**3GPP TSG-RAN WG2 Meeting #115-e DRAFT R2-2108939**

**Electronic Meeting, August 9th – 27th 2021**

Agenda Item: 8.7.2.2

Source: MediaTek Inc. (Email Discussion Rapporteur)

**Title: DRAFT Email Report of [AT115-e][609][Relay] Service continuity procedures**

Document for: Discussion and decision

# Introduction

This document is to kick off the following email discussion:

* [AT115-e][609][Relay] Service continuity procedures (MediaTek)

 Scope: Progress the remaining proposals on service continuity with focus on the stage 2 procedures.

 Intended outcome: Report with TP for 38.300, in R2-2108939

 Deadline: Tuesday 2021-08-24 2000 UTC

This email discussion intends to discuss the remaining proposals of service continuity in both R2-2107710 and R2-2108196. The delegates are strongly recommended to read both R2-2107710 and R2-2108196 before providing your reply to the questions casted in this document, since the background information of the proposals as summarized within both R2-2107710 and R2-2108196 is not repeated in this document.

This email discussion intends to also discuss the stage 2 level description (TP for TS38.300 running CR) based on the available agreements made for service continuity with regard to L2 relaying.

# Issue list

## Confirmation of the Remaining proposals within R2-2107710

During the online discussion, proposals 4/5/7/17/19/20/26 were agreed as captured in chair notes. However the following easy proposals within R2-2107710 were not discussed during online session:

Order of steps in service continuity procedures (step numbers referring to Figure 4.5.4.1-1 of TR 38.836):

Proposal 15 (easy) (15/19): For indirect to direct path switch, RRC Reconfiguration message to Relay UE can be sent any time after step 3 based on gNB implementation, as in the Figure 4.5.4.1-1.

Proposal 16 (easy): For indirect to direct path switch, the timing of the PC5 unicast link release is up to UE implementation after step 3.

Proposal 18 (easy): For indirect to direct path switch, based on RRC Reconfiguration by gNB Remote UE and Relay UE can execute PC5 connection reconfiguration to release PC5 RLC for relaying and the timing of PC5 connection reconfiguration is up to UE implementation after step 3.

Proposal 22 (easy) (18/19): For indirect to direct path switch, step 8 can be executed in parallel or after step 5.

Proposal 28 (easy) (15/19): For direct to indirect path switch, the PC5 connection setup procedure is executed after step 3 if the connection has not been setup yet.

Data forwarding:

Proposal 21 (easy) (18/19): For indirect to direct path switch, Relay UE does not perform data forwarding back to gNB for Remote UE.

Message contents:

Proposal 25 (easy) (17/19): For indirect to direct path switch, the contents in RRC Reconfiguration message for Remote UE can be same as legacy NR RRC Reconfiguration with sync.

Proposal 30 (easy) (15/19): For direct to indirect path switch, additional indication from RRC\_CONNECTED Relay UE to gNB is not necessary to initiate Relay UE’s reconfiguration upon establishing unicast link with Remote UE.

Proposal 32 (easy) (18/19): For direct to indirect path switch, the contents in RRC Reconfiguration message for Relay UE can include at least Uu and PC5 RLC configuration for relaying, bearer mapping configuration.

### **Question 1(Proposal 15 within R2-2107710)**

Do you agree Proposal 15 within R2-2107710 as it is: for indirect to direct path switch, RRC Reconfiguration message to Relay UE can be sent any time after step 3 based on gNB implementation, as in the Figure 4.5.4.1-1?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes | We prefer to allow the following 2 gNB operations/implementation for flexibility:1. Step 6 is sent right after Step 3 (HO cmd).

*gNB intends to release relay UE’s resource for relaying after sending HO command. This operation has benefit to free up relay UE resources and reduce loading on the relay UE.* 1. Step 6 is sent right after Step 5 (reconfig complete).

*gNB intends to keep relay UE’s resource for relaying until HO complete. This operation has benefit in case of HO failure.* We don’t see clear benefit of one operation over another. Actually, benefit of 2) (i.e. fallback in HO failure) is marginal because RAN2 has agreed to introduce a default PC5 RLC configuration for RRC re-establishment (i.e. no need to rely on stored configuration in relay for re-establishment purpose).In all, we believe we should provide the flexibility to NW and no need to restrict in specification. |
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### **Question 2 (Proposal 16 within R2-2107710)**

Do you agree Proposal 16 within R2-2107710 as it is: for indirect to direct path switch, the timing of the PC5 unicast link release is up to UE implementation after step 3.

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes, but.. | We have two clarifications: 1. It is only for PC5 link release if no shared with non-relay link, i.e., it is not about releasing of PC5 RLC channel for relaying which is covered by other proposals (P18).
2. As clarified online, it can be initiated by either relay UE or remote UE based on UE implementation.

Thus, we prefer below wording change:for indirect to direct path switch, either relay UE or remote UE can initialize the PC5 unicast link release, and the timing ~~of the PC5 unicast link release~~ is up to UE implementation after step 3. |
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### **Question 3 (Proposal 18 within R2-2107710)**

Do you agree Proposal 18 within R2-2107710 as it is: for indirect to direct path switch, based on RRC Reconfiguration by gNB Remote UE and Relay UE can execute PC5 connection reconfiguration to release PC5 RLC for relaying and the timing of PC5 connection reconfiguration is up to UE implementation after step 3?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes, but | We think current wording is not crystal clear. Our understanding on this proposal is:* Timing of such reconfiguration of PC5 RLC for relaying is triggered by RRC reconfiguration from gNB (i.e. not UE implementation).
* Either remote UE or relay UE can initiate this procedure triggered by Reconfig message from gNB, as illustrated in below 2 cases:
	+ Case 1 (Remote UE): after reception of HO command (i.e. Step 3), remote UE sends RRCReconfigurationSidelink to relay UE for releasing PC5 link (as legacy PC5 connection reconfiguration procedure).
	+ Case 2 (Relay UE): after reception of RRCReconfiguraiton (i.e. Step6), relay UE sends RRCReconfigurationSidelink to remote UE for releasing PC5 link (as legacy PC5 connection reconfiguration procedure).

We tend to reuse PC5 RRC procedure / signaling as much as possible. Thus, we suggest below wording change:for indirect to direct path switch, ~~based on upon reception of RRC Reconfiguration by gNB~~, Remote UE ~~and Relay UE~~ can execute PC5 connection reconfiguration to release PC5 RLC for relaying upon reception of RRC Reconfiguration by gNB in Step 3, and Relay UE can execute PC5 connection reconfiguration to release PC5 RLC for relaying upon reception of RRC Reconfiguration by gNB in Step 6. ~~and the timing of PC5 connection reconfiguration is up to UE implementation after step 3~~?  |
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### **Question 4 (Proposal 22 within R2-2107710)**

Do you agree Proposal 22 within R2-2107710 as it is: for indirect to direct path switch, step 8 can be executed in parallel or after step 5.?

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| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes | It is same as legacy HO (i.e. data can be multiplexed with RRC reconfiguration complete) |
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### **Question 5 (Proposal 28 within R2-2107710)**

Do you agree Proposal 28 within R2-2107710 as it is: for direct to indirect path switch, the PC5 connection setup procedure is executed after step 3 if the connection has not been setup yet?

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| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes, but | This proposal is only for the case when unicast PC5 link is not established. When unicast PC5 link is already existing, this step is still needed to reconfigure PC5 RLC channel for relaying according to gNB configuration. Thus, we propose below wording change:for direct to indirect path switch, the PC5 connection setup procedure is executed after step 3 if the connection has not been setup yet; If existing PC5 link is reused for relaying, PC5 RLC channel for relay is reconfigured according to configuration from gNB. |
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### **Question 6 (Proposal 21 within R2-2107710)**

Do you agree Proposal 21 within R2-2107710 as it is: for indirect to direct path switch, Relay UE does not perform data forwarding back to gNB for Remote UE?

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| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes | RAN2 has agreed “the DL/UL lossless delivery during the path switch is done according to the PDCP status report”. In our understanding, this agreement has precluded the solution that relay UE performs data forwarding back to gNB for remote UE. |
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### **Question 7 (Proposal 25 within R2-2107710)**

Do you agree Proposal 25 within R2-2107710 as it is: for indirect to direct path switch, the contents in RRC Reconfiguration message for Remote UE can be same as legacy NR RRC Reconfiguration with sync?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
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### **Question 8 (Proposal 30 within R2-2107710)**

Do you agree Proposal 30 within R2-2107710 as it is: for direct to indirect path switch, additional indication from RRC\_CONNECTED Relay UE to gNB is not necessary to initiate Relay UE’s reconfiguration upon establishing unicast link with Remote UE?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes | We don’t fully understand why this indication is needed. When to send Relaying configuration to relay UE is gNB decision as part of HO preparation, which doesn’t need relay to trigger. |
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### **Question 9 (Proposal 32 within R2-2107710)**

Do you agree Proposal 32 within R2-2107710 as it is: for direct to indirect path switch, the contents in RRC Reconfiguration message for Relay UE can include at least Uu and PC5 RLC configuration for relaying, bearer mapping configuration?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
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## Discussion of the Remaining proposals within R2-2108196

During the online discussion, proposals 2/13 were agreed as captured in chair notes. However the following proposals within R2-2108196 were not discussed during online session:

Measurements:

Proposal 1 RAN2 to discuss whether S-measure criteria shall be used by the Remote UE.

Proposal 3 RAN2 to discuss whether the SL measurement quantity should be SL-RSRP for the case of path switch from indirect to direct path.

Proposal 4 RAN2 to discuss whether the SL measurement quantity should be SD-RSRP for the case of path switch from direct to indirect path.

Proposal 5 RAN2 to discuss if the Relay UE ID that is included in the measurement report is the Source L2 ID.

Proposal 6 RAN2 to discuss whether the Relay UE can be configured with measurements towards one particular Remote UE for purposes of path switch of that Remote UE.

RRC\_IDLE or RRC\_INACTIVE relay UE:

Proposal 7 RAN2 to discuss whether a Relay UE in RRC\_INACTIVE state can be selected by the gNB during path switch from direct to indirect link.

Proposal 8 RAN2 to discuss whether a Relay UE in RRC\_IDLE state can be selected by the gNB during path switch from direct to indirect link.

Proposal 9 RAN2 to discuss how a Relay UE in RRC\_INACTIVE/RRC\_IDLE transits to RRC\_CONNECTED upon path switch (e.g., via indication coming from the gNB or Remote UE).

T304 alike timer:

Proposal 10 RAN2 to discuss on whether the legacy T304 can be reused for the path switch procedure.

Proposal 11 RAN2 to discuss the need of new timer(s) other than T304 for the path switch procedure and if yes, whether more than one new timer is needed (i.e., one for the direct to indirect path switch and another one for the indirect to direct path switch).

Contents of reconfiguration:

Proposal 12 RAN2 to discuss if the Relay UE ID included in RRC reconfiguration is C-RNTI and whether the Remote UE ID needs to be included in the RRC reconfiguration complete message.

### **Question 10 (Proposal 1 within R2-2108196)**

Do you agree that S-measure criteria shall be used by the Remote UE?

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| Company | Yes/No | Comments |
| MediaTek | No | We think that even though the PC5 link quality between relay UE and remote UE is good enough, it can not guarantee that the PC5 link quality is better than Uu.  |
| Qualcomm | No | First, Remote UE may have one chipset for sidelink and another for Uu. In this case, measurement on PC5 and Uu can be in parallel. Thus, S-measure is not necessary in this case.Second, S-measure is never deployed although in spec for a long time  |
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### **Question 11 (Proposal 3 within R2-2108196)**

Do you agree that the SL measurement quantity should be SL-RSRP for the case of path switch from indirect to direct path?

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| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
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### **Question 12 (Proposal 4 within R2-2108196)**

Do you agree that the SL measurement quantity should be SD-RSRP for the case of path switch from direct to indirect path?

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| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
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### **Question 13 (Proposal 5 within R2-2108196)**

Do you agree that the Relay UE ID that is included in the measurement report is the Source L2 ID?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes | Relay UE’s source L2 ID is included in discovery message. It is straight forward to use it as relay UE identifier in measurement report. In addition, we think relay UE needs to send it to gNB in SUI so that gNB can get the mapping between relay’s C-RNTI and L2 source ID.Another solution is to use C-RNTI of relay UE. However, it implies relay needs to broadcast its C-RNTI in discovery. It is not necessary because its source L2 ID is already included in discovery message. And remote UE should not need to know C-RNTI of relay which is only used by gNB according to C-RNTI’s definition. |
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### **Question 14 (Proposal 6 within R2-2108196)**

Do you agree that the Relay UE can be configured with measurements towards one particular Remote UE for purposes of path switch of that Remote UE?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | No | Legacy measurement configuration for remote UE is sufficient. The benefit of this proposal is not clear to us. |
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### **Question 15 (Proposal 7 within R2-2108196)**

Do you agree that a Relay UE in RRC\_INACTIVE state can be selected by the gNB during path switch from direct to indirect link?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | No | We should focus on RRC\_ Connected Relay UE for path switch at this release due to work load.  |
| Qualcomm | Yes | 1. gNB has UE context of relay UE in INACTIVE, so that it can prepare its HO command.
2. gNB keeps I-RNTI of relay, and can also get the mapping from relay’s L2 source ID to I-RNTI similar to CONNECTED state. Thus, gNB can identify relay UE based on measurement reporting from remote UE.
3. The INACTIVE relay UE transits to CONNECTED state after the remote UE connects to the relay UE (as part of HO procedures) and the remote UE context is fetched from gNB at that point.
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### **Question 16 (Proposal 8 within R2-2108196)**

Do you agree that a Relay UE in RRC\_IDLE state can be selected by the gNB during path switch from direct to indirect link?

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| Company | Yes/No | Comments |
| MediaTek | No | We should focus on RRC\_ Connected Relay UE for path switch at this release due to work load.  |
| Qualcomm | No | 1. gNB has no UE context of relay UE in IDLE, so that it can’t prepare its HO command.
2. In IDLE state, relay UE only has 5G-S-TMSI as UE ID. However, it is not known by gNB, and gNB can’t get a mapping from L2 source ID to IDLE UE IE
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### **Question 17 (Proposal 9 within R2-2108196)**

If your answers to Q15/Q16 are yes, companies are invited to describe how a Relay UE in RRC\_INACTIVE/RRC\_IDLE transits to RRC\_CONNECTED upon path switch (e.g., via indication coming from the gNB or Remote UE)?

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| Company |  | Comments |
| Qualcomm |  | For INACTIVE relay UE, we prefer it transits to CONNECTED state after reception of RRC reconfiguration complete message from remote UE, and the remote UE context is fetched from gNB at that point. |
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### **Question 18 (Proposal 10 within R2-2108196)**

Do you agree that the legacy T304 (or T304 alike timer) can be reused for the path switch procedure?

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| Company | Yes/No | Comments |
| MediaTek | Yes but | We see the benefit to have T304-alike timer to control the procedure of path switch as normal handover procedures for Path switch from indirect to direct, where is there is RA procedure.For path switch from direct to indirect, we may introduce a new timer since there is no RA procedure.  |
| Qualcomm | Yes for indirect to direct |  |
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### **Question 19 (Proposal 11-1 within R2-2108196)**

Do you agree the need of new timer(s) other than T304 for the path switch procedure?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes  | For path switch from direct to indirect, we may introduce a new timer since there is no RA procedure. |
| Qualcomm | See comments | For path switch from indirect to direct, we don’t see need for new timer. The legacy one is sufficient For path switch from direct to indirect, we think similar mechanism as T304 can be introduced, and only the stop condition needs spec change. The detailed spec change can be discussed in future meeting |
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### **Question 20 (Proposal 11-2 within R2-2108196)**

If your answer to Q18 is yes, do you think if more than one new timer is needed (i.e., one for the direct to indirect path switch and another one for the indirect to direct path switch)?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | No | we may introduce a new timer only for path switch from direct to indirect |
| Qualcomm | No | For path switch from indirect to direct, we don’t see need for new timer. The legacy one is sufficient For path switch from direct to indirect, we think similar mechanism as T304 can be introduced, and only the stop condition needs spec change (i.e. a timer is included in HO command as legacy and its starting condition is same as T304). The detailed spec change can be discussed in future meeting |
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### **Question 21 (Proposal 12-1 within R2-2108196)**

Do you agree that the Relay UE ID included in RRC reconfiguration is C-RNTI?

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| Company |  | Comments |
| MediaTek | No | We think the proposal itself is not clear. Actually within RRC reconfiguration, the reference contrition [8] discussed the necessity to put a Remote UE ID within the RRC reconfiguration message in order to help the Relay UE to know the destination of Remote UE, with the intention to proceed the subsequent indirect communication after the path switch for the Remote UE completes.Then in this case, we think this discussion may be related to the local Remote ID allocation discussion within email discussion [604].  |
| Qualcomm | No | In path switch from direct to indirect, the intention of including relay UE ID in RRC reconfiguration towards remote UE is for remote UE to establish unicast PC5 link. As we specified in Rel-16 V2X, the unicast PC5 link is identified by Source L2 ID and Destination L2 ID (i.e. not based on C-RNTI). We think it is important to keep this principle. Thus, we think relay’s UE L2 source ID can be included instead, and remote UE can find it via discovery message. If C-RNTI is included, gNB needs to provide the mapping from relay’s L2 source ID to C-RNTI to remote UE via another Uu RRC message, which is unnecessary spec change. |
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### **Question 22 (Proposal 12-2 within R2-2108196)**

Do you agree that the Remote UE ID needs to be included in the RRC reconfiguration complete message?

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| Company |  | Comments |
| MediaTek | Yes | We think that a local Remote UE ID may be included RRC reconfiguration complete message during path switch procedure. Meanwhile this discussion may be subject to the discussion at email discussion [604] for local Remote ID allocation. |
| Qualcomm | No | In path switch from direct to indirect, gNB can identify remote UE ID via the configured Uu RLC channel in Step 2. Thus, explicitly including remote UE ID is unnecessary.Of course, it is only applied to relay in CONNECTED state. For IDLE/INACTIVE, further discussion is needed (if RAN2 agree to support). |
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## Stage 2 level description of service continuity of L2 relaying

During the post-meeting discussion after RAN2#114e, there is a discussion on how to capture the procedures of service continuity into the running CR of Stage 2 TS 38.300 for SL relay. However, the procedures of service continuity was not captured into the endorsed running CR yet.

This section proposes to discuss the stage 2 level procedure text and signalling flow for the service continuity of L2 U2N Relay operation following the description in reference contribution [2]:

**Switching from *indirect* to direct path**

For service continuity of L2 U2N relay, the following procedure is used, in case of U2N Remote UE switching to direct Uu cell:

1. The existing measurement configuration and measurement report signalling procedures can be used with extension to evaluate both relay link measurement and Uu link measurement. The measurement results from U2N Remote UE are reported when configured reporting criteria is met. The SL relay measurement report shall include at least U2N Relay UE ID, serving cell ID, and SL-RSRP information.

2. The gNB performs admission control based on its implementation and decides to admit the Remote UE onto direct Uu path.

3. The gNB sends RRCReconfiguration message to the U2N Remote UE to provide the RRC reconfiguration. The U2N Remote UE stops UP and CP transmission via U2N Relay UE after reception of RRCReconfiguration message from the gNB.

4. The U2N Remote UE synchronizes with the gNB and performs Random Access. From this step, the U2N Remote UE transits to a normal UE.

5. The UE (i.e. previous U2N Remote UE) feedbacks the RRCReconfigurationComplete to the gNB via target path, using the target configuration provided in the RRCReconfiguration message.

6. The gNB sends RRCReconfiguration message to the U2N Relay UE to reconfigure the connection between the U2N Relay UE and the gNB.

7. The UE (i.e. previous U2N Remote UE) or the U2N Relay UE initiates the PC5 link release, if needed.

8. The data path is switched from indirect path to direct path between the UE (i.e. previous U2N Remote UE) and the gNB. The timing of step 8 is independent of step 6 and step 7.

### **Question 23**

Do you agree that the above listed steps describes the signaling flow for U2N Remote UE switching to direct Uu cell?

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| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
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*Figure 1: Procedure for U2N Remote UE switching to direct Uu cell*

### **Question 24**

Do you agree that Figure 1 can be reused as the signaling flow for U2N Remote UE switching to direct Uu cell?

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| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | See comments | It is better to refine this figure based on latest agreements, especially related to timing |
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**Switching from direct to indirect path**

For service continuity of L2 U2N Relay, the following procedure is used, in case of a UE switching to U2N Relay UE:

1. The UE (i.e. potential U2N Remote UE) reports one or multiple candidate U2N Relay UE(s), after it measures/discovers the candidate U2N Relay UE(s).

- The UE may filter the appropriate U2N Relay UE(s) according to Relay selection criteria before reporting. The measurement results from the UE are reported when the configured reporting criteria is met as legacy measurement report.

- The reporting can include at least U2N Relay UE ID, U2N Relay UE’ s serving cell ID, and SL-RSRP information.

2. The gNB decides to switch the UE (i.e. potential U2N Remote UE) to a target U2N Relay UE. Then the gNB may send an RRCReconfiguration message to the target U2N Relay UE.

3. The gNB sends the RRCReconfiguration message to the UE (i.e. potential U2N Remote UE). The contents in the RRCReconfiguration message can include at least U2N Relay UE ID, PC5 RLC configuration for relaying and the associated end-to-end Radio Bearer(s). The UE (i.e. potential U2N Remote UE) stops UP and CP transmission over Uu after reception of RRCReconfiguration message from the gNB.

4. The UE (i.e. potential U2N Remote UE) establishes PC5 connection with target U2N Relay UE, if the connection has not been setup yet.

5. The UE (i.e. potential U2N Remote UE) completes the path switch procedure by sending the RRCReconfigurationComplete message to the gNB via the Relay UE. From this step, the UE transits to a U2N Remote UE.

6. The data path is switched from direct path to indirect path between the U2N Remote UE and the gNB.

### **Question 25**

Do you agree that the above listed steps describes the signaling flow for U2N Remote UE switching to indirect Relay UE?

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| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
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*Figure 2: Procedure for U2N Remote UE switching to indirect Relay UE*

### **Question 26**

Do you agree that Figure 2 can be reused as the signaling flow for U2N Remote UE switching to indirect Relay UE?

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| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | See comments | It is better to refine this figure based on latest agreements, especially related to timing |
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## Other issues

There may be additional issues that need to be discussed to describe the service continuity of L2 relaying.

### **Question 27**

**Please give the explanation of any additional issues to describe the service continuity of L2 relaying.**

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| Company | Comments |
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# Rapporteur’s summary and Proposal

TBD

# References

1. [R2-2106991](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs//R2-2106991.zip), Service Continuity for L2 U2N Relay, CATT, RAN2#115, Electronic, August 2021

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