QoS enforcement can be supported. The gNB is aware of AS conditions of sidelink and Uu link, based on which the QoS breakdown can be flexible and tailored to such conditions (e.g. can be used to adapt the QoS breakdown when there is congestion on sidelink). *[This is superfluous/too much detail.]*  [Rapporteur]: This is a conclusion drawn from the architecture.  In case of OOC, remote UE operates using the configuration provided in SIB or dedicated RRC signaling *[It is not clear how this part is related to QoS management.]* with overall better QoS performance than using pre-configuration *[This last statement needs verification/reference.].*  [Rapporteur]: This is a well known assumption in LTE/NR V2X. No need for verification.  QoS can be enforced for each bearer as the gNB can decide whether an E2E bearer is admitted or not depending on the current congestion.  ...  Further details of the steps for path switch procedure (e.g. measurements, message content) and potential differences on the Uu interface for inter-gNB cases **mayneed to** be discussed in the normative phase.  ...  The detailed mechanism for such SI request and forwarding and the exact system information that can be relayed to Remote UEs **canneeds to be** be discussed at normative phase.  [Rapporteur]: Prefer to have a consistent wording across the conclusion section with the rest of the TR have changed them all to "can be“ – which is what other sections of the TR use. |
| Nokia | No | We generally agree with the changes from Qualcomm and Ericsson.  Protocol Stack Design  We would also like to note that the discussion of whether the adaptation layer should be present for PC5 between remote and relay UE will rely on study of different solutions for this.  [Rapporteur]: This is common understanding – I assume there is no need to mention further in the conclusion that what is there now: " *Whether the adaptation layer is also supported at the PC5 interface between Remote UE and Relay UE can be discussed in the normative phase*.“  Control Plane Procedures  What UE behaviour needed to support RRC\_INACTIVE, we also still need to analyse both for the relay and remote UE.  [Rapporteur]: Probably the support of INACTIVE itself does not have any impacts, but certain procedures (e.g. allowable states) may have specific impacts which have anyways been mentioned elsewhere in the TR.  For the sentence; „Specifically, the relay UE can forward system information to the remote UE via broadcast, groupcast or unicast. On-demand SI request is supported for all RRC states. The detailed mechanism for such SI request and forwarding and the exact system information that can be relayed to Remote UEs can be discussed at normative phase.“  Putting the note on the On-demand SI request in the middle of the agreement sort of twists the message that we need to study the method for forwarding. We would prefer two switch these; „Specifically, the relay UE can forward system information to the remote UE via broadcast, groupcast or unicast. The detailed mechanism for such SI request and forwarding and the exact system information that can be relayed to Remote UEs can be discussed at normative phase. On-demand SI request is supported for all RRC states.“  [Rapporteur]: The suggestion seems indicate that the mechanism to support SI request can be discussed in normative phase before mentioning that SI is supported. The point is both the SI request, and the forwarding need to be studied, so the initial text should be clear. |
| Intel | No | We do not have any major concerns. A couple of minor ones:  Since we are going to have separate evaluation and conclusion sections for L2 and L3 based relay, we think it would be good to have some commonality/alignment for at least the Remote/relay UE authorization, Discovery and Relay (re) selection sections to ensure that the wording is aligned across both relaying solutions when capturing independently.  [Rapporteur]: Perhaps this is something that can done after both L2 and L3 TPs are agreed and rapporteur includes in the TR (i.e. post meeting email discussion?)  It seems there are some references to L3 relay solutions withing the above text. We suggest some rewording to focus on L2 relay here only, since it is the conclusion for L2 relay. For instance, suggest to change clauses such as “*for both L2 and L3*” to “*for L2*”  [Rapporteur]: Reworded references to L3 in text as suggested. |
| ZTE | NO | We agree with the above conclusion |
| Convida | No | We agree with the above conclusion |
| vivo | Yes | Agree with comments from Qualcomm and Ericsson.  Further agree with Nokia that of whether the adaptation layer should be present for PC5 between remote and relay UE will rely on study of different solutions design.  QoS Management  The general QoS handling for L2 UE-to-Network Relay was studied. The gNB implementation can handle the QoS breakdown over Uu and PC5 for end-to-end QoS enforcement. [Too detailed solution, some discussions are needed for confirmation]. The end-to-end QoS enforcement can be supported. The gNB is aware of AS conditions of sidelink and Uu link,[there is no such agreement, at least some discussion is required.].[We do not how this related to QoS management. This should be removed] QoS can be enforced for each bearer as the gNB can decide whether an E2E bearer is admitted or not depending on the current congestion. |
| Philips | No | Agree with the conclusions |

## 2.2 Conclusions for L2 U2U Relay

Rapporteur suggests the following text for conclusion section for L2 UE to UE Relay, which was generated by taking text directly from the following contributions [3][25][26][27][28] while avoiding overlaps and discussion of L2/L3 comparison material.

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*---------------------------------------------------------- TR 38.836 ----------------------------------------------------------*

## 6.2 Evaluation and Conclusion of UE-to-UE Relay

### 6.2.1 Layer-2 Relay

RAN2 has studied L2 UE-to-UE relay and has reached the following conclusions:

#### 6.2.1.1 Relay discovery and (re)selection

Discovery was studied for L2 UE-to-UE Relay and the baseline solution for L2 relay is the same as that of L3 relay.

Relay (Re)selection was studied for L2 UE-to-UE Relay and the baseline solution for L2 relay is the same as that of L3 relay.

#### 6.2.1.2 Relay and remote UE authorization

Both Relay and Remote UE separately follow Rel-16 V2X design (TS 23.287), and no RAN2 impact is expected.

#### 6.2.1.3 QoS management

The design of QoS support for both L2 and L3 UE-to-UE relay are in the scope of SA2. No RAN2 impact of the solution captured in SA2 is identified thus far.

#### 6.2.1.4 Security

In case of L2 UE-to-UE Relay, the security is established at PDCP layer in an end to end manner between source remote UE and destination remote UE. The end-to-end security can be supported.

#### 6.2.1.5 Protocol stack design

The protocol stack and PC5 adaptation layer function (both first hop PC5 and second hop PC5) were studied for L2 UE-to-UE Relay.

#### 6.2.1.6 CP procedures

The connection establishment procedure was studied for L2 UE-to-UE Relay. RAN2 consider the SA2 solution in TR 23.752 as baseline. Further RAN2 impacts can be discussed in WI phase, if any.

#### 6.2.1.7 Standards impact

Standardization impact from RAN2 perspective to support the operations of L2 UE-to-NW relay can be inferred from discussion in section 4.5, and in this conclusion. From RAN2 perspective, the standard support of L2 UE-to-UE Relay is mainly at RAN.

*---------------------------------------------------------- TR 38.836 ----------------------------------------------------------*

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**Q3.2 Do companies have any major concern with the above suggested text. If so, please provide the suggested changes in the comments section.**

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| --- | --- | --- |
| Company | Response (Y/N) | Comments |
| MediaTek | No | We agree with the current wording.  If we wish to polish the wording, the order of the bullets can be adjust to follow the order of the objectives as listed in SID of SL relay.  [Rapporteur]: Will change the order in the final TP submitted to the reflector on Tuesday (to avoid excessive track changes in the above) |
| OPPO | See comment | For the QoS part, there is one NOTE in SA2 TR conclusion (and similarly in Solution#31) that „NOTE 2: It is left to RAN WG2 to support the QoS enforcement in AS layer.“, so it is suggested to add „Further RAN2 impacts can be discussed in WI phase, if any.“ into that for alignment.  For the CP procedure part, although we see the point of „RAN2 consider the SA2 solution in TR 23.752 as baseline“ since that comes directly from the TR, but so far SA2 is still working on the solution (e.g., #9), and no conclusion yet. Considering SA2 meeting is after RAN2 meeting #113 as the last one for SI @ RAN, maybe one way to clarify is to say that „RAN2 consider the SA2 solution in TR 23.752 as baseline**, pending final SA2 conclusion**. Further RAN2 impacts..“  [Rapporteur]: It seems these comments are related to solutions/text that may evolve in the last meeting of SA2. At this point, it may be preferrable to not make any assumptions in the RAN2 TR. Anyways, all of our work in RAN2 for the WI will have to be "pending final SA2 conclusion.“ |
| Apple | No with commment | Regarding OPPO comments, for U2U relay solution 31, it is not clear to us what AS layer mechanisms need to be done for end-to-end QoS for Layer 2 U2U relay, because the L3 and L2 apporaches are quite similar in Solution 31. RAN2 can consider QoS enforcements in WI for L2 U2U if the QoS solution for U2U relay is not limited to Solution 31. But for Soluiton 31 itself, it is OK to say QoS support is in SA2 scope.  [Rapporteur]: See response to OPPO comment. |
| Huawei, HiSilicon | No concern | We agree with the current wording.  Regarding OPPO’s comment on QoS, we share the same view as Apple the SA2 solution #31 is taken as baseline for both L2 U2U and L3 U2U, and it seems no further enhancement is needed to enfore the QoS from RAN2‘s perspective so far. But considering the SA2/RAN2 discussion on U2U is not as thorough as U2N, we are open to discuss in WI if further requirement is identified.  Regarding OPPO’s comment on CP procedure, we understand the solution of link establishment in high layer is in SA2’s scope but not RAN2, so it is of course up to SA2. From RAN2’s perspective, there is no issue identified to support either SA2 solution (e.g. solution #9). We do not see the need to mention this in TR, but maybe we can capture something in chairman notes if needed.  [Rapporteur]: See response to OPPO comment. |
| Orange | No major concern | Any further requirements in regards to SA2 specs can be discussed in WI phase. |
| LG | No | We have no concern. |
| Ericsson | Yes | Regarding discovery, for U2U relay, SA2 has concluded that Integrated PC5 unicast link establishment procedure (sol#8 in TR23.752) is also supported, which should be included.  [Rapporteur]: This seems covered already in the discovery email discussion, and can be updated later if needed.  Regarding Qos, in sol#31 of TR 23.752, one EN is captured  How to ensure the PC5 QoS over the two PC5 links by the Adaptation Layer, and the functionalities of the Adaptation Layer will be confirmed by RAN WG2.  Suggest to add a sentence as the below  Further **RAN2 impacts for QoS management are also captured in the clause 6.31 of SA2 TR.**  [Rapporteur]: See response to OPPO comment. Also, there are no RAN2 impacts captured in the SA2 specifications, only notes about what RAN2 needs to consider. |
| Qualcomm | Yes | We agree with OPPO’s suggestion. We think they are indeed misalignments with current SA2 TR. Thus, we think some clarifications are needed from RAN2 side.  Please note that the intention is just to avoid misunderstanding in upcoming RAN Plenary discussion: SA2 somehow had some notes require RAN2 to resolve, although we think they should be resolved by SA2. RAN2 anyway should make further clarification on these SA2 notes.  [Rapporteur]: See response to OPPO comment. |
| Samsung | Yes | Some sub-sections present a conclusion, while others (‚Protocol stack design‘) just state what’s been studied which makes it sound like an FYI.  [Rapporteur]: Conclusion should be able to summarize what was studied.  We additionally share OPPO and Qualcomm‘s concerns.  [Rapporteur]: See response to OPPO comment. |
| Nokia | Yes | We agree with Oppo, Ericsson, Qualcomm. |
| Intel | No | We are fine in general. Please refer to our comments for consideration regarding the references to L3 based relay as in the question above |
| ZTE | No | We agree with the above conclusion |
| Convida | No | We agree with the above conclusion |
| vivo | Yes | Agree with OPPO, Ericsson and Qualcomm. Misalignment should be avoided between SA2 and RAN2. |
| Philips | No | Agree with the conclusions |

## 2.3 RAN2 Recommendation

**Q3.3 Do companies agree that for L2 relay:**

* **RAN2 has determined L2 relay solution to be feasible**
* **L2 relay meets all of the objectives of the SID**
* **Mechanisms for layer-2 relay with minimum specification impact have been studied and identified by RAN2**
* **RAN2 recommends L2 UE to NW and UE to UE relay can proceed to normative work**

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| --- | --- | --- |
| Company | Response (Y/N) | Comments |
| MediaTek | Yes | We agree with the current wording.  For the last bullet (bullet 4), one alternative is to capture the recommendation for normative work in a seperate subsection within conclusion section, which applies to both L2 and L3 solution. With this saying, the first three bullets can be kept within the conclusion for L2. |
| OPPO |  | We are generally fine with the wording.  But would also assume that bullet-4 may come with similar sugggestion on L3 relay as well.. |
| Apple | Yes | We agree with all 4 bullets listed above. |
| Huawei, HiSilicon | Yes | We agree with all 4 bullets listed above. |
| Orange | Yes | We agree with the current wording. |
| LG | No | We agree with the current wording. |
| Ericsson | No | 1. As highlighted by papers [8][14][28], intensive design complexity has been identified. Therefore, we don’t agree with the wording   **Mechanisms for layer-2 relay ~~with minimum specification impact~~ have been studied and identified by RAN2**  “With minimum specification impact” shall be removed. |
| Qualcomm | No | For 3rd bullet, we don’t think the conclusion wth “minimum spec impact“ can be made for now. Maybe we can discuss it with L3 conclusion togother.  For 4th bullet, given the current situation, we agree with MediaTek’s suggested alternative. |
| Samsung | No | Regarding third bullet point, we do not think it captures the whole story and agree with Ericsson that „minimum specification impact“ should be removed. As a compromise, we could also consider the following change:   * Mechanisms for layer-2 relay with minimum specification impact have been studied and identified by RAN2; **the full extent of the specification impact of identified mechanisms will only become clear in the normative phase** |
| Nokia | No | We also have concern on the third bullet, as this has not been the main focus of the study. A good example of this ist he adaptation layer, and RRC state transitions.  Furthermore, we would like to echo Ericsson‘s comments that it would be a good approach to add the items which is pushed for further study in the work item into a list, indicating the necessary work to be made in RAN2. Such a statement should also include the work pushed to the WI, such as;   * gNB decision and assistance on relay (re)selection, * details of discovery configuration for the remote UE * Whether the adaptation layer is also supported at the PC5 interface between Remote UE and Relay UE * The N:1 mapping on PC5 * Details of handling in case PC5 RLC channels with different e2e QoS are mapped to the same Uu RLC channel   Details of forwarding system information mechanisms of broadcast, groupcast and PC5-RRC signalling design and what system information can be relayed to Remote UEs |
| Intel | Yes | We are fine with the current text |
| ZTE | Yes | We are fine with the above 4 bullets. |
| Convida | Yes | We agree with all 4 bullets listed above. |
| vivo | Yes | * **RAN2 has determined L2 relay solution to be feasible** * **L2 relay meets all of the objectives of the SID** * **Mechanisms for layer-2 relay with [there was no such evaluation]have been studied and identified by RAN2** * **RAN2 recommends L2 UE to NW and UE to UE relay can proceed to normative work** |
| Philips | Yes | We agree with the current recommendations |

# 4 References

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