**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?

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Lenovo | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |

### **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.

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | No | In Wednesday meeting, following agreement was made.  For indirect to direct path switch, PC5 unicast link can be released after Remote UE and Relay UE receive RRC reconfiguration from gNB (if there are no non-relaying PC5 RLC channels on the same PC5 unicast link, i.e. dedicated relaying link). FFS details of inter-layer interaction.  According to above agreement, the PC5 unicast link release shall be done after Remote UE and Relay UE receive RRC reconfiguration from gNB, which corresponds to step 3 and step 6. |
| OPPO | Yes with comment | We agree it is up to **remote** UE implementation, as we commented about, the RRCReconfig for relay UE would be after step 3 at any time based on network implementation, in that case, we cannot ensure after step 3, relay UE can immediately get the RRCReconfig (i.e., step-6 may not be immediately after step 3) and initialize the PC5 unicast link release but anyway remote UE can be ensured.  And it is good to clarify it is for PC5-S.  So prefer the following wording  For indirect to direct path switch, the timing of the PC5**-S** unicast link release is up to UE implementation for remote UE after step 3, and for relay UE after step 6. |
| Lenovo | Yes with comments | We would like to point out one thing.  If we support P15 and P16, the relay UE will continue to transmit the DL data before the relay receives one of RRC Reconfiguration and PC5 S release request and after the remote UE receives RRC Reconfiguration. That means the remote UE will continue to receive the DL data from relay UE after the remote UE receives RRC Reconfiguration. |
| vivo | Yes, with comments | We assume that here the “UE implementation” means that after the PC5-S unicast link release procedure or PC5 RRC connection release *is triggered by step 3*, the *specific moment when* the Remote/Relay really executes the link/connection release afterward is up to UE implementation. The problem here is that no matter for PC5 RRC connection release or PC5-S unicast link release, the conditions/triggers on when to release are actually specified in the current RAN2/SA2 Spec:   * for the release of PC5 RRC connection, there are now the trigger conditions of “SL RLF” and “release indication from upper layers”; * for the release of PC5-S unicast link, there is an explicit PC5 unicast link procedure to be conducted.   That is, the current specs may not support the link/connection release completely based on UE implementation, i.e. the UE cannot arbitrarily release a unicast link/connection as long as it wants.  If the interpretation above is correct, suggested rewording would be as follows:  *When the PC5-S unicast link/PC5 RRC connection release is triggered after step-3, the timing of the PC5 unicast link release execution is up to UE implementation. FFS the trigger condition(s) of such PC5-S unicast link/PC5 RRC connection release.*  Technically speaking, it seems undesirable to introduce a completely UE-implementation-based link/connection release condition/trigger, even for the path switch cases. |
| Sharp | Yes with comments | We share the same view with Qualcomm that the PC5 link release could be initiated either by remote UE or relay UE.  The timing refers UE implementation. |

### **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?

|  |  |  |
| --- | --- | --- |
| 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~~? |
| Xiaomi | No with comments | The question is not clear to us. If it’s up to gNB’s RRC Reconfiguration, the timing is not up to UE implementation. Upon reception of RRC Reconfiguration indicating release PC5 RLC, remote/relay UE shall follow the control from gNB. UE should not suspend gNB’s configuration. |
| OPPO | Yes but | Same view as QC, we agree the Uu-RRC RRCReconfig for relay UE can be at any time based on network implementation, in that case, relay UE can release PC5 RLC bearer after receiving Uu-RRC RRCReconfig after step 3 (as commented by QC, the timing is not up to UE implementation), while for relay UE, it is after step-6. |
| Lenovo | yes |  |
| vivo | Yes, with comments | This is also related to the discussion on whether relaying/non-relaying shared PC5 RRC connection is allowed. In the case of relaying dedicated PC5 RRC connection, the link/connection will be released directly, so any related PC5 configurations can be directly released w/o the need to further execute “PC5 reconfiguration procedure” for bearer release.  For a shared PC5 RRC connection (if really supported), since the link/connection cannot be released directly, the PC5 connection reconfiguration procedure is needed for PC5 RLC bearer release, at least following the current procedure. But as our comments in Q2, there may still be some trigger conditions added for SL-DRB release, as in the current Spec SL-DRB release also needs specified trigger conditions, and here we assume the relevant proposal in the question means that after this procedure is triggered, the *specific moment when* the UE really executes the procedure is in a UE implementation way. |
| Sharp | Yes but | We share the same view with Qualcomm that the PC5 connection reconfiguration to release PC5 RLC for relaying could be initiated either by remote UE or relay UE.  The timing refers UE implementation, which should be after reception of RRC Reconfiguration by gNB. |

### **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.?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes | It is same as legacy HO (i.e. data can be multiplexed with RRC reconfiguration complete) |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Lenovo | yes |  |
| vivo | Yes | But it seems no specific Spec impact is needed. |
| Sharp | Yes |  |

### **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?

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | Yes |  |
| OPPO | See comment | During the online discussion, email discussion rapporteur clarifies that within this email discussion, relay-only PC5 unicast link would be discussed and leave FFS for the relay/non-relay shared link case. Thus, target this proposal, we are wondering when will the “if” condition happen if we just consider relay-only case. To make it clear, we suggest to delete the “if” condition and mark FFS for shared link between relay service and non-relay service. |
| Lenovo | See comments | After gNB determines to perform path switching towards the target relay and the corresponding PC5 connection has not been established yet, gNB can request remote UE to establish the PC5 link towards the target relay. |
| vivo | Yes | As previous comments, we may further look into the trigger conditions for PC5 RRC connection establishment in this case. Current Spec has only the trigger condition “if PC5 RRC connection establishment is request by upper layers (i.e. PC5-S unicast link has been established)” for PC5 RRC connection establishment. Since PC5-S unicast link anyway needs to be setup, perhaps the simplest way is to make AS indicate the upper layers of the path switch, and when PC5-S unicast link is established, PC5-RRC connection will be established accordingly as per the current Spec. |
| Sharp | Yes |  |

### **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?

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Lenovo | Yes | We have agreed that lossless can be ensured by PDCP layer. |
| vivo | Yes |  |
| Sharp | Yes |  |

### **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?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Xiaomi | Yes | Legacy message could be baseline. |
| OPPO | Yes |  |
| Lenovo | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |

### **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?

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Lenovo | Yes | Whether additional signalling for the path switch to Relay UE in RRC\_IDLE or RRC\_INACTIVE is needed or not can be discussed separately. |
| vivo | Yes |  |
| Sharp | Yes |  |

### **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?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Lenovo | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |

## 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?

|  |  |  |
| --- | --- | --- |
| 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 |
| Xiaomi | Yes | We see the benefit to reduce remote UE measurement by introducing S-measure for remote UE.  Relay UE is expected to locate at the cell edge. So if remote UE is close to relay UE, it’s more likely to be able to find the serving cell. Otherwise, remote UE may not be able to find the serving cell. Therefore, the sidelink signaling strength could be used to control intra-frequency measurement.  Regarding MTK’s question, we want to clarify the S-measure on sidelink is different to S-measure on Uu. If the sidelink RSRP between relay and remote UE is below certain value, remote UE could choose not to perform intra-frequency measurement on serving cell. |
| OPPO | No | It should be addressed that even the PC5 link quality between relay UE and remote UE is good enough, the link quality between relay UE and Uu cannot be ensured. Therefore, S-measure criteria may not be adaptable for the sidelink relay scenario. |
| Lenovo | Yes for direct to indirect case.  No for indirect to direct case | We need to discuss S-measure criteria based on the different cases. the legacy threshold of S-measure criteria is based on Uu channel. Therefore, it is easy to extend to direct to indirect case.  For indirect to direct case, the s-criteria is not needed. |
| vivo | No | We think this is an optimization. |
| Sharp | No | We share the same view with OPPO. |

### **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?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Xiaomi | Yes with comments | If SL-RSRP is available, the proposal works. However, it’s possible that SL-RSRP is not available in case of no data transmission from relay to remote. RAN2 should further discuss how to handle this case. |
| Lenovo | Yes |  |
| vivo | No, see comment | Now we are discussing measurement in RRC\_CONNECTED for path switch. In this circumstance, our view is that the SD-RSRP should always be measured, and whether SL-RSRP is measured is up to NW configuration.  Specifically, the SL-RSRP related meas and reporting config can be optionally provided, whereas the SD-RSRP related meas and reporting config may always be provided based on proper NW implementation. If the SL-RSRP related meas and reporting config is provided, the UE perform SL-RSRP measurement; otherwise, the UE doesn’t. |
| Sharp | Yes |  |

### **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?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Xiaomi | Yes |  |
| Lenovo | Yes |  |
| vivo | No, see comment | Now we are discussing measurement in RRC\_CONNECTED for path switch. In this circumstance, our view is that the SD-RSRP should always be measured, and whether SL-RSRP is measured is up to NW configuration.  Specifically, the SL-RSRP related meas and reporting config can be optionally provided, whereas the SD-RSRP related meas and reporting config may always be provided based on proper NW implementation. If the SL-RSRP related meas and reporting config is provided, the UE perform SL-RSRP measurement; otherwise, the UE doesn’t. |
| Sharp | Yes |  |

### **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?

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Lenovo | Yes |  |
| vivo | Yes |  |
| Sharp | Yes |  |

### **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?

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | No | The measurement result between relay and remote UE can already be reported by remote UE. |
| OPPO | No |  |
| Lenovo | No |  |
| vivo | No | Logically, remote UE should be responsible for measurements related to path switch. Relay UE assisted measurement looks like some forms of optimization. |
| Sharp | No |  |

### **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?

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | Yes | gNB is not aware of relay UE’s RRC state. Furthermore, RAN could page relay UE in order to trigger relay UE enter CONNECTED. The UE ID in paging message could be relay UE’s L2 source ID. |
| OPPO | Yes | As a matter of fact, relay UE would not be regarded as normal Uu UE since it does not have any particular traffic packets which needs to be transferred with network, in that case, network is not necessarily to know the relay UE’s context (even it can be known for RRC\_INACTIVE relay). Either remote UE or network trigger the relay to access into RRC\_CONNECTED can make it work. |
| Lenovo | No | It can work but Xn message is needed to assist gNB to identify relay state, which is complicated. It is better not to discuss it in this release. |
| vivo | No | RRC\_CONNECTED Relay UE first, please. |
| Sharp | No | We support remote UE could be switched to a relay UE without PC5 connection establishment between them. If such a relay UE is in RRC\_IDLE/INACTIVE state, extra delay could be an issue. |

### **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?

|  |  |  |
| --- | --- | --- |
| 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 |
| Xiaomi | Yes | gNB is not aware of relay UE’s RRC state. Furthermore, RAN could page relay UE in order to trigger relay UE enter CONNECTED. The UE ID in paging message could be relay UE’s L2 source ID. |
| OPPO | Yes | Same comment in Q15 |
| Lenovo | No | It can work but Xn message is needed to assist gNB to identify relay state, which is complicated. It is better not to discuss it in this release. |
| vivo | No | RRC\_CONNECTED Relay UE first, please. |
| Sharp | No | Same comment in Q15 |

### **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)?

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi |  | RAN could page relay UE in order to trigger relay UE enter CONNECTED. The UE ID in paging message could be relay UE’s L2 source ID |
| OPPO | We are open to both options |  |
|  |  |  |

### **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?

|  |  |  |
| --- | --- | --- |
| 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 |  |
| Xiaomi | Yes for indirect to direct |  |
| OPPO | Yes  Just for indirect to direct path switch |  |
| Lenovo | Yes for indirect->direct.  No for direct->indirect. | Legacy T304 is used to control the random access during handover. UE stops T304 when the UE completes random access. Therefore, legacy timer T304 can be reused in the path switching from indirect to direct since there is a random access in this path switching. But, for path switching from direct to indirect, there is no random access. A new timer could be needed for the path switching from direct to indirect. |
| vivo | Yes, with comment | For indirect-to-direct case, reusing T304 seems to have no problem.  For direct-to-indirect case, we may introduce a T304-like timer, with the failure handling following legacy Uu (i.e. reestablishment). As to the conditions on timer handling, e.g. when to start/stop/restart, we need to further discuss as what MTK commented above. |
| Sharp | Yes  Just for indirect to direct path switch |  |

### **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?

|  |  |  |
| --- | --- | --- |
| 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 |
| Xiaomi | Comments | Unlike Uu, the PC5 unicast connection establishment is out of gNB’s control. It’s not clear to us how gNB set the new timer. If it’s blindly configured, we prefer leave to UE implementation to determine the PC5 unicast connection establishment failure. |
| OPPO | Yes  Just for path switch from direct to indirect | Same comment as QC |
| Lenovo | Yes for direct->indirect.  No for indirect->direct. | See comments for Q18 |
| vivo | Comment | It can be a new timer not completely the same as, but mostly like, T304. |
| Sharp | Yes  Just for indirect to direct path switch |  |

### **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)?

|  |  |  |
| --- | --- | --- |
| 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 |
| Xiaomi | No |  |
| OPPO | No | As mentioned above, the legacy timer can be used for indirect to direct path switch. |
| Lenovo | No | See comments for Q18 |
| vivo | No | For indirect to direct case, our preference is to directly reuse T304, instead of a new one. |
| Sharp | No |  |

### **Question 21 (Proposal 12-1 within R2-2108196)**

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

|  |  |  |
| --- | --- | --- |
| 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. |
| Xiaomi | No | The question is not clear. We understand the question means whether relay UE’ C-RNTI is included in RRC reconfiguration to remote UE during direct to indirect path switch. We prefer to use L2 source ID. |
| OPPO | See comment | First of all, we do not think this proposal is clear.  Our view is that the need of relay UE ID is for direct to indirect path switch and the need of remote UE ID is for indirect to direct path switch. Thus it is reasonable to clarify the scenario in the proposal.  Then we do not think C-RNTI is needed as relay UE ID. In general, relay UE’s source ID can work for more cases since that is the one to be included in discovery message. |
| Lenovo | See comments | Not sure whether RRC reconfiguration is sent to remote UE? if yes, Relay UE ID included in RRC reconfiguration could be Layer 2 source ID. Then, remote UE can establish the PC5 connection towards the candidate relay UE based on the Layer 2 ID. |
| vivo | No | We think the L2 ID may be already sufficient in this release, although we can understand that the concern may be the less stability of L2 ID than C-RNTI. |
| Sharp | No | We share the same view with Xiaomi, and prefer to use L2 source ID |

### **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?

|  |  |  |
| --- | --- | --- |
| 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). |
| Xiaomi | Comments | The question is not clear. We understand the question means whether remote UE’s ID needs to be included in RRC reconfiguration complete during indirect to direct path switch.  We understand this question is related to who allocates the temporary remote UE ID. If it’s allocated by gNB, remote UE doesn’t need to report its ID, since gNB can identify the remote UE by temporary ID. If it’s allocated by relay UE, remote UE need to report is ID. |
| OPPO | No | It is not needed for all cases since for connected relay UE, gNB can tell which remote UE it is via adaptation layer header design already. |
| Lenovo | No | The intention could be that gNB can identify the remote UE when receiving the complete message. If RRC reconfiguration complete is contained in relay’s Uu RRC message, the remote UE ID can be added in the Uu relay RRC message. We prefer not to impact the legacy RRC reconfiguration complete. |
| vivo | No | Assume this is related to the direct to indirect switch as seen from proponent contributions. Then what Remote UE ID this question is actually referring to. Local remote UE ID? But can/need it be visible at the remote UE (so to be included in the complete message)? We think for Remote UE identification, it seems the local remote UE ID in Uu adaptation layer header is already enough. |
| Sharp | No | If it is indirect to direct path switch case, it could be done as legacy and there is no need to include the remote UE id.  If it is direct to indirect path switch case, remote UE ID could be indicated in the adaptation layer, and also there is no need to include the remote UE id. |

## 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?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Xiaomi | Yes with comments | In 1, it’s FFS whether SD-RSRP could be reported. |
| OPPO | Yes |  |
| Lenovo | Yes with comments | Relay UE continues to transmit DL data until receiving RRC reconfiguration from gNB or receiving PC5-s release request from remote UE. Therefore, it is possible for remote UE to continue to receive DL data buffered in relay UE in step 3. Therefore, FFS is needed for remote UE to continue to receive DL data buffered in relay UE after receiving RRC reconfiguration. |
| vivo | / | It seems a little bit earlier to review the TP word by word during the meeting, as there are likely agreements to be reached in this meeting and impacting above texts/below figures. Suggest to directly capture related procedural texts/figures in the post-meeting running CR email discussion, based on the agreements made in this meeting. |
| Sharp | Yes |  |



*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?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | See comments | It is better to refine this figure based on latest agreements, especially related to timing |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Lenovo | Yes |  |
| vivo | / | Like in Question 23. |
| Sharp | Yes |  |

**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?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Xiaomi | Comments | Regarding step 1,   1. Remote UE may filter appropriate U2N relay not only according to relay selection criteria, but also other configured criteria. For example, only the intra-gNB relay UE is reported, since only intra-gNB service continuity is supported in R17. 2. Report should include SD-RSRP, since the PC5 connection may not be established. |
| OPPO | Yes |  |
| Lenovo | Yes with comments | One FFs is needed: When to release source Uu link |
| vivo | / | Like in Question 23. |
| Sharp | Yes |  |



*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?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| MediaTek | Yes |  |
| Qualcomm | See comments | It is better to refine this figure based on latest agreements, especially related to timing |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Lenovo | Yes |  |
| vivo | / | Like in Question 23. |
| Sharp | Yes |  |

## 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.**

|  |  |
| --- | --- |
| Company | Comments |
|  |  |
|  |  |

# Rapporteur’s summary and Proposal

TBD

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