**3GPP TSG RAN WG2 Meeting #116-e R2-211xxxx
Electronic Meeting, 1st - 12th November 2021**

**Agenda item: 8.7.1**

**Source: CATT**

**Title: Summary [AT116-e][620][Relay] Reply LS to SA2 on discovery and relay (re)selection (CATT)**

**Document for: Discussion and Decision**

# Introduction

This is email discussion for below offline discussion:

* [AT116-e][620][Relay] Reply LS to SA2 on discovery and relay (re)selection (CATT)

 Scope: Discuss the questions in R2-2111236 and draft a reply, taking into account decisions of this meeting.

 Intended outcome: Approvable LS and report

 Deadline: Thursday 2021-11-11 0100 UTC

The above email discussion is divided in two phases:

* **Phase I:** Companies are invited to provide feedback on the questions of this email discussion by 9th Nov 01:00am UTC.
* **Phase II:** Rapporteur submits a summary and proposals based on the feedback with draft LS reply, and companies can comment on the summary and draft LS reply by 11th Nov 01:00am UTC.

# Discussion

## Q1 of SA2 LS

1) SA2 has assumed 5G MOCN architecture is supported for 5G ProSe Layer-2 UE-to-Network Relay as described in clause 4.2.7.2 of TS 23.304, and would like to ask RAN2 to confirm this assumption. SA2 has also realized PLMN IDs are required (before Layer-2 link has been established) for the Layer-2 Remote UE to perform PLMN selection as well as Relay selection under 5G MOCN architecture, and would like to know whether PLMN IDs are forwarded by Layer-2 UE-to-Network Relay to Layer-2 Remote UE via the AS layer message.

Since the 5G MOCN architecture for 5G ProSe Layer-2 UE-to-Network Relay described in clause 4.2.7.2 of TS 23.304 supports RAN sharing, during the online session, some company proposed to discuss whether RAN sharing is supported for the NG-RAN node of Layer-2 UE-to-Network Relay firstly.



**Figure-1 5G ProSe Layer-2 UE-to-Network Relay reference architecture (Figure 4.2.7.2-1 in TS 23.304)**

**Question 1-1:** **Do you think RAN sharing can be supported for the NG-RAN node for Rel-17 Layer-2 UE-to-Network Relay? Please give your comments.**

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| **Companies** | **Yes/No** | **Comments** |
| Qualcomm | Yes | SA2 has captured supporting of RAN sharing in TS 23.304 clause 4.2.7.2:*If the serving PLMNs of the 5G ProSe Layer-2 Remote UE and the 5G ProSe Layer-2UE-to-Network Relay are different then NG-RAN is shared by the serving PLMNs, see the 5G MOCN architecture in clause 5.18 of TS 23.501 [4].* |
| OPPO | Yes | Do not see a reason to exclude it if it is already in SA2 and no big effort from RAN side. |
| Ericsson | No | RAN2 has not discussed RAN sharing scenario yet during Rel-17. We shall avoid additional design efforts due to RAN sharing, sicne it is not in the SI/WI scope. |
| Xiaomi | No | Share similar view as Ericsson. |
| Nokia | No | We think the LS from SA2 has not taken into account all issues (authorizations, mobility, access control) for L2 U2N relay that araise with RAN sharing. The support of MOCN network sharing depends on Remote UE awareness of available PLMNs and TAI - that’s the simple part of the story. The more problematic issue is how to handle the case when the PLMN serving the Remote UE is different from the one serving the Relay UE. For example UAC, TAC and cell ID are parameters that can be PLMN specific – which ones are going to be used when relay UE establish a connection ? Security procedures (also affecting SA2/SA3) towards different CNs are not clear. How is the Relay UE expected to set up PDU session towards a PLMN that is different from its RPLMN? The Remote UE’s choice of PLMN can’t dictate the Relay UEs PLMN selection. Furthermore there are no guarantees that the Remote UE’s selected PLMN would even be allowed for the Relay UE. Since there are a lot of unsolved issue we rather prefer to exclude RAN sharing for SL relay in Rel-17.  |
| CATT | Yes | We share the same view as QC and oppo. |
| InterDigital | Yes | This is upto SA2, and they have indicated it is supported. |
| Apple | Yes | If SA2 has decided to support RAN sharing, then RAN2 need follow and make efforts to support it, or give technical reasons that why it cannot be supported. “No time” is not a technical reason. |
| Samsung | No | We share the view from Ericsson that RAN2 should not take extra efforts for RAN sharing. |
| Lenovo | No | Agree with Ericsson since we have not discussed this case and the left TU is not enough. |
| Sharp | Yes |  |
| vivo | Yes | Agree with companies that it seems the RAN sharing can already be supported from SA2’s point of view, so there is no need to exclude this by RAN2. |
| MediaTek | Yes | Agree with Qualcomm |
| Huawei, HiSilicon | Yes | We have the similar view as Qualcomm and OPPO. The main work to support RAN sharing is in SA2 scope. In RAN, it seems the existing mechanisms can work without much update, e.g. Relay UE forward SI including per-PLMN parameters, and remote UE apply the parameters for its selected PLMN. And if there are issues related to higher layer procedures, it could be addressed in SA2. |
| ZTE | Yes | If SA2 identify that RAN sharing is necessary for SL relay, we think RAN should support it as well. |
| LG | No | Share similar view as Ericsson. |
| Intel | Yes | Agree with company views that it is in SA2 realm and we only need to support availability of some system information. |
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**Question 1-2: If answered “Yes” on question 1-1, do companies think RAN2 can confirm 5G MOCN architecture is supported for 5G ProSe Layer-2 UE-to-Network Relay as described in clause 4.2.7.2 of TS 23.304?**

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| **Companies** | **Yes/No** | **Comments** |
| Qualcomm | Yes | We see no reason to challegne SA2 spec. |
| OPPO | Yes |  |
| CATT | Yes |  |
| InterDigital | Yes |  |
| Apple | Yes |  |
| Sharp | Yes |  |
| vivo | Yes |  |
| MediaTek | Yes |  |
| Huawei, HiSilicon | Yes |  |
| ZTE | Yes |  |
| Intel | Yes |  |
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Both [2] and [3] point out that PLMN IDs specified in Q1 is focused on the non-serving case since the serving NCGI has been agreed to be included in discovery message already in SA2 [1].

Furthermore, it was clarified that the remote UE needs to acquire the non-serving PLMN IDs before PC5 link establishment as indicated by SA2. In [2], two solutions on how to deliver the non-serving PLMN IDs were given as below:

- RRC container in discovery message

- Broadcast PC5-RRC

In [3], it is proposed to include the PLMN IDs in Relay UE’s discovery message.

**Question 1-3: If answered “Yes” on question 1-1, which option do companies prefer on how to deliver the non-serving PLMN IDs to the remote UE? Please give your comments.**

* **Option 1: Discovery message, detail is decided by SA2.**
* **Option 2: RRC container in discovery message.**
* **Option 3: PC5-RRC broadcast message.**
* **Option 4: Others (if any, please give the detailed description).**

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| **Companies** | **Option** | **Comments** |
| Qualcomm | Option 2 (preferred)Option 1 is acceptable. Do not agree Option 3 | Please note that RAN2 has agreed to include serving PLMN ID in discovery message. Then, we think Option 2 is simplest solution, to avoid futher interaction with SA2.We do not agree Option 3 because:* We don’t think RAN2 can complete spec work to design new groupcast/broadcast PC5 RRC message. It has RAN1 impacts because it is a new PC5-RRC message. However, there is no RAN1 TU, we think it is NO way to work it out in this release. And it has SA2 impacts at least on L2 ID management.
* If a new broadcast/groupcast PC5 RRC is agreed, it implies that remote UE is required to monitor two broadcast messages (i.e., discovery message and broadcast/groupcast PC5 RRC) before PC5 connection, which introduces extra complexity for remote UE.
 |
| OPPO | 2 or 3 | The reason that option-1 is not preferred is it will lead to too much interation between CT1 and RAN2 when it comes to stage-3 details, and this difficulty would continue when later there are additional fields to be added (e.g., in future releases). Instead, a RRC container means the stage-3 pecification work is still in RAN2, which thus simplify the inter-WG interaction a lot. |
| CATT | Option 2 | Since PLMN selection is part of relay (re)selection, if Layer-2 U2N remote UE acquires PLMN IDs via PC5-RRC message, it needs to associate discovery message with PC5-RRC message. Furthermore, there is latency between discovery message and PC5-RRC message. To avoid these problems, we can exclude option3.Option 2 is simplest solution, to avoid futher interaction with SA2. |
| InterDigital | Option 3 | In addition to avoiding inter-layer interraction, using a PC5 RRC aligns well with transmission of other system information. |
| Apple | 1 or 2 | Not sure why need a new massage when there is no size limits on R17 Discoevry message in PC5 interface. |
| Sharp | Option 2 |  |
| vivo | Option 1 or 2 | To us, discvoery message is enough. For whether a container is used, we can follow the majority view. |
| MediaTek | Option 2 |  |
| Huawei, HiSilicon | Option 2 | Same view as Qualcomm. |
| ZTE | Option 1 | The detailed design for discovery message can be up to SA2. |
| Intel | Option 2 or 1 |  |
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## Q2 of SA2 LS

2) SA2 has realized TAI is needed for 5G ProSe Layer-2 Remote UE to determine the type of initial access message (Mobility Registration Update or Service Request), and would like to ask whether TAI is forwarded by 5G ProSe Layer-2 UE-to-Network Relay to the 5G ProSe Layer-2 Remote UE via the AS layer message.

Both [2] and [3] considered that remote UE can acquire TAI after PC5 connection establishment. TAI included in SIB1 which is forwarded by 5G ProSe Layer-2 UE-to-Network Relay to the 5G ProSe Layer-2 Remote UE via the PC5-RRC message is sufficient.

**Question 2-1: Do companies agree that TAI can be forwarded by Relay UE to the Remote UE via PC5-RRC message** after PC5 connection establishment**? Please give your comments.**

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| **Companies** | **Yes/No** | **Comments** |
| Qualcomm | Yes, but... | We agree that TAI can be forwarded by Relay UE via PC5 RRC after unicast PC5 link is established with remote UE. However, in offline#622 of L2 control plane procedure, RAN2 will discuss whether discovery message can include *cellAccessRelatedInfo*. If it is agreed, TAI can be obtained by remote UE via discovery message because TAI is a part of *cellAccessRelatedInfo*. So, we can wait for the outcome of the discussion to decide whether to indicate TAI can also be delivered via discovery.  |
| OPPO | Yes |  |
| Ericsson | Yes |  |
| Xiaomi | Yes |  |
| Nokia | comments | Of course TAI can be forwarded by Relay UE to Remote UE. However please note that TAI can be PLMN specific. |
| CATT | Yes |  |
| InterDigital | Yes | This is the case with any system information. |
| Apple | Yes |  |
| Samsung | Yes |  |
| Lenovo | See comments | We think TA information is bound to a corresponding PLMN as in the IE *PLMN-IdentityInfo*, this leads us to believe that these two (PLMN and TAC) are coupled together. If companies propose to use Discovery to signal PLMN Id list, we think this will not be natural to out their correponding TAs in a different message without repeating the PLMN information. |
| Sharp | Yes |  |
| vivo | Yes with comments | Agree with Qualcomm that this may be carried in discovery message also, depending on related discussion. |
| MediaTek | Yes |  |
| Huawei, HiSilicon | See comments | We also think the TAI could be siganlled together with PLMN ID in Q1, and it could be the cellAccessRelatedInfo as Qualcomm commented.Thus we prefer to wait for offline#622 conclusion. |
| ZTE | See comments | We also think TAI can be delivered to remote UE in the same way as PLMN IDs. |
| LG | Yes |  |
| Intel | See comment | We have similar comment as Qualcomm. TAI is made up of PLMN ID and TAC both of which are part of SIB1-> *CellAccessRelatedInfo* -> *PLMN-IdentityInfoList* and if we agree to broadcast list of PLMN IDs in discovery, we can also advertise the TAI within the same message. However, we can also repeat the information within PC5-RRC if majority prefers this option.  |
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## Q3 of SA2 LS

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| 3) SA2 has discussed the Editor’s Note in TS 23.304 clause 6.4.3.6:Editor’s Note Whether the Layer-2 link modification procedure is also applicable to ProSe Communication via 5G ProSe Layer-2 UE-to-Network Relay requires cooperation with RAN2.SA2 understands that during the Layer-2 link establishment procedure the 5G ProSe Layer-2 UE-to-Network Relay and 5G ProSe Layer-2 Remote UE do not interact with the QoS Info (the information about PC5 QoS Flows), meaning there is no PC5 QoS Flow established in the PC5 unicast link between Layer-2 UE-to-Network Relay and Layer-2 Remote UE and the QoS handing is therefore setup by RAN. SA2 would like to ask as the Layer-2 link modification procedure is used to add/modify/remove PC5 QoS Flow(s) in the PC5 unicast link, whether this procedure is applicable or not to the Layer-2 UE-to-Network Relay? |

[3] clarified that the QoS Flow of Layer-2 Remote UE is Uu QoS Flow. SDAP layer for Layer-2 UE-to-Network Relay is located between Layer-2 Remote UE and gNB to perform the Uu QoS flow to DRB mapping. From AS perspective, there is no PC5 QoS flow for Layer-2 U2N relay. [3] proposed whether the Layer-2 link modification procedure is used can be decided by SA2 itself. [2] considered the view point by SA2 is valid, and suggested RAN2 to confirm SA2 understanding.

**Question 3-1: Do companies agree that RAN2 can confirm SA2 understanding (during the Layer-2 link establishment procedure the Relay UE and Remote UE do not interact with the PC5 QoS Flows Info)? Please give your comments.**

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| **Companies** | **Yes/No** | **Comments** |
| Qualcomm | Yes, but | We think it is sufficient to list related QoS agreements on L2 relay, and let SA2 decide  |
| OPPO | Yes | Essentially it is SA2/CT1 issues, not sure why RAN2 has a say on this issue though.. |
| Ericsson  | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes | During Layer-2 link establishment procedure the L2 UE-to-Network Relay and L2 Remote UE do not interact with the QoS Info. |
| CATT | Yes |  |
| InterDigital | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| Sharp | Yes |  |
| vivo | Yes |  |
| MediaTek | Yes |  |
| Huawei, HiSilicon | Yes |  |
| ZTE | Yes |  |
| LG | Yes |  |
| Intel | Yes |  |
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**Question 3-2: Regarding to the issue that whether the Layer-2 link modification procedure is applicable to the Layer-2 UE-to-Network Relay, which option do companies prefer? Please give your comments.**

* **Option 1:** **Whether the Layer-2 link modification procedure is used can be decided by SA2 itself.**
* **Option 2: RAN2 can decide that Layer-2 link modification procedure is not used and reply to SA2.**
* **Option 3: Others (if any, please give the detailed description).**

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| **Companies** | **Options** | **Comments** |
| Qualcomm | Option 1 | We don’t think RAN2 is in position to decide whether a PCS-S message is useful or not. We would like to suggest to copy related QoS agreement on L2 Relay, and leave it to SA2 to decide. |
| OPPO | 1 or 2 | Option-1 is reasonable since this is SA2/CT1 issue..Option-2 is also fine considering SA2 has expressed their preference clearly already. |
| Ericsson | Option 1 | The final decision shall be taken by SA2 considering LS reply from RAN2. |
| Xiaomi | 1 |  |
| Nokia | Option 1 | up to SA2 |
| CATT | Option 1 |  |
| InterDigital | Option 1 |  |
| Apple | Option 2 | Since SA2 has alredy asked, RAN2 need give a definite answer. There is no obvious reasons that L2 link modification procedure cannot be supported. So, RAN2 can reply that this procedure can be supported from RAN2 perspective.  |
| Samsung | Option 1 |  |
| Lenovo | Option 1 |  |
| Sharp | Option 1 |  |
| vivo | Option 1 |  |
| MediaTek | Option 1 |  |
| Huawei, HiSilicon | Option 2 | We understand SA2 is asking RAN2 to check on this issue, we need to provide the answer from RAN2 perspective. And since L2 relay uses Uu QoS modelling, there is no need to update L2 link based on PC5 QoS modeling. |
| ZTE | Option 1 |  |
| LG | Option 1 |  |
| Intel | Option 1 |  |
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## Q4 of SA2 LS

4) Per TS 23.304 clause 6.6.2, NG-RAN is provided with 5G ProSe authorised information indicating whether a UE is authorized to use 5G ProSe Direct Discovery, 5G ProSe Direct Communication, to act as a 5G ProSe Layer-2 UE-to-Network Relay, a 5G ProSe Layer-3 UE-to-Network Relay and a 5G ProSe Layer-2 Remote UE. NG-RAN is not provided with authorisation information for whether a UE is authorised to act as a 5G ProSe Layer-3 Remote UE.

Is the authorisation information for whether a UE can act as a 5G ProSe Layer-3 Remote UE needed by NG-RAN to enable configuring the UE with correct discovery configuration information via dedicated signalling?

In RAN2#113bis-e, RAN2 reached the below agreement which is common for L2 and L3:

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| Proposal 4 [Easy][23/23]: Relay UE and remote UE (IC) in RRC CONNECTED can use the discovery configuration provided via dedicated signalling if available. |

In [2], it thinks authorisation information for L3 remote UE is needed for NG-RAN to decide on the dedicated discovery configuration. In [3], it suggested that authorisation information for whether a UE is authorised to act as a 5G ProSe Layer-3 Remote UE RAN2 should be discussed in RAN3, and from RAN2’s perspective, Layer-3 remote UE (IC) in RRC CONNECTED can use the discovery configuration provided via dedicated signalling if available.

**Question 4-1: Regarding to the authorisation information for L3 remote UE, companies are encouraged to provide your views/preference to the following options. Please give your comments.**

* **Option 1:** **RAN2 confirm that authorization information for L3 remote UE is needed for NG-RAN.**
* **Option 2: Whether authorization information for L3 remote UE is needed for NG-RAN can be decided by RAN3.**
* **Option 3: RAN2 only confirm that dedicated signaling for discovery information configuration is feasible for L3 remote UE to SA2 and whether authorization information for L3 remote UE is needed for NG-RAN can be decided by SA2.**
* **Option 4: Others (if any, please give the detailed description).**

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| **Companies** | **Options** | **Comments** |
| Qualcomm | Option 2 | First, authrization is RAN3 and SA2 expertise. RAN2 don’t even have TU for autheization. We fail to understand why Option 1 is even list as an option. And we don’t think RAN2 should involve in this discussion because it is out of RAN2 scoping.Secondly, for the RAN2 agreement on dedicated signaling of discovery list in Option 3, we don’t think it is related to authrization. Please note that discovery and relay are two different functionalities. And LTE sidelink has one AS capability specified on which bands to support discovery (from TS 36.306):4.3.*21.3 discSupportedBands-r12**This field indicates the bands on which the UE supports sidelink discovery, as defined in TS 23.303 [24] and specified in TS 36.331 [5].*Although we have not started UE capablity discussion in RAN2, we tend to think it is straight forward to introduce similar AS capability for NR discovery. Then, gNB can decide whether to have dedicated signaling of discovery for L3 remote UE, based on whether it reports the capablity bit of discovery rather than it is authrized or not.  |
| OPPO | 1 and/or 2 | We tend to see authorization info is needed when NR-RAN has to send dedicated parameter for remote UE.So option-3 which kick the ball back to S2 seems not preferred (this issue indeed related to R2), and option-1/2 might be merged as one, i.e., RAN2 express the view (option-1), while up to RAN3 to decide (option-2) finally. |
| Ericsson | Option 2 | Agree with Qualcomm. |
| Xiaomi | 2 | Agree with QC |
| Nokia | Option 2 | NG-RAN gets information on whether a particular UE is authorised to use Direct Discovery, Direct Communication or to be L2 Relay or L3 Relay. In addition, the NG-RAN gets the information on whether the UE can act as L2 Relay UE, but so far SA2 has not identified any reason why NG-RAN would need to know the authorisation to act as L3 Remote UE.  |
| InterDigital | Option 2 | Agree with QC |
| Apple | Option 1/2  | Agree with OPPO. |
| Samsung | Option 2 | Agree with Qualcomm |
| Lenovo | Option 2 |  |
| Sharp | Option 2 |  |
| vivo | Option 2 |  |
| MediaTek | Option 2 |  |
| Huawei, HiSilicon | Option 1/3 | We agree with OPPO that the authorization info is needed as gNB may want to provide dedicated configuration to remote UE. Furthermore, we do not understand why this is pending for RAN3, as in usual the requirement and definition of authorization info are decided by SA2. In this case, considering SA2 is asking for RAN2 views in LS, we would better to provide RAN2 consideration on it. |
| ZTE | Option 2 | Authorization issue is within RAN3 domain. It is suggested to discuss it in RAN3. |
| LG | Option 2 |  |
| Intel | Option 2  | We can follow the WID where RAN3 is designated for authorization of both L2 and L3 relay and they can decide how it is utilized by gNB.  |
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# Conclusion

# References

1. R2-2111236 Reply LS on discovery and relay (re)selection (S2-2107972; contact: CATT) SA2
2. R2-2111123 Discussion on LS on discovery and relay (re)selection OPPO
3. R2-2111253 Discussion on LS on discovery and relay (re)selection CATT
4. TS23.304 Proximity based Services (ProSe) in the 5G System (5GS) (Release 17) V17.0.0