**3GPP TSG-RAN WG2 Meeting #112 electronic *R2-200nnnn***

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

Agenda Item: 8.7.3.1

Source: MediaTek Inc. (Email Discussion Rapporteur)

**Title: Rapporteur summary and proposal 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 at phase 1:

* [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.**

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

* **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**

**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.**

**Proposal-4: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **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.**

**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.**

**Proposal-5: 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 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.**

**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.**

**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 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. Then the following proposal is made:**

**Proposal-9: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **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**

**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.**

**Proposal-10: 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 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 multiplexing data coming from multiple Remote UEs.**

**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). Then the following proposal is made:**

**Proposal-11: Any additional functions other than bearer mapping and Remote UE identification for L2 UE-to-NW Relay can be discussed at WI stage.**

## 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.**

**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. Rapporteur suggests to do online discussion for the issue:**

**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. Rapporteur suggests to do online discussion for the issue:**

**Proposal-14: No additional functions is supported at 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) for L2 UE-to-NW relay operation.**

## 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:**

**Proposal-18: agree the following description for L2 UE-to-UE relay (also reflected by TP)**

* **The identity information of Source Remote UE SL Radio Bearer needs be put into the second PC5 hop adaptation layer 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-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. It is suggested to agree the following proposal:**

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

* **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.**

**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. Then the following proposal is made:**

**Proposal-20: The Destination Remote UE identity is carried by second hop PC5 Adaptation layer for L2 UE-to-UE Relay.**

## 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. Rapporteur suggests to do online discussion for the issue:**

**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. Rapporteur suggests to do online discussion for the issue:**

**Proposal-24: RAN2 discusses the support of additional functionalities over first hop PC5 Adaptation layer at WI phase for L2 UE-to-UE relay operation.**

## 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.**

**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.

*Editor notes: it is FFS how Relay UE forward the RRCSetupRequest/RRCSetup message for Remote UE at this step.*

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. This step prepares the relaying channels for SRB2/DRBs.

Step 7. 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.**

**Proposal-28: RAN2 further discuss the approach for the transmission of SRB0 message over Uu between Relay UE and gNB for L2 UE-to-NW Relay.**

## 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.**

**Proposal-29: RAN2 further discuss the connection establishment procedure for L2 UE-to-UE Relay.**

## 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.**

**Proposal-31: agree the following description for L2 UE-to-NW relay (also reflected by TP)**

* **Relay UE can forward the received system information to Remote UEs via broadcast or groupcast.**

**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:**

**Proposal-32 [Easy]: 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 dedicated PC5-RRC signaling and the detailed mechanisms of PC5-RRC signaling 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-UE 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

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

Secondly, it is suggested to treat the following blue proposals (based on clear majority view)

Thirdly, treat other proposals (without highlight).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 |
| P10 | P11 | P12 | P13 | P14 | P15 | P16 | P17 | P18 |
| P19 | P20 | P21 | P22 | P23 | P24 | P25 | P26 | P27 |
| P28 | P29 | P30 | P31 | P32 | P33 | P34 | P35 |  |

# Company input to Phase 2 discussion

There may be issues on the Rapporteur’s summary and Proposals in previous sections, please show company’s comments at this section.

|  |  |
| --- | --- |
| Company | Comments on Rapporteur’s summary and Proposal |
| OPPO | P4: according to the comment by rapporteur “Then the description with removal of “by Relay UE” can be put into a proposal and a TP describing L2 UE-to-NW relay.”, just wonder if the proposal should be rephrased? i.e., .” 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.”  P5: for the “in case of multiple Remote UEs based relaying”, it sounds like a condition for putting the UE identify and bearer identity info into the adapation layer header – this kind of details on conditional header presence can be left to WI phase, so suggest to remove it for now for simplification.  P10: similar comment as for P5, for “in case of multiplexing data coming from multiple Remote UEs”  P12-13: given this issue being controversial, it is suggested to delay this to WI-phase.  P13a: according to our SA2 colleague, this issue is too detailed for SI-phase, i.e., more as an issue for WI-phase, and considering the limited time, it is not suggested to send out a LS to SA2.  P19: similar comment as for P5, for “in case of multiple source remote UEs based relaying”  P23-24: similar to P12-13, it is suggested to delay this to WI-phase.  P27: For step-2, it is suggested to leave the FFS part to WI-phase, instead of putting an editor note into the TR. For step-6/7, as commented during phase-1 by multiple companies , they are suggested to be merged (not quite follow the comment by rapporteur on “step 6 (preparing relaying channel for SRB2 message transmission) should occur ahead of step 7 (SRB2 message)”, our understanding was that the RRC Reconfiguration signalling on relaying channel would happen via SRB1?  P28: it is suggested to delay this to WI-phase. |
| Huawei | **Thanks for the great efforts from rapporteur.**  In general, for those “(19/20) majority proposal“, we believe we can also consider it as “easy” after pahse2 if no strong concern. For example, P4/5/7/8/9/10/21/22/27/30. It is up to the rapporteur.  **P4**: Typo? Based on rapporteur’s summary, “Then the description with removal of “by Relay UE” can be put into a proposal and a TP describing L2 UE-to-NW relay”, it seems the “by Relay UE” is better to be deleted.  **P10**: Typo? “… the Uu adaptation layer by gNB ~~UE~~ at DL in order for Relay UE to… ”.  **P12**: Minor wording comments. We may need to add “for L2 UE-to-Network Relay” at the end.  **P13a**:  We see no need of this proposal and the LS for now. We can decide that after we have some progress on P12 for the PC5 adaptation layer.  This is more like the discussion on whether we need to aggregate the non-relaying traffic and the relaying traffic into one PC5 RLC/LCID. We see this is not the essential issue to be decided in SI phase, which can be decided later in WI phase or SA2 has clear conclusion on the separation of PC5 link for non-relaying traffic and the relaying traffic. No need to push SA2 on a tiny issue.  We believe the key point on P12/13 is to decide the need of PC5 adaptation layer. We prefer to directly discuss this based on P12. If this can not be decided in SI phase, we think it is fine to leave it open to WI phase, because this only impact the optimization for the N:1 mapping in PC5 link, but not impact on the bearer mapping functionality itself.  **P14**: Fine with the proposal. But we’d better not to exclude everything. How about “No additional functions is essential to be discussed in SI phase at PC5 Adaptation layer (if supported) other than…”?  **P20**: We are fine with the destination ID in adaption layer. But, we are wondering if the main purpose is for relay UE and it should be at least included in the **1st hop.** We want to clarify the basic intention, other than the multi-hop case. In non-multi-hop case, 2nd hop is already the last hop. Is the destination ID used for differentiate the non-relaying traffic and the relaying traffic? Is it related to P22/23?  **P27**: We prefer not to leave the Editor Notes for such detailed issue. We can say “Details on relay UE forward the RRCSetupRequest/RRCSetup message for Remote UE at this step can be discussed in WI phase” by the end of step paragraph.  **P28**: We see this as stage3 details. Default configuration is always the baseline. We can leave it to WI phase (see our comments in P27).  **P29**: I guess the discussion point is from R2 perspective. But, we have the SA2 TR as baseline or principle anyway. We prefer to formulate the P29 as below:  “The solution 8 and solution 9 as captured within SA2 TR23.752 is considered as baseline for the connection establishment procedure for L2 UE-to-UE Relay. FFS: R2 to further discuss the details from R2 impact, if any.”  **P31**: Generally, but is the really intention as below “Relay UE can forward the received system information to Remote UEs via broadcast or groupcast or discovery procedure”.  **P34**: Typo. “for L2 UE-to-~~UE~~NW Relay at WI phase” |
| Qualcomm | **P4**:  We prefer to keep “**by relay UE**”. According to P12, it is still FFS whether to have adaptation layer over PC5 in L2 U2N relay. Then if “**by relay UE**” is removed, isn’t P4 conflicted with P12? We need to point that during phase 1, only 4 companies (OPPO, Ericsson, Huawei, Intel) proposed to remove “by relay UE” while all other companies didn’t see issue, and 7 companies (QC, Apple, ZTE, Xiaomi, Sony, vivo, Lenovo) disagreed to remove “by relay UE”.  If Rapporteur would like to keep “by relay UE”, we think P4 needs to add a FFS “FFS whether to support adaptation layer over PC5 in L2 U2N relay”.  **P5**:  Similar to P4, we prefer to keep “**by relay UE**”.  In addition, we suggest to replace “**in case of multiple Remote UEs based relaying**” to “**in case of multiplexing data coming from multiple Remote UEs**”, to align P10.  **P11/14/24:**  As far as we see, company input to Q11/Q14/Q24 is similar. Then we are quite confused why their summary proposals are different?  For all these 3 questions, we don’t see majority view to support new function in this phase 1 but current P11/P24 seems to imply there may be new function to be supported in WI phase without SI discussion. We don’t think it is a good work procedure. As suggestion, we prefer to conclude the functionality in SI phase. If one function is not agreed by majority, it should be precluded in SI. In all, we suggest to align the tone of P11/P24 to P14 based on what we observed on company input. But we are open to discuss online in upcoming RAN2 meeting.  **P13a:**  We are fine to ask SA2 although we think RAN2 can decide P13 by ourself.  **P27:**  Same 2 comments as OPPO (editor note of step2 and step6/7)  **P31:**  We think we need to add a FFS: “FFS whether this is part of SL discovery message or separate SL broadcast/groupcast mechanism”. The point is whether we need to introduce a new PC5 physical channel to support broadcast/groupcast System information (if it is NOT part of discovery procedure)  Proposal-31: agree the following description for L2 UE-to-NW relay (also reflected by TP)   * Relay UE can forward the received system information to Remote UEs via broadcast or groupcast. “FFS whether this is part of SL discovery message or separate SL broadcast/groupcast mechanism”   We are fine with other summary proposals. Really appreciate Rapporteur’s hard work! |
| vivo | **P4**: Same comments as above.  **P5**: We think P5 is not needed. We noticed that rapporteur explained that Q3 talks about the principle of Uu adaptation layer but Q5 talks about the header design of Uu adaptation layer, however the implication behind them are similar. P5 can be easily derived if P3 and P4 are agreed.  **P10**: Similar comments as for P5. P10 is not needed as P10 can be easily derived if P8 and P9 are agreed.  **P12**: The sentence is not clear that it talks about the PC5 adaptation layer **for L2 UE-to-Network Relay.**  **P13**: Delete some words and focus on the use case support first, i.e., “**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.”**  **P16**: As we replied in the email, it may indicate some higher layer impact which needs to be considered by SA2. In case RAN2 agrees on P 16, we suggest to send LS to SA2 to ask SA2 on its feasibility.  **P17/18**: Similar comments as **P16**. We suggest to consult SA2 on this issue, if P17/18 are also agreeable.  **P20**: There is a need to clarity if the destination ID in adaption layer is only for extension to the multi-hop scenario.  **P23**: See comments on **P13**, we suggest to discuss together with **P13**.  **P31**: We suggest to add “FFS via unicast” to avoid confusion that unicast has already been excluded. |
| Xiaomi | P4, P5: we also want to keep ‘by relay UE’ to avoid the ambiguity of adaptation layer over PC5.  P20: We are not clear the necessity of destination UE information in single hop relay. Lower layer can already differentiate destination UE by layer 1 layer 2 sidelink destination ID.  P31: This proposal seems to exclude the possibility of SI delivery by unicast. But P32 clearly indicates SI delivery by dedicated PC5-RRC signaling, which is unicast. These two proposals seems to be contradictory. To align with P32, unicast should also be supported. |
| Ericsson (Min) | P1: To be clearer, it is the mapping between “Uu RBs of remote UEs” and “Uu RLC channel”, right? PC5 RLC channel is invisible to the adaptation layer at the relay UE. So, in the header, it is UU RB ID included in the adaptation layer header.  P2: to be clearer, it is “RBs from the same or different remote UEs” are mapped onto the same Uu RLC channel. “traffic” is not countable.  P3: to improve the wording, better to say ”used to indicate data sources” instead of ”remote UE identification”  P4 and P5: to improve the wording, better to say “remote UE and RB identity is included in ”  P7: important to make it clearer to avoid to map DRBs and SRBs onto the same RLC channel.  P8: to improve the wording, better to say ”needs to indicate data sources” instead of ”remote UE identification”  P9: better to use the wording ”in order for relay UE to map packets from a remote UE RB to specific PC5 RLC channel”  P10: “by gNB UE” -🡪 “by gNB”, better to use the wording ”in order for relay UE to map packets from a remote UE RB to specific PC5 RLC channel”  P11: disagree, we think at least RAN2 needs to study how to protect UE ID in the adaptation layer during the SI phase. As we suggested in the phase 1, RAN2 can send a LS to SA3 to confirm this issue.  P14: suggest to reformulate the proposal to “RAN2 discusses whether additional functions are needed …..”  P15: to be more clearer, the mapping is between E2E RBs and egress RLC channels. In the TP, it is very important to use correct wording to avoid confusion.  P16: to be more clearer, the mapping is between E2E RBs and egress RLC channels. In the TP, it is very mportant to use correct wording to avoid confusion.  P18: to be more clearer, it is “source E2E RB ID” that needs to be included in the adaptation layer header on the second hop.  P19: same comments as for P18.  P20: in addition, suggest to add one proposal, capturing that “RAN2 discuss whether additional functions need to be discussed during SI phase, such as how to protect UE ID”  P24: disagree, the proposal should be reformulated as “RAN2 discuss whether additional functionalities over first hop PC5 adaptation layer is needed during SI phase.”  P26: suggest to reformulate the proposal that, “RAN2 further discusses whether RAN2 should study how to split E2E QoS by relay UE”  P27: in step 2, suggest to clarify “what is the default L2 configuration? SRB0 or what?”, in addition, we prefer to update the figure to represent a flow diagram to show how messages are exchanged in sequential order.  P35: add FFS “whether different UAC parameters needed for remote UE and relay UE is FFS”. This FFS needs to be captured in the TR.  For summary-36, RRC state and UE capability is important to be studied during SI phase. Suggest to add a proposal, P36  **P36 RAN2 further discusses whether UE capability and RRC state issues need to be studied during SI phase.** |
| Philips | P1: we have the same understanding as Ericsson  P2: agree with Ericsson, beyond the lexical issue with “traffic” we believe that RBs is the right term  P4: we suggest to remove “by relay UE” and leave it open for now until WI phase. By then we will know if adaptation layer will be used in PC5. If not present, the relay UE will have to add it but we can specify it during WI phase.  P5: we agree with the proposal as is, that is, without “by relay UE”. We agree with Qualcomm 2nd proposal for P5 to align with P10  P11: we do not agree with the rapporteur. We agree with Qualcomm that at least we should discuss which additional functionality we want to include, details can be discussed during WI phase, but at least we should agree on the additional features. In view of this, we ask the rapporteur to break down the additional features suggested by the companies during phase 1 into individual questions so that companies can agree or disagree. For example, we would like to include the relation of buffer status of remote UE and relay UE (already suggested by Ericsson during phase 1) and a couple of others  P14: we do not understand why rapporteur wants to discuss P14 online but not P11, same approach should be follow for both. In any case we believe that breaking down the extra features suggested by the companies into individual companies (as suggested in our previous comment) can really save time during the online discussion  P15/P16/P18: agree with Ericsson  P19: agree with Ericsson. In addition, to be consistent with P18, P4 and P5, we suggest to remove “by relay UE”. See our comment on P4  P20: same as P11  P24: same as P11  P27: agree with Ericsson. In addition we think that we should add an editor note in step 1 stating that some details may need to be changed depending on the outcome of the discovery discussions  P31: agree with Qualcomm |
| Qualcomm2 | We have one more comment on **P27 on step 2, 3 and 6:**  In description of step 3/6, it states that **only Relay UE** is receiving configuration for relaying PC5 RLC channel and configuring the Remote UE. However, we think we should not preclude the case that **remote UE can also** configure relaying PC5 RLC CH based on configuration from gNB. The 2 key points are:   1. it should be gNB (instead of relay) to configure which PC5 RLC channel(s) used for relaying. And the configuration should be sent to remote UE, which should be clarified. 2. Relay may not know whether remote UE has successfully received the configuration from gNB. Thus, we think that it is also possible for remote UE to initiate the PC5 RLC channel establishment for relaying in step 3/6.   Based on above justifications, we would like to change description on step 3 and 6 of P27, as follows:  “ Step 3. The gNB and Relay UE perform relaying channel setup procedure over Uu. According to the configuration from gNB, the Relay UE or remote UE establishes an RLC channel for relaying of SRB1 towards the Remote UE over PC5. This step prepares the relaying channel for SRB1.  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 or remote UE sets up additional RLC channels between the Remote UE and Relay UE for traffic relaying. This step prepares the relaying channels for SRB2/DRBs.” |
| ZTE | Thanks for the rapporteur’s hard word.  **P4/P5:**  We think it is better to clarify the meaning of “by relay UE” at first. For our understanding, Q3 describes the function of remote UE identity and Q4 describes the the function of bearer identity. While for Q5, it describes what kinds of information should be included in Adapt layer for multiple remote UEs case, as the Rapporteur said, Q5 focuses on “header design of Uu adaptation layer”. Whatever, it is certain that the information of UE or bearer is included in the adaptation layer over Uu interface, and it does not matter where the identify info come from. In a word, the Uplink Uu adaptation header, it is always created by relay UE. Hence, from this point of view it is ok put “by relay UE”.  **P7:**  We friendly suggest to replace “different UEs” with “different Remote UEs”.  **P9/P10:**  Same reason for the answer of P4/P5. DL Uu adaptataion header is created by gNB, so put “by gNB” in the description for P9/P10, is it?  **P11/P14/P20/P24:**  As far as we see, these four proposals aim to discuss whether the additional functions for the four different adaptation layers (over Uu/PC5 for UE to NW and 1st/2nd PC5 for UE to UE ) are needed. We hold the opinion that “bearing mapping” is sufficient in R17. However, we are still open for the discussion.  Furthermore, P20 is not clear. According to our understanding, the destination UE id is needed to be included in intermediate hop PC5 adaptation layer for multiple-hop case. While for one-hop case, in fact, the destination UE id is not necessary.  **P27:**  For step 2, we need to address this issue since it is not clear when and how to establish the Uu BH bearer for forwarding the RRCSetupRequest/RRCSetup message for remote UE. It is better to keep the Note.  For step 6 and step 7 , we think they can be merged. Even though relaying channels have to be established at first in order to send RBs(DRB/SRB2), as for Reconfiguration message for relay UE (step6) and Reconfiguration message for remote UE(step7) , there is no strict logical or chronological requirements for gNB configuration.  **P33(c)/P34:**  In legacy Uu, gNB broadcasts the requested SI after receiving the msg 3 based on-demand SI request from RRC idle/inactive UE. However, for the (idle/inactive) Remote UE’s on-demand SI request, gNB can’t respond by unicast since the RRC connection hasn’t established for the remote UE. In addition, if gNB responds remote UE’s SI request by broadcasting concerned SI, relay UE can see the new SI transmitted but it won’t forward the received SI messages to remote UE since it isn’t aware of the remote UE’s on-demand SI request. Thus, it is needed for (idle/inactive) remote UE to notify its requested SIBs to the relay UE via PC5-RRC message, in order to trigger the relay UE to perform SIB forwarding.  We are fine with other summary proposals. |
| Nokia | First of all, we would like to thank the rapporteur for the good summary, and all the good comments from others.  As for the Huawei’s comments, we agree that the proposals with high majority (19/20) it would be beneficial to set these as a separate priority, higher than blue, and lower than green. In general, most of these relates to the question whether to send an LS to SA2, so a proposal for sending an LS to SA2 first would be even more beneficial. Based on the outcome of this, it should be easier to discuss the decision on the clear majority topics.  P12-14: before agreeing these, we should at least agree on whether to support the adaptation layer, which is a proposal that is missing. Alternatively, if the intention is to facilitate the discussion on whether to support the adaptation layer, we propose a rewording, such that all proposals here adds the needed “is supported”, as in the Q14. This way, it will be possible to see the extend of the 1st hop adaptation layer. Thereafter, we are missing a proposal to finalize the decision on the adaptation layer based on the agreed functionality. |
| Apple | Thanks for rapporteur’s hard work on this email summary.  For P4 and P5, I understand the discussion is formulated with two different questions, but the end results are quite identical. So it seems to me there is no need to have two proposals, P5 is the general case and shall be proposed. P4 is a special case by assuming a relay UE only serves one remote UE. There is no need for a proposal for this special case, in my view. If companies want to do optimization for the special case, this can be further discussed in WI stage.  For P18 and P19, I have the same view similar to P4/5. I think only P19 is needed.  For P20, Logically, the identification of destination remote UE is needed for the 1st hop of U2U relay, to include it in 2nd hop is just for forward-compatibility purpose. But it seems we do not have any proposals related to the information in 1st hop adaptation layer header, then this proposal is very confusing. |

# References

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