**3GPP TSG-RAN3 Meeting #117 R3-225020**

**Electronic Meeting, 15th – 26th August, 2022**

**Agenda item: 16.2**

**Source: ZTE (Moderator)**

**Title: Summary of offline discussion on CB# SLRelay1\_Authorization**

**Document for: Discussion and Decision**

# Introduction

This contribution provides the summary of the following email discussion,

**CB: # SLRelay1\_Authorization**

**- Discuss on UE authorization information for L2, and whether UE authorization information is needed for L3?**

**- Potential impacts on interfaces, e.g. NG, Xn? And whether to support for CU/DU split architecture?**

**- Split Qos to RLC channel, and Qos parameters？**

**- Any other issues for UE authorization?**

(ZTE - moderator)

Summary of offline disc [R3-225020](https://qualcomm-my.sharepoint.com/personal/shakrish_qti_qualcomm_com/Documents/Desktop/Dropbox/Pentari Systems/RAN3/117-e/CB/CB %23 SLRelay1_Authorization/Inbox/R3-225020.zip)

Please provide your views by **23:59 UTC Wednesday August 17th**, so that moderator may have time to make summary for companies’ reviewing before online session.

# For the Chairman’s Notes

Propose to capture the following: [TBD]

# Discussion

## Authorization for U2U relay

In the R18 SL relay enhancement WI [1], one of the objectives is to specify mechanisms to support single-hop Layer-2 and Layer-3 UE-to-UE relay for unicast, in which the signalling support for Relay and remote UE authorization may involve RAN3 work if SA2 concludes it is needed.

|  |
| --- |
| 1. Specify mechanisms to support single-hop Layer-2 and Layer-3 UE-to-UE relay (i.e., source UE -> relay UE -> destination UE) for unicast [RAN2, RAN3, RAN4].    1. Common part for Layer-2 and Layer-3 relay to be prioritized until RAN#98       1. Relay discovery and (re)selection [RAN2, RAN4]       2. Signalling support for Relay and remote UE authorization if SA2 concludes it is needed [RAN3] |

In TR 23.700-33 [2], SA2 has the on-going discussion on the potential solutions for Key Issue #1 (i.e., Support of UE-to-UE Relay) which includes how the network can control U2U relay operation. But there is no detailed discussion on service authorization to NG-RAN for U2U Relay operation.

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| --- |
| Whether and how the network can control UE-to-UE Relay operation, at least including how to:  - Authorize the UE-to-UE Relay, e.g. authorize a UE as UE-to-UE Relay.  - Authorize Source/Target UEs to use a UE-to-UE Relay.  - Provisioning policy and parameters for UE-to-UE Relay service. |

In R17 SL relay, the 5G ProSe authorization information for Direct discovery, Direct communication and U2N Relay operation were specified in NG/Xn/F1AP signallings. And the 5G ProSe authorization includes the following items:

Table . 5G ProSe Authorized IE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| 5G ProSe Direct Discovery | O |  | ENUMERATED (authorized, not authorized, ...) | Indicates whether the UE is authorized for 5G ProSe Direct Discovery |
| 5G ProSe Direct Communication | O |  | ENUMERATED (authorized, not authorized, ...) | Indicates whether the UE is authorized for 5G ProSe Direct Communication |
| 5G ProSe Layer-2 UE-to-Network Relay | O |  | ENUMERATED (authorized, not authorized, ...) | Indicates whether the UE is authorized for 5G ProSe Layer-2 UE-to-Network Relay |
| 5G ProSe Layer-3 UE-to-Network Relay | O |  | ENUMERATED (authorized, not authorized, ...) | Indicates whether the UE is authorized for 5G ProSe Layer-3 UE-to-Network Relay |
| 5G ProSe Layer-2 Remote UE | O |  | ENUMERATED (authorized, not authorized, ...) | Indicates whether the UE is authorized for 5G ProSe Layer-2 Remote UE |

When it comes to U2U relay, similarly, the authorization for U2U relay operation may be considered. According to the contributions in this meeting, [3][5][9] present that authorization for U2U relay may be needed. [3] thinks UE authorization for L2 U2U relay is needed while it is not needed for L3 U2U relay. [5][7] indicate U2U relay authorization is pending to SA2 or RAN2 discussion, if SA2 and RAN2 conclude it is needed, *5G ProSe Authorized* IE can be easily extended to support the U2U Relay operation. [6][8] think the authorization of U2U relay at NG-RAN is not needed.

In moderator’s view, though there is no conclusion on service authorization to NG-RAN for U2U Relay operation in SA2 yet, RAN3 could have preliminary study on the signalling support for U2U authorization first and try to make some progress. If SA2 concludes it is needed, RAN3 could further check the signalling support based on the progress.

Companies are encouraged to share the views on whether the authorization for L2 and L3 U2U relay is needed from RAN3’s perspective, what is the detailed items of U2U relay authorization, and the signalling impact to support U2U relay authorization.

### **Question 1: Do companies think the authorization for L2 and L3 U2U relay operation is needed from RAN3’s point of view? What is the detailed items of U2U relay authorization if needed?**

|  |  |
| --- | --- |
| Company | Comment |
| E/// | There is no detailed discussion in SA2 about whether NG-RAN node will be involved in the U2U relay. In KI#1 the entities are still Relay 1 and 2. We know that the corresponding authorization information will be easily introduced once SA2 concludes. Thus we prefer not to capture any agreement for this and wait for clear conclusion. |
| Qualcomm | In our view, NG-RAN should only be involved in resource management (setting PC5-AMBR and QoS) of a U2U relay in SL mode 1. We don’t see any benefit in AMF specially authorizing an NG-RAN for U2U relay purposes. Also, SA2 might send an LS to RAN3 in the upcoming meeting based on their conclusions, we can discuss in next meeting based on the LS. |
| ZTE | Authorization for L2 U2U relay/remote UE is needed, but it is not needed for L3 U2U relay/remote UE.  For L2 U2U relay UE in RRC\_Connected state, gNB needs to know it is a relay UE and to allocate SL resources and provide PC5 RLC channel configuration and bearer mapping between ingress PC5 RLC channel and egress PC5 RLC channel to the U2U relay UE, which is different from normal SL UE (gNB provides SLRB config not PC5 RLC channel config, and no bearer mapping config). Before providing configuration to L2 U2U relay UE, gNB verify whether the UE is authorized to act as a L2 U2U relay UE. Similarly for L2 U2U remote UE.  However, for L3 U2U relay communication, it is equivalent to normal SL communication hop by hop. That is, for L3 U2U relay/remote UE to perform relay communication, they are subject to the authorization of ProSe direct communication. So, it is not necessary to consider the authorization for L3 U2U relay/remote UE. |
| Samsung | No at this time. We think current PC5 authorization information seems be enough. It may be discussed later depending on SA2/RAN2 progress. |
| CATT | Wait for the SA2 procedure. If SA2 introduces new authorization information to support U2U relay, we can simply capture them in 5G ProSe Authorized IE. |
| China Telecom | We can wait for the progress of SA2. Once SA2 has a conclusion, corresponding authorization information can be introduced. |
| vivo | Authorization for L2 and L3 U2U relay operation should be first discussed in SA2. based on SA2 decision, corresponding RAN3 can be considered. |
| CMCC | SA2 has discussed authorization for U2U relay and impacts on NG-RAN has not been identified until now. In our understanding, RAN3 can start discuss this issues and try to progress on it. If SA2 has conclusion for that, we can further check.  For L2 U2U relay, we share same understanding with ZTE; as to L3 U2U relay, we think it would be better to introduce authorization, however, we can compromise to majority. |
| LGE | As mentioned in [7], we think that if the RAN2 concludes that the NG-RAN can allocate the SL resource for UE-to-UE Relay operation according to the network scheduled operation mode, the NG-RAN needs to know whether the UE is allowed for UE-to-UE Relay operation. Therefore, the Prose service authorization for UE-to-UE Relay operation should be provided to the NG-RAN.  However, the RAN2 has not yet discussed the aspect related to resource management for UE-to-UE Relay operation. Also, there is no SA2 conclusion on whether the Prose service authorization for UE-to-UE Relay operation is needed or not. As mentioned in Qualcomm, in SA2 #152-e meeting, the SA2 will have a discussion on this issue, and then may send a LS to RAN2 and RAN3. Then, we can further discuss this issue in next meeting. |
| Huawei | we can wait SA2 progress and add the Remote UE/UE-to-UE Relay authorization information later on. |

Moreover, contribution [3][7] indicate the 5G ProSe Authorized IE specified in R17 SL relay could be extended to include the U2U relay authorization if U2U relay authorization is supported (by SA2 conclusion).

### **Question 2: Do companies agree that the 5G ProSe Authorized IE specified in R17 SL relay should be extended to include the U2U relay authorization if supported?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| E//// | Too early | We prefer not to preclude and jump into specification details now. If any conclusion is made in other group, the changes to RAN3 specs will be straightforward. |
| Qualcomm | No | As mentioned in Q1, we don’t see any benefits on how NG-RAN node can use this authorization information even if provided from AMF. From NG-RAN perspective, a U2U relay should be just another UE interested in sidelink, there is no benefit of knowing whether it is U2U or not. |
| ZTE | Yes | RAN3 could have preliminary study on the signalling support for U2U authorization first and try to make some progress. If SA2 concludes it is needed, RAN3 could further check the signalling support based on the progress. |
| Samsung | Prefer to wait | We have the same view as Ericsson. |
| CATT | Yes, but | Whether to introduce new authorization information needs to wait for the conclusion of SA2. |
| China Telecom | Prefer to wait |  |
| vivo |  | Whether to extend R17 SL relay 5G proSe Authorized IE can be later discussed. |
| CMCC | Yes | Same view as ZTE. |
| LGE | Too early | Same view with Ericsson. If other WGs concludes that this IE is feasible, we can further discuss the details for this IE. |
| Huawei | Yes | Prefer to reuse the existing 5G ProSe Authorized IE |

Similar to the 5G ProSe Authorized IE specified in R17 SL relay, [3][5] indicate the U2U relay authorization information may be included in NGAP/XnAP messages. To be specific,

**The U2U relay authorization information may be included in the following NG and Xn messages:**

**- NGAP: Initial Context Setup Request, UE Context Modification Request, Handover Request, Path Switch Request Acknowledge;**

**- XnAP: Handover Request, Retrieve UE Context Response.**

### **Question 3: Do companies agree that the U2U relay authorization information may be included in the above listed NG and Xn messages, if supported?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| E/// | Prefer to wait |  |
| Qualcomm | Wait | Only if there is consensus on Q1 and Q2 |
| ZTE | Yes | The same as U2N relay. |
| Samsung | Prefer to wait |  |
| CATT | Yes, but | If the principle of SA2 follows R17, these messages can be reused. Whether to introduce new authorization information needs to wait for the conclusion of SA2. |
| China Telecom | Prefer to wait | If supported, similar to U2N relay. |
| vivo | Wait | See comments to Q1 and Q2. |
| CMCC | Yes |  |
| LGE | Prefer to wait | As mentioned in Q1, we need to wait for other WGs. |
| Huawei | Yes | The AMF shall include in a NGAP message sent to NG-RAN, Similarly, the authorization information should be added in the XnAP messages to propagate during mobility. |

In R17 SL relay, it was agreed to support U2N relay in CU-DU split architecture. So the 5G ProSe Authorized IE is also delivered in F1AP messages. [3][5] express the support of U2U relay in CU-DU split architecture. For U2U relay/remote UE in RRC\_Connected state, they are controlled by gNB. It is natural to support the U2U relay in CU-DU split architecture.

### **Question 4: Do companies agree to support the U2U relay in CU-DU split architecture?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| E/// | Prefer to wait |  |
| Qualcomm | No | gNB should not be responsible for providing bearer mapping, PC5/Uu RLC channel configuration etc., rather it should be the responsibility of U2U relay to provide it to source UE and target UE. RAN2 can discuss this first.  Also functionality of gNB for supporting U2U UEs need not be any different than supporting SL UE in mode 1. |
| ZTE | Yes | For U2U relay/remote UE in RRC\_Connected state, they are controlled by gNB which may be in a CU-DU split architecture. In this case, CU may request DU to provide PC5 RLC channel configuration for L2 U2U relay/remote UE. |
| Samsung | Prefer to wait |  |
| CATT | Yes | Similar as U2N |
| China Telecom | Prefer to wait | If supported, similar to U2N relay. |
| vivo | Prefer wait | See comments to Q3 |
| CMCC |  | We are open for that. |
| LGE | Prefer to wait | As mentioned in Q1, we need to wait for other WGs. |
| Huawei | Yes | similar to U2N relay |

If U2U relay is supported in CU-DU split architecture, U2U relay authorization may be included in F1AP messages. To be specific,

**The U2U relay authorization information may be included in the following F1AP messages:**

**- F1AP: UE context Setup Request, UE Context Modification Request.**

### **Question 5: Do companies agree that the U2U relay authorization information may be included in the above listed F1AP messages, if supported?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| E/// | Prefer to wait |  |
| Qualcomm | No |  |
| ZTE | Yes |  |
| Samsung | Prefer to wait |  |
| CATT | Yes, but | If the principle of SA2 follows R17, this F1 message can be reused. Whether to introduce new authorization information needs to wait for the conclusion of SA2 |
| China Telecom | Prefer to wait |  |
| vivo | Prefer wait | See comments to Q4 |
| CMCC | Yes |  |
| LGE | Prefer to wait | As mentioned in Q1, we need to wait for other WGs. |
| Huawei | Yes |  |

## Support U2U relay in CU-DU split architecture

According to the discussion in Question 4, if U2U relay is supported in CU-DU split architecture, [3][5] indicate F1 impact on how to configure the L2 U2U relay/remote UE with PC5 RLC channel and bearer mapping may be considered.

For L2 U2U relay, the Source UE connects to Target UE via Relay UE. The end-to-end SLRB is established between the source UE and target UE. And the end-to-end SLRB shall be mapped to PC5 RLC channels by the two PC5 hops between source UE and relay UE and between relay UE and target UE, in which the end-to-end PC5 QoS should be satisfied by two hops of link in the U2U relay.

For PC5 RLC channel configuration for L2 U2U relay/remote UE, CU may provide PC5 RLC channel to be setup/modified list and PC5 RLC channel QoS information of each PC5 RLC channel to DU, while DU responses with admission result and DU side configurations. [5] proposes to introduce new IE that the CU indicates the DU to configure the PC5 RLC channel for U2U relay.

### **Question 6: Do companies agree that F1AP enhancement for PC5 RLC channel configuration is needed for L2 U2U relay?**

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Yes/No | Comment | |
| E/// | Neutral | Still we need to wait for filtering out the solutions in SA2. If QoS splitting is supported, then potential F1AP could be considered. | |
| Qualcomm | No | As mentioned in Q4, no enhancements needed for supporting U2U relay in split gNB architecture.  QoS split should be discussed first in RAN2. | |
| ZTE | Yes | For L2 U2U relay/remote UE in RRC\_Connected state, they are controlled by gNB which may be in a CU-DU split architecture. In this case, CU may request DU to provide PC5 RLC channel configuration for L2 U2U relay/remote UE.  For PC5 RLC channel configuration of L2 U2N relay UE in F1, the QoS of the PC5 RLC channel is referred to Uu QoS, but for PC5 RLC channel config of L2 U2U relay UE, the QoS of the PC5 RLC channel shall be PC5 QoS. In addition, there are two hops PC5 RLC channel config for L2 U2U relay UE (PC5 RLC channel between relay UE and source UE, and PC5 RLC channel between relay UE and target UE), so the pee UE ID (e.g. source UE or target UE) shall be indicated for a PC5 RLC channel.  Anyway, the detailed enhancements can be discussed later, but it is definitely that F1AP enhancement for L2 U2U relay configuration is needed. | |
| Samsung | No at this time | There would be network-uncontrolled scenario, e.g. out-of-coverage of relay and/or remote UEs. We think RAN3 should wait for RAN2 progress. | |
| CATT | Yes, but | It depends on RAN2 about QoS split. | |
| China Telecom | Not now | RAN3 should wait for RAN2 progress. | |
| vivo | No strong view |  | |
| CMCC | Pending | Waiting for RAN2 progress. |
| LGE | Prefer to wait | Wait for other WG’s conclusion on this issue. | |
| Huawei | Yes | Same view as ZTE | |

1. discusses two options for end-to-end PC5 QoS split, i.e. Option 1: QoS split at Source UE side, and Option 2: QoS split at Relay UE side, and proposes the gNB-CU on the Tx/source UE side split the E2E PC5 QoS to RLC channel level QoS parameters.

In moderator’s view, which node to perform E2E QoS split may also involve RAN2 discussion. Shall RAN3 wait for RAN2’s progress or RAN3 discuss this issue?

### **Question 7: Do companies think it is necessary for RAN3 to discuss which node to perform E2E PC5 QoS split for L2 U2U relay or wait for RAN2’s progress?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| E/// | Not now | This topic is a bit away from stable in RAN2. |
| Qualcomm |  | RAN2 should discuss first |
| ZTE |  | RAN2 should discuss first |
| Samsung | Not now | We think RAN3 should wait for RAN2 progress. |
| CATT | Depends on other WG | But tend to agree with [5]’s proposal technically. |
| China Telecom | Not now |  |
| vivo |  | RAN2 should discuss first |
| CMCC | Pending | Waiting for RAN2 progress. |
| LGE |  | RAN2 should discuss first. |
| Huawei | Yes | We can Waiting for RAN2 progress. |

## Authorization for multi-path transmission and path switching

Among contributions in this meeting, [4][6][8] address the discussion for multi-path authorization. SA2 has captured the following objectives as part of their Key Issue to support authorization for multi-path relays in TR 23.700-33:

*Whether and how the network authorizes and the triggers for connection establishment for* ***multi-path transmission****, including:*

* *Whether and how to authorise a Remote UE to use the multi-path transmission for specific ProSe service(s).*
* *What information is required for and how does a Remote UE or UE-to Network Relay or the network trigger the multi-path connection establishment.*
* *How to provide/update the rules for multiple-path transmission.*

Solution #26 proposed that the above key issue has the following impacts relevant to RAN3.

|  |  |
| --- | --- |
| Solution #26: Multi-path transmission via Layer-2 UE-to-Network Relay | NG-RAN:  -     Multi-path connection establishment and the transfer of data via both paths, taking into account authorization from AMF.  AMF:  -     Provide authorization to NG-RAN. |

[4] proposes that gNB receive the multi-path authorized information from CN. During remote UE’s mobility, source gNB transfer the multi-path authorized information to target gNB during the handover preparation procedure. [6][8] suggest RAN3 to discuss the signalling support for authorization of multi-path transmission after SA2’s further progress.

### **Question 8: Do companies think NG/Xn/F1AP related signalling enhancement is needed to support the authorization for multi-path transmission from RAN3’s point of view?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| E/// | Yes |  |
| Qualcomm | Yes |  |
| ZTE | Yes |  |
| Samsung | Yes, but | We think F1AP signalling enhancement would be also required, but it may depend on multi-path solution. So F1AP impact is FFS at this time. |
| CATT | Yes |  |
| China Telecom | Yes |  |
| vivo | Yes |  |
| CMCC | Yes |  |
| LGE | Yes with WA | To make progress, we propose the working assumption on “NG-RAN receives the multi-path authorization from the AMF”. If SA2 confirms that this IE is feasible, this working assumption can turn into the agreement in next meeting. |
| Huawei | Yes |  |

In contribution [8], authorization for path switching is addressed. Among SA2’s solutions, Solution#23 for path switching includes the enhancement for the authorization policy to support inter-gNB mobility path switching. To support the inter-gNB path switch, SA2 has been discussing the delivery of the authorized PLMN list to NG-RAN.

|  |
| --- |
| **Solution #23 in TR 23.700-33**  **AMF:**  - Receives the target U2N relay UE info from gNB and AMF.  - Sends the target U2N relay UE info to gNB.  - Sends the authorized PLMN list to gNB. |

If SA2 concludes the AMF provides the authorized PLMN list fto gNB. RAN3 signalling enhancement may be required.

### **Question 9: Do companies think NG/Xn/F1AP related signalling enhancement is needed to support the authorization for path switching from RAN3’s point of view?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| E/// | Wait for SA2 | We better not preclude anything possible enhancements before SA2 selects the solution. Open for discussion. |
| Qualcomm |  | First. we want to understand why an authorization during inter-gNB path switching is needed?  This was one of the reasonings provided:  “Source gNB does not know whether the target relay UE has been authorized. If the source gNB decides handover the remote UE to an unauthorized target relay UE, the handover procedure will failure. To avoid handover failure, source gNB should know the authorized information of target relay UE”.  Isn’t this just an optimization to avoid such handover failures? Can’t we just reuse existing mechanisms e.g., handover preparation would fail if its an authorized target relay UE?  Also, it is not clear how this authorized PLMN list looks like? Does the source NG-RAN use this authorized PLMN list simply for better target relay selection or any other purposes? Can source NG-RAN retrieve this authorized PLMN list from AMF even if it is outside the authorized PLMN list? |
| ZTE | Not sure | May wait for SA2’s further progress. |
| Samsung | No at this time | We don’t see the necessity yet, but it may be discussed later depending on SA2’s further progress. |
| CATT | Yes | Similar as Question 8.  In 6.23.2.4 in 23.700-33 (step2),  2. The gNB decides to switch the U2N Remote UE to a target U2N Relay UE. The gNB selects a target U2N relay UE taken into the authorized PLMN list which is retrieved from AMF to select the target U2N relay UE.  It means that the source gNB should know the authorization information of target relay UE when path switching. |
| China Telecom | Depends on other WG |  |
| vivo | Not sure | Open for further discussion |
| CMCC |  | Waiting for SA2 progress. |
| LGE | Prefer to wait | Wait for SA2’s conclusion on this issue. |
| Huawei | Wait for SA2 |  |

# Conclusion, Recommendations [if needed]

[TBD]

# References

1. RP-221262, Revised WID on NR sidelink relay enhancements, RAN#96
2. TR 23.700-33, SA2
3. R3-224370, Discussion on UE authorization for U2U relay, ZTE
4. R3-224380, Authorization information for multi-path, Nokia, Nokia Shanghai Bell
5. R3-224551, SL relay: U2U relay, Huawei
6. R3-224600, Authorization for multi-path support and U2U relays, Qualcomm Incorporated
7. R3-224750, Discussion on authorization for UE-to-UE relay operation, LG Electronics
8. R3-224757, Authorization Enhancement to support Rel.18 Sidelink Relay, Samsung
9. R3-224904, Consideration on authorization for U2U relay, CMCC