**3GPP TSG-RAN WG2 Meeting #112 electronic *R2-2009122(Part 3/3)***

**Online, November 2 - 13, 2020**

Agenda Item: 8.7.3.1

Source: MediaTek Inc. (Email Discussion Rapporteur)

**Title: Final Summary and proposals based on the email discussion**

**[Post111-e][627][Relay] Remaining issues on L2 architecture**

Document for: Discussion and decision

# Introduction

This document is to summarize the following email discussion based on both phase 1 discussion and phase 2 discussion:

* [Post111-e][627][Relay] Remaining issues on L2 architecture (MediaTek)

Scope: Discuss the remaining issues from [AT111-e][605], including the functionality of the adaptation layer and control plane procedures.

Intended outcome: Summary to next meeting

Deadline: Long

# Rapporteur’s summary and Proposal

## Uu Adaptation layer for L2 UE-to-Network Relay

**Rapporteur summary-1: All companies joining the email discussion agree that the Uu adaptation layer at Relay UE supports UL bearer mapping between ingress PC5 RLC channels for relaying and egress Uu RLC channels over the Relay UE Uu path. Then this description can be put into an easy proposal and a TP describing L2 UE-to-NW relay.**

**Proposal-1: [Easy] agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **For L2 UE-to-NW relay, the Uu adaptation layer at Relay UE supports UL bearer mapping between ingress PC5 RLC channels for relaying and egress Uu RLC channels over the Relay UE Uu path.**

**Rapporteur summary-2: All companies joining the email discussion agree that the different traffics of the same Remote UE and/or different Remote UEs can be subject to N:1 mapping and data multiplexing over Uu RLC channel. Then this description can be put into an easy proposal and a TP describing L2 UE-to-NW relay. Some companies further indicated that the exact mapping is up to network configuration, which can be considered during normative phase.**

**[Phase 2]The wording “traffics” is replaced with “RBs” based on phase 2 discussion.**

**Proposal-2: [Easy] agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **The different RBs of the same Remote UE and/or different Remote UEs can be subject to N:1 mapping and data multiplexing over Uu RLC channel**

**Rapporteur summary-3: All companies joining the email discussion agree that Uu adaptation layer is used to support Remote UE identification for the UL traffic (multiplexing the data coming from multiple Remote UE). Then this description can be put into an easy proposal and a TP describing L2 UE-to-NW relay.**

**Proposal-3: [Easy] agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**For L2 UE-to-NW relay, Uu adaptation layer is used to support Remote UE identification for the UL traffic (multiplexing the data coming from multiple Remote UE).**

**Rapporteur summary-4: Clear majority companies (19/20) joining the email discussion agree that the identity information of Remote UE Uu Radio Bearer needs be put into the Uu adaptation layer by Relay UE at UL in order for the gNB to correlate the received data packets with the specific PDCP entity associated with the right Remote UE Uu Radio Bearer. However, there is a little bit confusion for some companies to read the wording “by Relay UE”. Then the description with removal of “by Relay UE” can be put into a proposal and a TP describing L2 UE-to-NW relay.**

**[Phase 2]P4 is merged into P5 according to phase 2 discussion.**

* **Proposal-4: void**

**Rapporteur summary-5: Clear majority companies (19/20) joining the email discussion agree that the identity information of Remote UE Uu Radio Bearer and the identity information of Remote UE needs be put into the Uu adaptation layer by Relay UE at UL in order for gNB to correlate the received data packets for the specific PDCP entity associated with the right Remote UE Uu Radio Bearer of a particular Remote UE in case of multiple Remote UEs based relaying. However, there is a little bit confusion for some companies to read the wording “by Relay UE”. Meanwhile the rapporteur acknowledged that the answer of Q5 may be derived by the answer of Q3 and Q4. One thing to clarify is that Q3 talks about the principle of Uu adaptation layer but Q5 talks about the header design of Uu adaptation layer. Then the description with removal of “by Relay UE” can be put into a proposal and a TP describing L2 UE-to-NW relay.**

**[Phase 2]Phase 2 summary on P4/P5: P4/P5 are based on the same question formulated with two different cases, but the end discussion results are quite identical. So P4/P5 can be merged together to simplify the discussion (then the condition of P5 is removed). The rewording is needed based on multiple companies input, which is reflected in the final summary. The comments indicated that there is misalignment between the summary and actual proposals for P4 i.e. the description should be rephrased with removal of “by Relay UE”. Meanwhile, a number of companies replied that “by Relay UE” should be kept for P4/P5 in order to avoid any confusion (possible mean the support of PC5 adaptation layer). Rapporteur suggests to keep “by Relay UE” in the merged P4/P5.**

**Proposal-5 (merging P4): agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **The identity information of Remote UE Uu Radio Bearer and Remote UE is included in the Uu adaptation layer at UL in order for gNB to correlate the received data packets for the specific PDCP entity associated with the right Remote UE Uu Radio Bearer of a particular Remote UE.**

**Rapporteur summary-6: All companies joining the email discussion agree that the Uu adaptation layer can be used to support DL bearer mapping at gNB to map end-to-end Radio Bearer (SRB, DRB) of Remote UE into Uu RLC channel over Relay UE Uu path. Then this description can be put into an easy proposal and a TP describing L2 UE-to-NW relay. Some companies further discussed the need to support reflective RB mapping between DL and UL, which may be visited during normative phase.**

**Proposal-6: [Easy] agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **The Uu adaptation layer can be used to support DL bearer mapping at gNB to map end-to-end Radio Bearer (SRB, DRB) of Remote UE into Uu RLC channel over Relay UE Uu path**

**Rapporteur summary-7: Clear majority companies (19/20) joining the email discussion agree that the Uu adaptation layer can be used to support DL N:1 bearer mapping and data multiplexing between multiple end-to-end Radio Bearers (SRBs, DRBs) of a particular Remote UE and/or different UEs and one Uu RLC channel over the Relay UE Uu path. Then this description can be put into a proposal and a TP describing L2 UE-to-NW relay.**

**[Phase 2]P7 is reworded based on comments received from phase 2 discussion.**

**Proposal-7: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **The Uu adaptation layer can be used to support DL N:1 bearer mapping and data multiplexing between multiple end-to-end Radio Bearers (SRBs, DRBs) of a particular Remote UE and/or different Remote UEs and one Uu RLC channel over the Relay UE Uu path**

**Rapporteur summary-8: Clear majority companies (19/20) joining the email discussion agree that the Uu adaptation layer needs to support Remote UE identification for Downlink traffic which can be done as part of bearer mapping function or as a separate packet routing function. However, as there is a reply on the definition of packet routing function, in order to simplify the discussion, Rapporteur suggests to remove the terminology to host the function. Then the revised description can be put into a proposal and a TP describing L2 UE-to-NW relay.**

**Proposal-8: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **The Uu adaptation layer needs to support Remote UE identification for Downlink traffic**

**Rapporteur summary-9: Clear majority companies (19/20) joining the email discussion agree that the identity information of Remote UE Uu Radio Bearer needs be put into the Uu adaptation layer by gNB at DL in order for Relay UE to correlate the received data packets with the specific PC5 RLC channel associated with the right Remote UE Uu Radio Bearer. However, as there is a confusion during the reply on the needed Remote UE identity and the optionality of it. It should be noted that** **Q9 discusses the identity information of Remote UE Uu Radio Bearer and it does not necessarily mean Remote UE identity.** **Meanwhile, the optional presence of a particular IE can be discussed at normative phase.**

**[Phase 2]But P9 is merged into P10 according to phase 2 discussion.**

* **Proposal-9: void**

**Rapporteur summary-10: Clear majority companies (19/20) joining the email discussion agree that the identity information of Remote UE Uu Radio Bearer and the identity information of Remote UE needs be put into the Uu adaptation layer by gNB UE at DL in order for Relay UE to correlate the received data packets with the specific PC5 RLC channel associated with the right Remote UE Uu Radio Bearer for the particular Remote UE in case of multiple Remote UEs based relaying. Meanwhile the rapporteur acknowledged that the answer of Q10 may be derived by the answer of Q8 and Q9. One thing to clarify is that Q8 talks about the principle of Uu adaptation layer but Q10 talks about the header design of Uu adaptation layer. Then the description with some rewording as suggested by the reply can be put into a proposal and a TP describing L2 UE-to-NW relay.**

**[Phase 2]According to phase 2 discussion, P9/P10 are merged with rewording as below:**

**Proposal-10 (merging P9): agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **The identity information of Remote UE Uu Radio Bearer and the identity information of Remote UE needs be put into the Uu adaptation layer by gNB at DL in order for Relay UE to map the received data packets from Remote UE Uu Radio Bearer to its associated PC5 RLC channel.**

**Rapporteur summary-11: There is no majority view based on the answers to Q11. Some companies see the need to discuss RLF handling, flow control, etc. at Uu adaptation layer for L2 Relaying as supported by IAB during SI phase. Many companies suggest to discuss such details at WI stage but many other companies suggest to discuss the issues if needed at SI stage before WI stage. Some companies did not see the need to discuss additional functions at Rel-17 other than bearer mapping and Remote UE identification (i.e. one-hop routing).**

**[Phase 2]The comments received from some companies at phase 2 show concern on the proposal (the comments show preference to study the functionality at SI before the work at WI stage). Rapporteur understanding is that the discussion on additional functionality should be contribution driven. Meanwhile the agreement of this proposal cannot produce any TP to the TR. This proposal is reworded to resolve the concern and can be treated in low priority.**

**Proposal-11: Any additional functions other than bearer mapping and Remote UE identification for L2 UE-to-NW Relay can be discussed in contribution driven manner.**

## PC5 Adaptation layer for L2 UE-to-Network Relay

**Rapporteur summary-12: Based on the answers to Q12, there are many companies (10/20) that support the N:1 mapping by PC5 adaptation layer between Remote UE Uu Radio Bearer and PC5 RLC channel for relaying. Some companies (8/20) did not see the need. Two companies have no strong view. The key discussion is whether there is a LCID space bottleneck for RLC channel between Remote UE and Relay UE if always assuming 1:1 mapping between Remote UE Uu Radio Bearer and PC5 RLC channel. Rapporteur suggests to do online discussion for the issue:**

**Proposal-12: RAN2 discuss the support of N:1 mapping by PC5 adaptation layer between Remote UE Uu Radio Bearer and PC5 RLC channel for relaying for L2 UE-to-NW relay.**

**Rapporteur summary-13: Based on the answers to Q13, there is no clear majority (8 supports among 20 replies) on the support of traffic differentiation via PC5 adaptation layer between the non-relaying traffic and the relaying traffic for L2 UE-to-NW relay operation. Some companies (9/20) did not see the need. One company has no strong view. One company prefers to discuss PC5 adaptation layer first. One company suggests to send LS to SA2 to clarify whether relaying PC5-S connection is separate from normal PC5-S connection.**

**Proposal-13: RAN2 discuss the support of traffic differentiation via PC5 adaptation layer between the non-relaying traffic and the relaying traffic for L2 UE-to-NW relay operation.**

**Proposal-13a: RAN2 discuss the need to send LS to SA2 to clarify whether relaying PC5-S connection is separate from normal PC5-S connection.**

**Rapporteur summary-14: Based on the answers to Q14, The majority (13/19) did not see the need to discuss additional functions for PC5 Adaptation layer if supported other than bearer mapping, identification of remote UE, and traffic differentiation between the non-relaying traffic and the relaying traffic if supported. Meanwhile, 5 companies see the need.**

**[Phase 2]The phase 2 comment received suggest the aligned wording of P11/P14/P20/P24. In the final summary, the rewording of P14 is aligned with P11. This proposal is reworded to resolve the concern and can be treated in low priority.**

**Proposal-14: Any additional functions supported at PC5 Adaptation layer other than bearer mapping, identification of remote UE, and traffic differentiation between the non-relaying traffic and the relaying traffic (if supported) for L2 UE-to-NW relay operation can be discussed in contribution driven manner.**

## 2nd Hop PC5 Adaptation layer for L2 UE-to-UE Relay

**Rapporteur summary-15: All companies joining the email discussion agree that the second hop PC5 adaptation layer can be used to support bearer mapping between the ingress RLC channels over first PC5 hop and egress RLC channels over second PC5 hop at Relay UE. Then this description can be put into an easy proposal and a TP describing L2 UE-to-UE relay.**

**Proposal-15: [Easy] agree the following description for L2 UE-to-UE relay (also reflected by TP)**

* **For L2 UE-to-UE relay, the second hop PC5 adaptation layer can be used to support bearer mapping between the ingress RLC channels over first PC5 hop and egress RLC channels over second PC5 hop at Relay UE.**

**Rapporteur summary-16: Clear majority (18/20) companies joining the email discussion agree that the adaptation layer over second PC5 hop can be used to support N:1 bearer mapping and data multiplexing between multiple ingress PC5 RLC channels over first PC5 hop and one egress PC5 RLC channel over second PC5 hop. However, two companies raised the issue on the multiple transmitting Remote UEs scenario and suggests to liaison SA2. The issue was raised at last meeting but in Rapporteur understanding this is a RAN2 issue and the details should be resolved at WI stage. It is suggested to agree the following proposal:**

**Proposal-16: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

* **For L2 UE-to-UE relay, the adaptation layer over second PC5 hop can be used to support N:1 bearer mapping and data multiplexing between multiple ingress PC5 RLC channels over first PC5 hop and one egress PC5 RLC channel over second PC5 hop.**

**Rapporteur summary-17: Clear majority (18/20) companies joining the email discussion agree that the second hop PC5 adaptation layer needs to support Remote UE identification for relaying traffic, which can be done as part of bearer mapping function or a separate packet routing function. Meanwhile some companies suggests to remove the wording “which can be done as part of bearer mapping function or a separate packet routing function”. Two companies raised the issue on the multiple transmitting Remote UEs scenario and suggested to contact SA2, but in Rapporteur understanding this is a RAN2 issue and the details should be resolved at WI stage. It is suggested to agree the following proposal:**

**Proposal-17: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

* **For L2 UE-to-UE relay, the second hop PC5 adaptation layer needs to support Remote UE identification for relaying traffic.**

**Rapporteur summary-18: Clear majority (15/20) companies joining the email discussion agree that the identity information of Source Remote UE SL Radio Bearer needs be put into the second PC5 hop adaptation layer by Relay UE in order for Destination Remote UE to correlate the received data packets for the specific PDCP entity associated with the right end-to-end SL Radio Bearer. Among the comments within the reply, some companies suggest to remove “by Relay UE”, which did not change the mean of the sentence. Two companies did not see the need to discuss this details at SI. Two companies raised the issue on the multiple transmitting Remote UEs scenario and suggested to contact SA2. It is suggested to agree the following proposal.**

**[Phase 2]According to phase 2 discussion, P18/P19 are merged**

* **Proposal-18: void**

**Rapporteur summary-19: Majority (15/20) companies joining the email discussion agree that the identity information of Source Remote UE SL Radio Bearer and the identity information of Source Remote UE needs be put into the second PC5 hop adaptation layer by Relay UE in order for Destination Remote UE to correlate the received data packets for the specific PDCP entity associated with the right end-to-end SL Radio Bearer in case of multiple Source Remote UEs based relaying.**

**Meanwhile the rapporteur acknowledged that the answer of Q19 may be derived by the answer of Q17 and Q18. One thing to clarify is that Q17 talks about the principle of PC5 adaptation layer but Q19 talks about the header design of PC5 adaptation layer.**

**Among the comments within the reply, two companies did not see the need to discuss this details at SI. Two companies raised the issue on the multiple transmitting Remote UEs scenario and suggested to contact SA2.**

**[Phase 2]According to phase 2 discussion, P18/P19 are merged with rewording as below:**

**Proposal-19: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

* **The identity information of Source Remote UE end-to-end Radio Bearer and the identity information of Source Remote UE needs be put into the second PC5 hop adaptation layer by Relay UE in order for Destination Remote UE to correlate the received data packets for the specific PDCP entity associated with the right end-to-end SL Radio Bearer.**

**Rapporteur summary-20: According to the replies, the majority (16/20) companies see the need for second hop PC5 Adaptation layer to carry the Destination Remote UE identity. Some companies see the need to discuss RLF handling, flow control, etc. at second hop PC5 Adaptation layer for L2 Relaying as supported by IAB. Many companies suggest to discuss such details at WI stage but some companies suggest to discuss the issues if needed at SI stage before WI stage.**

**[Phase 2]During phase 2 discussion, there are some companies that prefer to formulate P20 as same as P11/14/P24. Rapporteur understanding is that the discussion on additional functionality should be contribution driven. Meanwhile the agreement of proposals (like P11/P14/P24) cannot produce any TP to the TR. Then a new proposal is introduced to resolve the concern and such proposal can be treated in low priority.**

**In addition, the discussion to carry Destination Remote UE identity over second hop PC5 Adaptation layer should be a different discussion. However, according to the comments received, the majority company see the need to carry Destination Remote UE identity over first hop PC5 Adaptation layer regardless of multi-hop case. Meanwhile, rapporteur assumes that source Remote UE ID and end-to-end RB ID should be put at the first hop PC5 Adaptation layer if first hop PC5 Adaptation layer is supported. Rapporteur suggests to make that proposal for the functionality of first hop PC5 Adaptation layer conditional to the agreement of the support first hop PC5 Adaptation layer.**

**Proposal-20: Any additional functions supported at second hop PC5 Adaptation layer for L2 UE-to-UE Relay can be discussed in contribution driven manner.**

**Proposal-20a: The source Remote UE identity, end-to-end RB identity, Destination Remote UE identity are carried by first hop PC5 Adaptation layer for L2 UE-to-UE Relay operation.(** **conditional to the agreement of the support of first hop PC5 Adaptation layer)**

## 1st Hop PC5 Adaptation layer for L2 UE-to-UE Relay

**Rapporteur summary-21: According to the replies, clear majority (19/20) companies see the need to support the N:1 mapping by first hop PC5 adaptation layer between Remote UE SL Radio Bearers and first hop PC5 RLC channels for relaying. However one company did not see the need. Then the following proposal is made:**

**Proposal-21: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

* **Support the N:1 mapping by first hop PC5 adaptation layer between Remote UE SL Radio Bearers and first hop PC5 RLC channels for relaying.**

**Rapporteur summary-22: According to the replies, clear majority (19/20) companies see the need to support the adaptation layer over first hop PC5 between Source Remote UE and Relay UE in order to identify the traffic destined to different Destination Remote UEs. However one company did not see the need. Then the following proposal is made:**

**Proposal-22: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

**Support the adaptation layer over first hop PC5 between Source Remote UE and Relay UE in order to identify the traffic destined to different Destination Remote UEs.**

**Rapporteur summary-23: Based on the answers to Q23, there is no majority (8 supports among 20 replies) on the support of traffic differentiation via first hop PC5 adaptation layer between the non-relaying traffic and the relaying traffic for L2 UE-to-UE relay operation. Half companies (10/20) did not see the need. One company has no strong view. One company suggests to send LS to SA2 to clarify whether relaying PC5-S connection is separate from normal PC5-S connection.**

**Proposal-23: RAN2 discuss the support of traffic differentiation via first hop PC5 adaptation layer between the non-relaying traffic and the relaying traffic for L2 UE-to-UE relay operation.**

**Rapporteur summary-24: Based on the answers to Q24, there is no clear majority (11/20) on any additional functionalities such, RLF, flow control, source UE identification, etc. Meanwhile, many companies prefers to discuss the issues at WI stage.**

**[Phase 2]In phase 2 discussion, there are some companies that prefer to formulate the proposals in a similar way for P11/14/P20/P24. The discussion on additional functionality should be contribution driven. Meanwhile the agreement of this proposal cannot produce any TP to the TR. Then the proposal is reworded to resolve the concern and can be treated in low priority.**

**Proposal-24: Any additional functions supported at first hop PC5 Adaptation layer for L2 UE-to-UE Relay can be discussed in contribution driven manner.**

## QoS handling for L2 Relay

**Rapporteur summary-25: According to the replies to Q25, all companies agree that 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 based UE to Network relaying. Then the following easy proposal is made:**

**Proposal-25 [Easy]: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **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 based UE to Network relaying.**

**Rapporteur summary-26: According to the replies to Q26, all companies agree with Alt2 i.e. QoS handling for L2 UE-to-UE Relay is subject to upper layer, e.g. solution 31 within TR23.752 studied by SA2. Meanwhile some companies thinks both Alt1 and Alt2 can work. Alt2 can be put into an easy proposal. Meanwhile, there is a discussion on whether RAN2 needs to discuss the RAN2 impacts of the end-to-end QoS splitting at Relay UE. Some companies see the need and some other companies see this as an SA2 issue or UE implementation issue.**

**Proposal-26 [Easy]: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

* **QoS handling for L2 UE-to-UE Relay is subject to upper layer, e.g. solution 31 within TR23.752 studied by SA2.**

## Connection Establishment for L2 UE-to-Network Relay

**Rapporteur summary-27: According to the replies to Q27, clear majority companies (19/20) replied yes or yes with comments. One company suggests to send LS to SA2 to check whether the legacy PC5-S connection setup procedure can be reused for relay connection setup. However according to the discussion, rapporteur’s understanding is that RAN2 can discuss the procedure from AS perspective for connection establishment. Among the comments received, there is a proposal to merge step 6 and step 7. But rapporteur’s understanding is that step 6 (preparing relaying channel for SRB2 message transmission) should occur ahead of step 7 (SRB2 message). Among the comments received, there is a proposal to remove the RRC states for both Remote UE and Relay UE, this can be reflected by the proposal below. There is also some additional wording comments which can also be reflected by the proposal below. There is suggestion to discuss the Uu transmission for RRCSetupRequest/RRCSetup message, which is discussed by Q28. FFS can be put as an editor note following step 2.**

**[Phase 2]There three issues raised during phase 2 discussion. At first, the companies suggest to merge step 6 and step 7 as indicated in phase 1 discussion. This will be fixed in the final summary. Secondly, there is a discussion on the need to keep the editor note for step 2. Rapporteur suggests to put a sentence at the end of the description for step 2 as suggested by Huawei: “The details for Relay UE to forward the RRCSetupRequest/RRCSetup message for Remote UE at this step can be discussed in WI phase”. Thirdly, according to the commend from Qualcomm and the discussion taken at RAN2 email reflector, in step 3 and step 6, the node to initiate the establishment of relaying RLC channel should be open (Remote UE and Relay UE). In addition, as a reply to Ericsson comment, the default L2 configuration means the PC5 L2 configuration to transmit SRB0. The message based diagram is not preferred as we just present a high-level conceptual procedure. As a reply to Phillips comment, the wording can be refined if needed when there is any related discussion concluded for discovery.**

**Proposal-27: agree the following description for connection establishment procedure of L2 UE-to-NW relay (also reflected by TP)**



Figure 1: Connection Establishment for L2 UE-to-NW relay

Step 1. The Remote and Relay UE perform discovery procedure, and establish PC5-RRC connection using the legacy Rel-16 procedure as a baseline.

Step 2. The Remote UE sends the first RRC message (i.e. RRCSetupRequest) for its connection establishment with gNB via the Relay UE, using a default L2 configuration on PC5. The gNB responds with an RRCSetup message to Remote UE. The RRCSetup delivery to the Remote UE uses the default configuration for L2 on PC5. If the relay UE had not started in RRC\_CONNECTED, it would need to do its own connection establishment as part of this step. The details for Relay UE to forward the RRCSetupRequest/RRCSetup message for Remote UE at this step can be discussed in WI phase.

Step 3. The gNB and Relay UE perform relaying channel setup procedure over Uu. According to the configuration from gNB, the Relay UE establishes an RLC channel for relaying of SRB1 towards the Remote UE over PC5. This step prepares the relaying channel for SRB1.

Step 4. Remote UE SRB1 message (e.g. an RRCSetupComplete message) is sent to the gNB via the Relay UE using SRB1 relaying channel over PC5. Then the Remote UE is RRC connected over Uu.

Step 5. The Remote UE and gNB establish security following legacy procedure and the security messages are forwarded through the Relay UE.

Step 6. The gNB sets up additional RLC channels between the gNB and Relay UE for traffic relaying. According to the configuration from gNB, the Relay UE sets up additional RLC channels between the Remote UE and Relay UE for traffic relaying. The gNB sends an RRCReconfiguration to the Remote UE via the Relay UE, to set up the relaying SRB2/DRBs. The Remote UE sends an RRCReconfigurationComplete to the gNB via the Relay UE as a response.

**Rapporteur summary-28: According to the replies to Q28, there is no majority support on the transmission of the first RRC message (i.e. RRCSetupRequest) via Uu adaptation layer. Among the comments, there is a question on what ‘always available’ means. ‘Always available’ means the first RRC message needs to be packed by Uu adaptation layer with a header. If Uu adaptation layer is not available for the first RRC message transmission, it will skip the Uu adaptation layer. In rapporteur understanding (as also indicted by some of the replies), there is a benefit to unify transmission of SRB0 and other SRBs and DRBs if the adaptation layer exists prior to the transmission of the first RRC message, which also means there should be common RLC channel(s) between Relay UE and gNB used to forward all first RRC message(s) for the Remote UE (s). Those common RLC channels can be default configuration or be configured by gNB in advance.**

**[Phase 2]There are comments received to suggest the discussion at WI stage as stage 3 issue. It should be in contribution driven manner. The proposal is reworded.**

**Proposal-28: The further discussion on the approach for the transmission of SRB0 message over Uu between Relay UE and gNB for L2 UE-to-NW Relay can be in contribution driven manner.**

## Connection Establishment for L2 UE-to-UE Relay

**Rapporteur summary-29: According to the replies to Q29, there is no majority support and there is some confusion on the wording and the steps. One clarification is that step1/2 serves to prepare the signaling connection over PC5 but the configuration of SLRB serves to configure the relaying channel for SL DRBs. One thing to note is that these steps are revised based on the steps described within solution 8 and solution 9 as captured within SA2 TR23.752. Rapporteur acknowledges that step 0/1/2 does not have explicit AS layer impact and then there is quite some room to improve the wording. Given the comments received, rapporteur suggests to further discuss the connection establishment procedure for L2 UE-to-UE Relay.**

**[Phase 2] Huawei provided a rewording proposal as “The solution 8 and solution 9 as captured within SA2 TR23.752 are considered as baseline for the connection establishment procedure for L2 UE-to-UE Relay. RAN2 can further discuss the details of RAN2 impact, if any.”** **This will be reflected by the following proposal.**

**Proposal-29: The solution 8 and solution 9 as captured within SA2 TR23.752 are considered as baseline for the connection establishment procedure for L2 UE-to-UE Relay. RAN2 can further discuss the details of RAN2 impact, if any.**

## System information delivery for Remote UE (UE-to-NW relay)

**Rapporteur summary-30: According to the replies to Q30, clear majority companies (19/20) replied yes or yes with comments. There is clear support to reword the sentence in the question with removal of both “essential” and “as required”. Then the wording “Relay UE can support the relaying of the system information to the Remote UE(s) and what system information can be relayed to Remote UEs can be discussed at normative phase” can be put into a proposal as below.**

**Proposal-30: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **Relay UE can support the relaying of the system information to the Remote UE(s) and what system information can be relayed to Remote UEs can be discussed at normative phase.**

**Rapporteur summary-31: According to the replies to Q30, majority companies (16/20) replied yes or yes with comments. About the exact signaling used by Relay UE to forward the received system information to Remote UEs via broadcast or groupcast, it can be is part of SL discovery message or separate SL broadcast/groupcast message, which can be further discussed later on.**

**[Phase 2] P31 is merged into P32.**

* **Proposal-31: void**

**Rapporteur summary-32: According to the replies to Q32, All companies agree that Relay UE can forward the system information to Remote UE via dedicated PC5-RRC signaling and the detailed mechanisms of PC5-RRC signaling design can be discussed in WI stage. With regard to the comments saying that Relay UE may decide to transmit SI via PC5 RRC without gNB involvement or Relay UE just perform transparent DL RRC message forwarding, which can be further discussed later on. Based on the comments received, rapporteur suggests the following easy proposal:**

**[Phase 2]The comments received to suggest the merge of P31 and P32 to cover all cast types for SI forward are reasonable. This will be reflected in the final summary. In addition, Qualcomm suggest to add the FFS “whether this is part of SL discovery message or separate SL broadcast/groupcast mechanism”. Rapporteur understanding is that such details can be discussed at WI stage.**

**Proposal-32 [Easy] [merging P31]: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **Relay UE can forward the system information to Remote UE via broadcast, groupcast, or dedicated PC5-RRC signalling. The detailed mechanisms of broadcast, groupcast (whether this is part of SL discovery message or separate SL broadcast/groupcast mechanism”) and PC5-RRC signalling design can be discussed in WI stage.**

**Rapporteur summary-33: According to the replies to Q33, majority companies (14/20) agree a/b/c/d on the principle of on-demand SI delivery for Remote UE. And there are clear majority companies (16/20) that agree a/b/c on the principle of on-demand SI delivery for Remote UE. There is also clear support to reword b) to decouple** **IDLE/INACTIVE and CONNECTED state. A likely rewording for b) can be: “Only Msg3 based on-demand SI request is supported for Remote UE during Idle or Inactive mode; For connected Remote UE, only on-demand SIB request (i.e. dedicatedSIBRequest) is supported as Rel-16”.**

**Proposal-33: agree the following on-demand SI delivery principles for Remote UE for L2 UE-to-NW relay (also reflected by TP)**

* **On-demand SI request is supported for Remote UE for all RRC states (Idle/Inactive/Connected state).**
* **Only Msg3 based on-demand SI request is supported for Remote UE during Idle or Inactive mode; For connected Remote UE, only on-demand SIB request (i.e. dedicatedSIBRequest) is supported as Rel-16.**
* **The legacy Uu RRC procedure is reused to support the Remote UE’s on-demand SI request.**
* **On-demand SI delivery is supported for the Remote UE(s) regardless of out-of-coverage or in-coverage,** **when connected with Relay UE.**

**Rapporteur summary-34: According to the replies to Q34, there is no majority support for the PC5-RRC message based SIB notification from Remote UE to the Relay UE. The supporting companies see the benefit to improve the SI delivery performance. There is a proposal to require Relay UE to forward all necessary broadcasted SIB by default, (i.e., RAN2 define a set of SIBs that needs to be forwarded by relay UE), which needs standard support. Based on the comments received, there are many supports to postpone the related discussion to WI phase.**

**Proposal-34: RAN2 further discuss PC5-RRC message based SIB notification from Remote UE to the Relay UE for L2 UE-to-NW Relay at WI phase.**

## Access Control for L2 UE-to-Network Relay

**Rapporteur summary-35: According to the replies to Q35, all companies replied yes or yes with comments. Among the comments, there is a proposal during the reply to study different UAC parameters to the relay UE and remote UE and to leave it as FFS. Rapporteur understanding is that this can be discussed later on or at WI phase.**

**Proposal-35 [Easy]: agree the following access control check principles for L2 UE-to-NW relay (also reflected by TP)**

* **The Relay UE may provide UAC parameters to Remote UE**
* **The access control check is performed at Remote UE using the parameters of the cell it intends to access.**
* **The UE-to-Network Relay UE does not perform access control check for the Remote UE's data.**

## Other issues

# **Rapporteur summary-36: According to the replies to Q36, there are not so many input. One reply suggests to discuss capability exchange and RRC state combination between Relay UE and Remote UE. One reply suggests to discuss registration update and RAN based notification area update. All these aspects can be potentially discussed at WI phase. As such, no proposal needs to be made.** Summary on the proposals for online treatment

It is proposed that the proposals are treated in the following order:

At first place, it is suggested to do block approval for the following green easy proposals (with all companies support).

Then, it is suggested to do block approval for the following yellow easy proposals (with 19/20 company’s support)

Thirdly, it is suggested to do block approval for the following blue proposals (based on clear majority view)

In the end, treat other proposals as low priority (without highlight).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P1 | P2 | P3 |  | P5 | P6 | P7 | P8 |  |
| P10 | P11 | P12 | P13/P13a | P14 | P15 | P16 | P17 |  |
| P19 | P20/P20a | P21 | P22 | P23 | P24 | P25 | P26 | P27 |
| P28 | P29 | P30 |  | P32 | P33 | P34 | P35 |  |

Green easy proposals

**Proposal-1: [Easy] agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**For L2 UE-to-NW relay, the Uu adaptation layer at Relay UE supports UL bearer mapping between ingress PC5 RLC channels for relaying and egress Uu RLC channels over the Relay UE Uu path.**

**Proposal-2: [Easy] agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**The different RBs of the same Remote UE and/or different Remote UEs can be subject to N:1 mapping and data multiplexing over Uu RLC channel**

**Proposal-3: [Easy] agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**For L2 UE-to-NW relay, Uu adaptation layer is used to support Remote UE identification for the UL traffic (multiplexing the data coming from multiple Remote UE).**

**Proposal-6: [Easy] agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**The Uu adaptation layer can be used to support DL bearer mapping at gNB to map end-to-end Radio Bearer (SRB, DRB) of Remote UE into Uu RLC channel over Relay UE Uu path**

**Proposal-15: [Easy] agree the following description for L2 UE-to-UE relay (also reflected by TP)**

**For L2 UE-to-UE relay, the second hop PC5 adaptation layer can be used to support bearer mapping between the ingress RLC channels over first PC5 hop and egress RLC channels over second PC5 hop at Relay UE.**

**Proposal-25 [Easy]: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**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 based UE to Network relaying.**

**Proposal-26 [Easy]: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

**QoS handling for L2 UE-to-UE Relay is subject to upper layer, e.g. solution 31 within TR23.752 studied by SA2.**

**Proposal-32 [Easy] [merging P31]: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**Relay UE can forward the system information to Remote UE via broadcast, groupcast, or dedicated PC5-RRC signalling. The detailed mechanisms of broadcast, groupcast (whether this is part of SL discovery message or separate SL broadcast/groupcast mechanism”) and PC5-RRC signalling design can be discussed in WI stage.**

**Proposal-35 [Easy]: agree the following access control check principles for L2 UE-to-NW relay (also reflected by TP)**

* **The Relay UE may provide UAC parameters to Remote UE**
* **The access control check is performed at Remote UE using the parameters of the cell it intends to access.**
* **The UE-to-Network Relay UE does not perform access control check for the Remote UE's data.**

Yellow easy proposals

**Proposal-5 (merging P4): agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**The identity information of Remote UE Uu Radio Bearer and Remote UE is included in the Uu adaptation layer at UL in order for gNB to correlate the received data packets for the specific PDCP entity associated with the right Remote UE Uu Radio Bearer of a particular Remote UE.**

**Proposal-7: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**The Uu adaptation layer can be used to support DL N:1 bearer mapping and data multiplexing between multiple end-to-end Radio Bearers (SRBs, DRBs) of a particular Remote UE and/or different Remote UEs and one Uu RLC channel over the Relay UE Uu path**

**Proposal-8: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**The Uu adaptation layer needs to support Remote UE identification for Downlink traffic**

**Proposal-10 (merging P9): agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**The identity information of Remote UE Uu Radio Bearer and the identity information of Remote UE needs be put into the Uu adaptation layer by gNB at DL in order for Relay UE to map the received data packets from Remote UE Uu Radio Bearer to its associated PC5 RLC channel.**

**Proposal-21: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

**Support the N:1 mapping by first hop PC5 adaptation layer between Remote UE SL Radio Bearers and first hop PC5 RLC channels for relaying.**

**Proposal-22: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

**Support the adaptation layer over first hop PC5 between Source Remote UE and Relay UE in order to identify the traffic destined to different Destination Remote UEs.**

**Proposal-27: agree the following description for connection establishment procedure of L2 UE-to-NW relay (also reflected by TP)**



Figure 1: Connection Establishment for L2 UE-to-NW relay

Step 1. The Remote and Relay UE perform discovery procedure, and establish PC5-RRC connection using the legacy Rel-16 procedure as a baseline.

Step 2. The Remote UE sends the first RRC message (i.e. RRCSetupRequest) for its connection establishment with gNB via the Relay UE, using a default L2 configuration on PC5. The gNB responds with an RRCSetup message to Remote UE. The RRCSetup delivery to the Remote UE uses the default configuration for L2 on PC5. If the relay UE had not started in RRC\_CONNECTED, it would need to do its own connection establishment as part of this step. The details for Relay UE to forward the RRCSetupRequest/RRCSetup message for Remote UE at this step can be discussed in WI phase.

Step 3. The gNB and Relay UE perform relaying channel setup procedure over Uu. According to the configuration from gNB, the Relay UE establishes an RLC channel for relaying of SRB1 towards the Remote UE over PC5. This step prepares the relaying channel for SRB1.

Step 4. Remote UE SRB1 message (e.g. an RRCSetupComplete message) is sent to the gNB via the Relay UE using SRB1 relaying channel over PC5. Then the Remote UE is RRC connected over Uu.

Step 5. The Remote UE and gNB establish security following legacy procedure and the security messages are forwarded through the Relay UE.

Step 6. The gNB sets up additional RLC channels between the gNB and Relay UE for traffic relaying. According to the configuration from gNB, the Relay UE sets up additional RLC channels between the Remote UE and Relay UE for traffic relaying. The gNB sends an RRCReconfiguration to the Remote UE via the Relay UE, to set up the relaying SRB2/DRBs. The Remote UE sends an RRCReconfigurationComplete to the gNB via the Relay UE as a response.

Blue proposals

**Proposal-16: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

**For L2 UE-to-UE relay, the adaptation layer over second PC5 hop can be used to support N:1 bearer mapping and data multiplexing between multiple ingress PC5 RLC channels over first PC5 hop and one egress PC5 RLC channel over second PC5 hop.**

**Proposal-17: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

**For L2 UE-to-UE relay, the second hop PC5 adaptation layer needs to support Remote UE identification for relaying traffic.**

**Proposal-19: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

**The identity information of Source Remote UE end-to-end Radio Bearer and the identity information of Source Remote UE needs be put into the second PC5 hop adaptation layer by Relay UE in order for Destination Remote UE to correlate the received data packets for the specific PDCP entity associated with the right end-to-end SL Radio Bearer.**

**Proposal-20a: The source Remote UE identity, end-to-end RB identity, Destination Remote UE identity are carried by first hop PC5 Adaptation layer for L2 UE-to-UE Relay operation.(** **conditional to the agreement of the support of first hop PC5 Adaptation layer)**

**Proposal-30: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

**Relay UE can support the relaying of the system information to the Remote UE(s) and what system information can be relayed to Remote UEs can be discussed at normative phase.**

**Proposal-33: agree the following on-demand SI delivery principles for Remote UE for L2 UE-to-NW relay (also reflected by TP)**

* **On-demand SI request is supported for Remote UE for all RRC states (Idle/Inactive/Connected state).**
* **Only Msg3 based on-demand SI request is supported for Remote UE during Idle or Inactive mode; For connected Remote UE, only on-demand SIB request (i.e. dedicatedSIBRequest) is supported as Rel-16.**
* **The legacy Uu RRC procedure is reused to support the Remote UE’s on-demand SI request.**
* **On-demand SI delivery is supported for the Remote UE(s) regardless of out-of-coverage or in-coverage,** **when connected with Relay UE.**

Other proposals:

**Proposal-11: Any additional functions other than bearer mapping and Remote UE identification for L2 UE-to-NW Relay can be discussed in contribution driven manner.**

**Proposal-12: RAN2 discuss the support of N:1 mapping by PC5 adaptation layer between Remote UE Uu Radio Bearer and PC5 RLC channel for relaying for L2 UE-to-NW relay.**

**Proposal-13: RAN2 discuss the support of traffic differentiation via PC5 adaptation layer between the non-relaying traffic and the relaying traffic for L2 UE-to-NW relay operation.**

**Proposal-13a: RAN2 discuss the need to send LS to SA2 to clarify whether relaying PC5-S connection is separate from normal PC5-S connection.**

**Proposal-14: Any additional functions supported at PC5 Adaptation layer other than bearer mapping, identification of remote UE, and traffic differentiation between the non-relaying traffic and the relaying traffic (if supported) for L2 UE-to-NW relay operation can be discussed in contribution driven manner.**

**Proposal-20: Any additional functions supported at second hop PC5 Adaptation layer for L2 UE-to-UE Relay can be discussed in contribution driven manner.**

**Proposal-23: RAN2 discuss the support of traffic differentiation via first hop PC5 adaptation layer between the non-relaying traffic and the relaying traffic for L2 UE-to-UE relay operation.**

**Proposal-24: Any additional functions supported at first hop PC5 Adaptation layer for L2 UE-to-UE Relay can be discussed in contribution driven manner.**

**Proposal-28: The further discussion on the approach for the transmission of SRB0 message over Uu between Relay UE and gNB for L2 UE-to-NW Relay can be in contribution driven manner.**

**Proposal-29: The solution 8 and solution 9 as captured within SA2 TR23.752 are considered as baseline for the connection establishment procedure for L2 UE-to-UE Relay. RAN2 can further discuss the details of RAN2 impact, if any.**

**Proposal-34: RAN2 further discuss PC5-RRC message based SIB notification from Remote UE to the Relay UE for L2 UE-to-NW Relay at WI phase.**

# References

[1] Phase 1, [Post111-e] [627] [Relay] Remaining issues on L2 architecture v21 (Rapp summary)

[2] Phase 2, [Post111-e] [627] [Relay] Remaining issues on L2 architecture v13 (Rapp summary)