**3GPP TSG-RAN WG2 Meeting #114 e R2-21xxxxx**

**E-Meeting, 19th - 27th May 2021**

**Source: vivo (Rapporteur)**

**Title:****Summary on agenda item 8.7.4.1 on L2 relay control plane**

**Agenda Item:** **8.7.4.1**

**Document for:** **Discussion and Decision**

# Introduction

A Pre-meeting offline discussion was triggered as follows:

* [Pre114-e][604][Relay] Summary on agenda item 8.7.4.1 on L2 relay control plane (vivo)

The offline discussion was summarized in [1] with the following proposals

|  |
| --- |
| **[Easy]**  **Proposal 1： [Easy] RAN2 to confirm that the RRC state combination of Relay UE in RRC\_IDLE and Remote UE in RRC\_INACTIVE is supported.**  **Proposal 6： [Easy] The indication of Relay UE upon detecting Uu RLF may trigger the Remote UE connection re-establishment.**  **Proposal 7： [Easy] Remote UE may trigger the Remote UE connection re-establishment upon detecting PC5 RLF.**  **Proposal 10： [Easy] For IC case, Remote UE performs TAU/RNAU based on its own serving cell information (i.e., as legacy) if Remote UE is NOT PC5-connected with Relay** UE.  **Proposal 20： [Easy] When a Relay UE in RRC IDLE or RRC INACTVE, the Relay UE monitors paging occasions of its PC5-RRC connected Remote UEs.**  **[Cross WG]**  **Proposal 2： [Cross WG] RAN2 to decide firstly whether new or existing establishment/resume cause value is used for Relay UE when Relay UE enters RRC\_CONNECTED only for relaying purpose.**  **Proposal 3： [Cross WG] Send LS to SA2/CT1 to check their view on whether new or existing establishment/resume cause value is** used.  **Proposal 12： [Cross WG] In case of remote UE RRC resume, RAN2 to discuss when the Retrieve UE Context procedure is performed, the new gNB may retrieve both the** remote and relay UE context.  **Proposal 13： [Cross WG] If it is agreed that when the Retrieve UE Context procedure is performed, the new gNB may retrieve both the remote and relay UE context, RAN2 to send a Ls to RAN3 on whether UE Context has inter-gNB specification impact**  **Proposal 27： [Cross WG] Confirm the WA that Remote UE performs UAC based on legacy procedure independently.**  **Proposal 28： [Cross WG] RAN2 to discussion whether Relay UE should perform UAC or can skip UAC when it intends to access network only for the purpose of relaying but not for its own service.**  **Proposal 29： [Cross WG] Send a LS to SA2 to ask SA2 view on whether Relay UE should perform UAC or can skip UAC when it intends to access network only for the purpose of relaying but not for its own** service  **[For discussion]**  **Proposal 4： [For discussion] For the delivery of remote UE’s SRB0 RRC message, for the configuration of Uu RLC channel the following options can be considered**   * + - * + **Default configuration**         + **Specified (fixed) configuration**         + **Network configurable**   **Proposal 5： [For discussion] For the delivery of Remote UE’s SRB1 RRC message such as *RRCResume* and *RRCReestablishment* message as legacy SRB1:**   * + - Introduce default configuration of Uu RLC channel for relaying, which can be reconfigured to dedicated signalling by the Network     - Network configuration via dedicated signaling is used for the configuration of Uu RLC channel if available in Relay UE. Otherwise, default configuration is used   **Proposal 8： [For discussion] The Remote UE performs RRC re-establishment procedure as follows:**   * If a suitable cell is available, the Remote UE initiates RRC re-establishment procedure towards the suitable cell; * If a suitable relay is available, the Remote UE initiates RRC re-establishment procedure towards the suitable relay UE’s serving cell; * If both a suitable cell and a suitable relay are available, the remote UE can select either one to initiate RRC re-establishment procedure based on implementation.   **Proposal 9： [For discussion] For OOC case, RAN2 to discuss whether Remote UE should perform TAU/RNAU procedure.**  **Proposal 11： [For discussion] For IC case, Remote UE performs TAU/RNAU based on Relay UE’s serving cell information after Remote UE is PC5-connected with Relay UE.**  **Proposal 14： [For discussion] The serving gNB of the Relay UE allocates Remote UE ID to be used in adaptation layer. FFS details.**  **Proposal 15： [For discussion] Remote UE can receive the system information via PC5 before and after PC5 connection establishment with Relay UE.**  **Proposal 16： [For discussion] RAN2 to decide whether minimum SI or essential SIB(s) should be defined for Remote UE.**  **Proposal 17： [For discussion] If minimum SI or essential SIB(s) is supported, whether the minimum SI or essential SIB(s) should be defined before or after the remote UE PC5 connection establishment with Relay UE**  **Proposal 21： [For discussion] When Relay UE in RRC CONNECTED and Remote UE in RRC\_IDLE/RRC\_INACTIVE, whether the Relay UE monitors PO of its PC5-RRC connected Remote UE(s) or receive paging message of the Remote UE(s**) through dedicated RRC message.  **Proposal 22： [For discussion] When Relay UE in RRC CONNECTED and remote UE in RRC CONNECTED, Relay UE may monitor only for SI change indication and/or PWS notifications in any PO.**  **Proposal 24： [For discussion] RAN2 to decide whether Short Paging message forwarding over sidelink is supported in Rel-17.**  **[Lower priority**]  **Proposal 18： [Lower priority] RAN2 to discuss how SIB(s) can be forwarded after decision on if minimum SI or essential SIB(s) is defined for Remote UE.**  **Proposal 19： [Lower priority] For IC, RAN2 to discuss whether Remote UE shall be allowed to request and receive SI over direct (Uu) path. FFS on any enhancement to Remote UE if both direct (Uu) path and indirect (relay) path are available for SI request and reception.**  **Proposal 23： [Lower priority] RAN2 to discuss whether Relay UE can skip Paging monitoring of Remote UEs after the baseline paging monitoring and forwarding mechanism is clear.**  **Proposal 25： [Lower priority] RAN2 to study if any potential issue and solution needed on Remote UE and Relay UE PO overlapping case**.  **Proposal 26： [Lower priority] A new PC5-RRC message is needed to relay the paging information from relay UE to Remote UE for unicast.** |

The following offline discussion is further triggered to mainly discuss these proposals as follows:

* [AT114-e][604][Relay] Summary on agenda item 8.7.4.1 on L2 relay control plane (vivo)

Scope: Discuss the proposals in R2-2106463 and progress toward consensus where possible.

Intended outcome: Report to comeback session

**Deadline: 2021-05-25 1000 UTC**

The Rapporteur proposes to conduct this email discussion as follows:

* **Phase 1**: Companies provide feedback on the questionnaire of this email discussion by **2021-05-21 1000 UTC**
* **Phase 2**: Rapporteur submit a summary and proposals based on the feedback and companies can comments on the summary and proposals by **2021-05-25 0700 UTC, to allow time for final proposals reshaping and Tdoc submission.**

# Contact Information

To make it easier to find the correct contact delegate in each company for potential follow-up questions, the rapporteur encourages the delegates who provide input to provide their contact information in this table:

|  |  |
| --- | --- |
| Company | Contact: Name (E-mail) |
| vivo | Kimba Dit Adamou, Boubacar (kimba@vivo.com) |
| Ericsson | Antonino Orsino (antonino.orsino@ericsson.com) |
| InterDigital | Martino Freda (martino.freda@interdigital.com) |
| Spreadtrum | Xing Liu (xing.liu1@unisoc.com) |
| Nokia | Jakob buthler (Jakob.buthler@nokia.com) |
| Lenovo, Motorola Mobility | Prateek (pmallick@lenovo.com) |
| CATT | Hao Xu(xuhao@catt.cn) |
| LG | Seoyoung Back(seoyoung.back@lge.com) |
| ETRI | Sungcheol Chang(scchang@etri.re.kr) |
| Huawei, HiSilicon | wangrui46@huawei.com |
| Apple | zhibin\_wu@apple.com |

# Discussion

## Connection management

On RRC state combination of relay UE and remote UE an open issue in the offline #603 at last RAN2#113bis-e meeting.

*Proposal 7: [16/21] [For discussion] The RRC state combination of relay in IDLE and remote UE in INACTIVE is supported.*

During summary of contributions proposed at this meeting, it is observed that the majority companies still would like to confirm the support of RRC state combination of Relay UE in RRC\_DLE and Remote UE in RRC\_INACTIVE. The following proposal was captured in [1]:

***Proposal 1： [Easy] RAN2 to confirm that the RRC state combination of Relay UE in RRC\_IDLE and Remote UE in RRC\_INACTIVE is supported.***

As such RRC state combination has been discussed since SI phase for several times and should be determined ASAP, as rapporteur we suggest RAN2 to confirm the support of RRC state combination of Relay UE in RRC\_DLE and Remote UE in RRC\_INACTIVE. The potential specification impact to support such RRC state combination can be investigated later based on company contributions in future meetings if any.

**Q1: Do companies agree that the RRC state combination of Relay UE in RRC\_IDLE and Remote UE in RRC\_INACTIVE is supported?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | We think the only RAN2 impact to allow it is that IDLE relay UE will be allowed to receive RAN paging of Remote UE. This is a small spec impact.  On the other hand, if we don’t allow this state combination, we need to specify procedure to preclude it, which is similar to what we specified for remote UE RRC establishment in section 4.5.5.1 of TR 38.836 (i.e. *If the Relay UE had not started in RRC\_CONNECTED, it would need to do its own connection establishment upon reception of a message on the default L2 configuration on PC5*). It will imply much more RAN2 specification work.  Considering RRC state is NW decision, we prefer to allow this state combination in spec, so that whether to have it can left for NW implementation (i.e. avoid spec work in RAN2). |
| ZTE | Agree | We think RRC state combination of relay in IDLE and remote UE in INACTIVE is a valid and should be supported. For example, if L2 remote UE has no active data, it is beneficial to allow it to enter into RRC\_INACTIVE state. And relay UE should also be allowed to enter into RRC\_IDLE even if there is RRC\_INACTIVE remote UE is connected with it. |
| MediaTek |  | We prefer not to introduce any additional specification impact to support such RRC state combination |
| OPPO | Agree | There would be more spec effort to exclude it than to include it. |
| Xiaomi | Agree | We understand there would be spec impact in either way. To allow this combination, IDLE relay UE may need to monitor more POs. To disallow this combination, the remote UE may need to trigger relay UE enter connected. Compared with the impacts, the pain is less to allow this combination. |
| Samsung | Agree | Allows for a more flexible NW implementation with smaller spec impact. |
| vivo | Agree | It may not be future-proof to exclude a specific RRC state combination of Remote UE and Relay UE which is in fact technically feasible. The potential specification impact to support such RRC state combination can be investigated later if any. |
| Ericsson | Agree |  |
| InterDigital | Agree | In addition to the problems mentioned by other companies, excluding this state would require discussion of what happens when a remote UE in RRC\_INACTIVE reselects to a relay which is in RRC\_IDLE. Supporting the state seems a more reasonable approach. |
| Spreadtrum | Agree |  |
| Intel | See comment | Firstly, from our understanding, in order to exclude this state combination, the gNB just has to release the Remote UE to idle at the same time when it releases the corresponding Relay UE as well. Moreover, we think that this state combination introduces additional latency to the Remote UE connection establishment procedure.  Secondly, we need to finalize whether the gNB or Remote UE would provide the paging related information to the Relay UE and correspondingly whether the Relay stores this information as part of PC5 context related to relaying or Uu context related to relaying. This might be important since the Relay UE has to keep the paging information of Remote UE while it might delete the Uu related context information while in idle.  Thirdly, we have to also clarify whether the Relay UE in idle is excluded or included during direct to indirect path switching being discussed as part of service continuity.  Lastly, we prefer to clarify this aspect with SA2 before agreeing to support of this combination. SA2 also excludes this combination suggesting that Relay UE should be in CM\_CONNECTED as long as any of its Remote UEs is in CM\_CONNECTED. In order to make progress, we can go with majority if we agree it as WA and check further for any technical issues. |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Not-agree | Allowing a relay to be in RRC Idle but the linked remote UE(s) in RRC Inactive is going to cause delay for the remote UEs when data becomes available for transmission. Why would this combination be useful?  The arguments about “specification work” when not allowing this is not well grounded, as need to look at detailed impacts in both cases. |
| CATT | Agree |  |
| LG | Agree. | We think there is no special reason the combination has to be excluded. |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree | Assuming the support of this RRC combination will reduce the spec impact in case remote UE needs to check RRC state of the relay UE during cell reselection and has no more standard effort than supporting remote UE in INACTIVE and relay UE in INACTIVE. |
| Apple | See comment | Such a combination will be obviously inferior to INACTIVE/INACTIVE combination. So, we think at least the remote UE need somehow aware of RRC state of Relay UE, in the case of relay (re)selection. The remote UE shall be given the means to avoid such a combination, if there are other better alternative relay choices. |

**Summary:**

On cause value of relay UE establishment/resume, the following proposal is left as an open issue in the offline #603 at last RAN2#113bis-e meeting as.

*Proposal 1: [16/23, 22/23] [Cross group] New establishment/resume cause value should be set when relay UE enters RRC\_CONNECTED for relaying purpose. RAN2 send an LS to SA2/CT1 on RAN2’s progress on this.*

According to proposals submitted at this meeting on cause value for relay UE [1], there is no clear majority view on this issue on whether existing cause value should be used or a new cause value should be introduced. And the following proposal was summarized:

***Proposal 2： [Cross WG] RAN2 to decide firstly whether new or existing establishment/resume cause value is used for Relay UE when Relay UE enters RRC\_CONNECTED only for relaying purpose.***

***Proposal 3： [Cross WG] Send LS to SA2/CT1 to check their view on whether new or existing establishment/resume cause value is*** *used.*

Regardless of on whether existing cause value should be used or a new cause value should be introduced, RAN2 need to involve other WG such SA2/CT1, therefore Rapporteur thinks there is two approaches on RAN2 how can further progress on this issue:

* RAN2 made a clear decision and inform SA2/CT1 to investigate their corresponding specification impact.
* RAN2 does not make clear decision and directly ask SA2/CT1 their view on whether existing cause value should be used or a new cause value should be introduced.

Therefore, Rapporteur proposes:

**Q2-1: Which establishment/resume cause value is used for Relay UE when Relay UE enters RRC\_CONNECTED only for relaying purpose?**

* **Option 1: new establishment/resume cause value;**
* **Option 2: existing establishment/resume cause value.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option** | **Comment** |
| Qualcomm | Option 1 if UAC in relay is agreed to skip; otherwise option 2 | We think this issue is coupled with whether UAC is required in relay UE.   1. Assuming we do only UAC for remote UE, we think a new single establishment cause is more reasonable because we are not sure how NW can do better with cause value from relay. Our understanding of the procedure is: gNB always allows relay UE connection and gets real cause value after reception of remote UE’s RRC Setup/Resume request later. Then, based on the real cause value, gNB can make RRC Reject decision for relay UE if needed. We think it is the solution with smallest spec impact. To align cause value between relay and remote requires either PC5 signaling change or procedure change 2. If we also do UAC for relay UE, we see some benefit for relay UE to align cause value with remote UE, so that NW can do a better decision on whether to reject relay’s connection request. However, we don’t prefer relay UE to perform UAC. |
| ZTE | Option 2 | SA2 has agreed that if the CM-IDLE relay UE receive a connection request from remote UE for relaying, relay UE shall trigger service request procedure to enter CM\_CONNECTED state before relaying the remote UE’s traffic. In this case, the existing establishment cause value provided by upper layer should be used for the RRC connection establishment of RRC\_IDLE relay UE. For RRC resume case, we think the relay UE can also reuse existing resume cause provided by upper layer when relay UE initiate the RRC resume only for the purpose of relaying. The interaction with NAS can be left to UE implementation. |
| MediaTek | Option 1 |  |
| OPPO | Option 1 | For option-2, no matter it is to be decided by AS or NAS layer, we do not see a feasible solution that when different remote UE use different cause value via different procedure (resume, establishment, re-establishment) to trigger the access of relay UE simultaneously, how the relay UE should decide on it, and how for network by receiving the existing cause value to perform access control if a special handling of relay UE access is expected. |
| Xiaomi | Option 2 | Option 2 is preferred based on following consideration:  1: It’s not future proof to introduce new cause value for relay.  2: There is no motivation to introduce new establishment cause value, since no new AI/AC are defined for relay.  3: Reusing existing cause value can help to avoid unnecessary differentiation between L2 relay and L3 relay.  4: A new cause value can’t provide enough granularity for gNB to determine whether to allow or reject the access request from different relay UEs.  Response to QC’s assumption:  We think this ‘relay UE’s request is always allowed’ assumption is very inefficient. gNB may reject the request from remote UE and then release relay UE’s connection again, which would result in waste of signaling and resource. It’s more efficient to indicate the real cause value in relay UE’s request.  Response to OPPO’s question:  We understand this simultaneous request is a corner case. Relay UE just decide the cause value based on the request which arrived first. Even this corner case occurs, there are many feasible solutions. For example, pick the cause value with the highest priority or left to UE’s implementation. |
| Samsung | Option 1 | We do not think UAC is needed for Relay UE. |
| vivo | Option 2 | Agree with ZTE’s observation.  It is also noticeable that similar issue has been discussed in other WIs e.g., Rel-10 Relay & Rel-16 IAB but no new cause value introduced. We do not think special handling of relay UE access by introducing new cause value is necessary. There are other ways that can be considered instead. For example, 1bit indication is defined in MSG5 (i.e., *RRCConnectionSetupComplete* in TS 36.331 and *RRCSetupComplete* in TS 38.331) for the network to know the connection establishment is for a Relay UE similar as an RN or an IAB-node, as shown below.   | *RRCConnectionSetupComplete* field descriptions | | --- | | ***rn-SubframeConfigReq***  If present, this field indicates that the connection establishment is for an RN and whether a subframe configuration is requested or not. |  |  | | --- | | *RRCSetupComplete-IEs* field descriptions | | ***iab-NodeIndication***  This field is used to indicate that the connection is being established by an IAB-node as specified in TS 38.300 [2]. | |
| Ericsson | Maybe Option 1 | We don’t have a strong view but probably it would be help to have a new establishment and resume cause to help the network deciding whether to accept or reject the request. |
| InterDigital | Option 1 | We see some value in the network being aware that the request to enter connected is for relaying purposes only, and having this knowledge before the relay has entered RRC\_CONNECTED (i.e. before MSG5). |
| Spreadtrum | Option 1 |  |
| Intel | Option 1 or Option 2 | No strong view. If Relay UE is primarily setting up the connection for Remote UE’s traffic, it seems sufficient that the Remote UE performs UAC. Therefore, we think that a new cause value would aid the gNB to always allow relay connection. At the same time, we can define in the specification for relay UE to skip UAC if establishing connection only for relaying.  The relay UE then has to obtain cause value from remote UE; in case it has multiple remote UE requests, there needs to be handling as well.  In any case, this is in the purview of CT1 to define; we can provide our recommendation according to majority view. |
| Nokia | Option 2 | For Option 1, using a single new cause value will not be sufficient for the RAN to differentiate the reason for the connection setup (e.g. MO voice/data, MT session, etc.) |
| Lenovo, Motorola Mobility | Option 2 |  |
| CATT | Option 2 | We have some sympathy with Xiaomi. According to the current information we collected, we prefer existing establishment/resume cause value. |
| LG | Option 2 | We think that the existing cause value can be reused for relay UE. Some companies seem to concern about how to decide one cause value of relay UE from different cause values coming from different remote UEs. We think NW can configure how to map the different cause values from remote UEs to the cause value of relay UE using the existing cause value. As the simplest example, NW can configure the different cause values from different remote UEs to one cause value of relay UE (for example, configured as 'mo-data' for relaying cause value). |
| Huawei, HiSilicon | Option 1 | Since it is a new type of access attempt, new cause value makes more sense, and we prefer to let CT1 make the final decision. |
| Apple | Option 2 |  |

**Q2-2: Do companies agree to send a LS to SA2/CT1 to either inform them about RAN2 decision or to ask their view on whether a new or existing establishment/resume cause value is used?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree |  |
| ZTE | Agree |  |
| MediaTek | Agree |  |
| OPPO | Agree | if the problem is indeed controversial to be solved in R2, it would be one way-out by inviting view from SA2/CT1. |
| Xiaomi | Agree |  |
| Samsung | Agree | We note that the rapporteur mentioned the possibility of involving CT1/SA2 in the decision making process captured in Q2-1, but we see no way of indicating support or otherwise for this approach. |
| vivo | Agree |  |
| Ericsson | Agree | Good if we can ask an opinion to SA2 and CT1. |
| InterDigital | Depends | It would be preferrable if RAN2 can take a decision on this and then inform SA2/CT1 of it. |
| Spreadtrum | Agree |  |
| Intel | Agree | We can suggest our majority view to SA2/CT1 and check their opinion. |
| Nokia | See comment | It is in RAN2 scope what cause values are used, and then RAN2 may send an LS to inform RAN3/SA2/CT1 about the decision. |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree |  |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree | RAN2 can say a new type of access attempt is identified for U2N relay, and let CT1 to evaluate the issue and make final decision as usual. |
| Apple | Agree |  |

**Summary:**

On SRB0/SRB1, there are still 2 FFS points in the following agreement for Uu RLC channel of Remote UE’s SRB0 and SRB1.

Agreement：

Proposal 6-1: [20/23] [Easy] For the delivery of remote UE’s SRB0 RRC message, specified (fixed) configuration is used for the configuration of PC5 RLC channel. FFS for the Uu RLC channel.

Proposal 6-2: [21/23, 22/23] [Easy] For the delivery of remote UE’s SRB1 RRC message other than RRCResume and RRCReestablishment message, network configuration via dedicated signalling is used for the configuration of PC5 RLC channel and Uu RLC channel.

Proposal 6-3: [23/23] [Easy] For the delivery of remote UE’s SRB1 RRC message such as RRCResume and RRCReestablishment message, default configuration is used for the configuration of PC5 RLC channel which can be reconfigured by network. FFS for Uu RLC channel.

A couple of companies have submitted contributions with proposals addressing those 2 FFS. Based on proposals captured in [1], it is observed that:

* For the delivery of Remote UE’s SRB0 RRC message, three approaches can be observed:
  + Default configuration
  + Specified (fixed) configuration
  + Network configuration
* For the delivery of Remote UE’s SRB1 RRC message such as *RRCResume* and *RRCReestablishment* message two approaches can be observed:
  + Default configuration
  + Network configuration

And the following proposals were summarized [1]:

***Proposal 4： [For discussion] For the delivery of remote UE’s SRB0 RRC message, for the configuration of Uu RLC channel the following options can be considered***

* + - * + ***Default configuration***
        + ***Specified (fixed) configuration***
        + ***Network configurable***

***Proposal 5： [For discussion] For the delivery of Remote UE’s SRB1 RRC message such as RRCResume and RRCReestablishment message as legacy SRB1:***

* + - *Introduce default configuration of Uu RLC channel for relaying, which can be reconfigured to dedicated signalling by the Network*
    - *Network configuration via dedicated signaling is used for the configuration of Uu RLC channel if available in Relay UE. Otherwise, default configuration is used*

For both the delivery of Remote UE’s SRB0 and SRB1,there is no clear majority on which configuration to used. To make progress Rapporteur would like to invite companies to think about the potential use cases for *RRCResume* and *RRCReestablishment*:

* **Case 1:** Remote UE Resume or Reestablishment to its own serving cell
* **Case 2:** Remote UE Resume or Reestablishment via current Relay UE to Relay UE’s serving cell
* **Case 3:** Remote UE Resume or Reestablishment via new Relay UE to Relay UE’s serving cell

If RAN2 aims to achieve common solution for the above 3 use case for *RRCResume* and *RRCReestablishment*, then for the delivery of remote UE’s SRB0 RRC message, specified (fixed) configuration can be used for the configuration of Uu RLC channel as legacy SRB0. And for delivery of Remote UE’s SRB1 RRC message such as *RRCResume* and *RRCReestablishment* message, default configuration can be at least used for the configuration of Uu RLC channel as legacy SRB1, which can be reconfigured by the network later in *RRCResume* message and first *RRCReconfiguration* message after *RRCReestablishment*. Therefore,

**Q3-1: For the delivery of remote UE’s SRB0 RRC message, which option(s) is chosen for the configuration of Uu RLC channel?**

* **Option 1: Default configuration**
* **Option 2: Specified (fixed) configuration**
* **Option 3: Network configurable**
* **Option 4: others, please specify**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option(s)** | **Comment** |
| Qualcomm | Option 1 and Option 3 (i.e. NW configuration is used if available in Relay UE. Otherwise, default configuration is used),  [QC2] Option 2 is also acceptable to us | Uu RLC config has one big difference from PC5 RLC config: Uu RLC is only used by relay UE in CONNECTED state while PC5 RLC is also used by remote UE in IDLE/INACTIVE state. So, we think we can have different solutions from PC5 RLC.  As analyzed in our contribution, it is also different from legacy Uu RRC procedure because **gNB is not aware of remote UE at this timing point because remote UE is in IDLE/INACTIVE state**. Therefore, although relay UE is in CONNECTED state, the remote UE’s dedicated Uu RLC channel for relaying is not configured yet. There are two alternatives to resolve this issue:  ‘ Alt-1 (default config which can be reconfigured + NW config)  Alt-2 (Always wait for NW configuration)  We think Alt-1 has the benefit to reduce latency by saving 2 RRC messages with the cost of reserving a LCID. And the cons of Alt-1 (i.e. reservation of LCID) should not a big issue because default Uu RLC channel can be reused by different remote UEs and we can also use eLCID.  [QC2] We are accept to follow the legacy Uu framework (Option 2).  Some companies argued after PC5 connection, relay UE can always get Uu RLC configuration from gNB after sending SUI to indicate it is relay. However, if we adopt this approach, isn’t remote UE’s PC5 RLC configuration for SRB0 can be treated the same way (i.e. gNB configures both PC5 and Uu RLC config for SRB0 to remote UE in a same PC5 message, and relay forward PC5 config to remote UE)? Then, it is conflicted with agreement to rely on default/specified PC5 RLC for SRB0/1 which was made in last meeting. |
| ZTE | Option 3 | In our opinion, gNB may provide the Uu RLC channel configuration for the delivery of remote UE’s SRB0 message to relay UE via dedicated signalling. Actually, after establishing the PC5 link with the remote UE, the relay UE may indicate to the gNB that it is a relay UE via SidelinkUEInformation and intends to perform U2N relay communication if relay UE has not done so before. When gNB receives the relay indication from relay UE, it may start to configure the relay UE with Uu RLC channel for subsequent remote UE’s SRB0 RRC message forwarding. |
| MediaTek | Option 3 |  |
| OPPO | Option 3 | in our mind, the procedure is: for a relay UE without any remote UE being connected with   * When a first remote UE connects to the relay, the relay report SUI to the network, * as a response, network configure a Uu RLC channel to carry the incoming SRB0/1 on Uu * relay UE forward the SRB0 for the first remote UE using the configured Uu RLC channel, and use the configured Uu RLC channel for SRB1 to receive the DL SRB1 message from network * when a second/third remote UE connects with the relay UE, the relay UE can directly use the configured Uu RLC channel for SRB0/1 without asking for further configuration (even thought the SUI report can still be triggered but relay does not need to wait for a Uu RLC channel configuration before sending SRB0/1 channel) * if at some time, all the remote UEs disconnect from the relay, there is no need to keep the Uu RLC channel for SRB0/1, and relay UE report it to network using SUI message * as a response, the network release the Uu RLC channel.   we understand the benefit of option-3 over option-1/2 is there is no need to statically occupy a LCID for the RLC channel, that is the legacy method, i.e., only when there is no other method, spec define specified/default configuration, otherwise, we always rely on network configuration instead of pre-fixing the parameter. |
| Xiaomi | Option 1 as baseline | We understand option 3 would introduce further delay due to waiting for NW configuration. Option 1 should be baseline. |
| Samsung | Option 2 | We understand QC’s view that there is an inherent difference in PC5 and Uu configuration but do not agree this means we need to adopt a different approach to PC5. |
| vivo | Option 1 and Option 3 (i.e. NW configuration is used if available in Relay UE. Otherwise, default configuration is used) | We see the technical point from above companies which prefer using network configuration instead of following legacy Uu SRB0. However, it is not acceptable to always rely on network configuration. Our concern is that the 2-step procedure of SUI+ *RRCReconfiguratio*n to get the Relay UE Uu backhual configuration for SRB0 would add much latency to the Remote UE  Resume or Reestablishment procedure. As a compromise way out, we suggest to follow Qualcomm’s proposal i.e., NW configuration is used if available in Relay UE, Otherwise, default configuration is used. |
| Ericsson | Option 2 | We do not see what is the issue with just reusing the legacy Uu framework. |
| InterDigital | Option 1 | Option 1 is preferrable to reduce delays, particularly when the relay UE is not RRC\_CONNECTED in the first place. |
| Spreadtrum | Option 3 | Remote UE’s SRB0 is relayed to the gNB after the RRC connection setup between the relay UE and the gNB. In such case, the gNB can do dedicated configuration for Uu RLC channels. |
| Intel | Option 1 and Option 3 | We believe that both option 1 and option 3 can work. If a new establishment cause is used or if Relay UE sends SUI to the network, then option 3 works; otherwise we can consider option 1 so that it can be reconfigured by the network as necessary. |
| Nokia | Option 2 | We agree with Samsung and Ericsson, that legacy procedures should be possible to reuse |
| Lenovo, Motorola Mobility | Option 3 |  |
| CATT | Option 2 | We prefer to reuse the Uu CCCH configuration which is specified in specification. |
| LG | Option 3 | When Remote UE makes a PC5 connection with Relay UE for relaying, the Relay UE informs it to the gNB. And the gNB will configure Uu RLC channel for delivering SRB0 of the Remote UE. On the other hand, if relay UE no longer has a PC5 connected remote UE, gNB may reconfigure the Uu RLC channel for the relay UE. We think NW can configure which Uu RLC channel can be used for the SRB0 of the remote UE. |
| ETRI | Option 2 |  |
| Huawei, HiSilicon | Option 1 | We feel only option1 is compatible with the alternative solutions no matter when/who allocates the remote UE ID before MSG3 forwarding from relay UE to gNB. If we want to decide configuration of SRB relaying before remote UE ID allocation, option1 is more preferred. |
| Apple | Option 1 | As long as it can be reconfigured later, we think using a default configuration makes sense. |

**Q3-2: Do companies agree that the delivery of Remote UE’s SRB1 RRC message such as *RRCResume* and *RRCReestablishment* message can reuse the same rule of legacy SRB1, i.e.?**

* **Option 1: Introduce default configuration of Uu RLC channel for relaying, which can be reconfigured to dedicated signalling by the Network**
* **Option 2: Network configuration via dedicated signaling is used for the configuration of Uu RLC channel if available in Relay UE. Otherwise, default configuration is used**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | Because relay UE is CONNECTED state, we think Uu RLC handling is same for SRB0 and SRB1 (*RRCReestablishment / RRCResume*). So, we prefer to use a common solution for them. It means we can only specify one common reserved LCID for both SRB0 and SRB1 (*RRCReestablishment / RRCResume*) |
| ZTE | Not-Agree | According to the RAN2#113bis meeting, it was agreed that network configuration via dedicated signalling shall be used to configure the Uu RLC channel for the delivery of SRB1 (messages other than RRCResume and RRCRestablishment), SRB2 and DRB packet.  Similarly, we think the Uu RLC channel for the delivery of remote UE’s SRB0 and SRB1 RRC message such as RRCResume and RRCReestablishment message should also be configured by network via dedicated signalling. As we mentioned in Q3-1, the gNB may configure the Uu RLC channel for relay UE once gNB receive the relay indication from relay UE which indicate that it is a relay UE and intends to perform U2N relay communication. |
| MediaTek | Agree |  |
| OPPO | We are agree with Option 2 | in our mind, the procedure is: for a relay UE without any remote UE being connected with   * When a first remote UE connects to the relay, the relay report SUI to the network, * as a response, network configure a Uu RLC channel to carry the incoming SRB0/1 on Uu * relay UE forward the SRB0 for the first remote UE using the configured Uu RLC channel, and use the configured Uu RLC channel for SRB1 to receive the DL SRB1 message from network * when a second/third remote UE connects with the relay UE, the relay UE can directly use the configured Uu RLC channel for SRB0/1 without asking for further configuration (even thought the SUI report can still be triggered but relay does not need to wait for a Uu RLC channel configuration before sending SRB0/1 channel) * if at some time, all the remote UEs disconnect from the relay, there is no need to keep the Uu RLC channel for SRB0/1, and relay UE report it to network using SUI message * as a response, the network release the Uu RLC channel.   we understand the benefit of option-3 over option-1/2 is there is no need to statically occupy a LCID for the RLC channel, that is the legacy method, i.e., only when there is no other method, spec define specified/default configuration, otherwise, we always rely on network configuration instead of pre-fixing the parameter. |
| Xiaomi | Agree |  |
| Samsung | Agree |  |
| vivo | Agree | We are fine to have common solution on Uu backhual configuration for SRB0 and SRB1. |
| Ericsson | Agree with comment | We are not sure what Option 1 and Option 2 they refer to since it seems to describe both the legacy Uu behavior. However, we are to use the legacy procedure for Uu SRB1. |
| InterDigital | Agree |  |
| Spreadtrum | Not agree | We prefer common solution for SRB0 and SRB1, i.e. Uu RLC channel is configured by network dedicated configuration. |
| Intel | Option 2 (network configuration) | Given the three cases outlined by the rapporteur, our understanding is that the Relay UE enters RRC\_CONNECTED before forwarding remote UE’s SRB0 and therefore, it is possible for the gNB to configure the relay UE upon receiving the first message from the remote UE and later sending remote UE’s SRB1 message using that reconfigured Uu RLC channel. Therefore, network configuration is feasible for sending remote UE’s Uu SRB1. |
| Nokia | Option 1 | We agree to use the legacy behaviour |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree | In NR Uu, Uu RLC channel for the delivery of SRB1 for RRCResume message applies the default SRB1 configuration. It can be reused for remote UE.  In NR Uu, Uu RLC channel for the delivery of SRB1 for RRCRestablishment message applies the stored SRB1 configuration (network configuration or default configuration). For remote UE, network configuration (stored in relay UE or configured by gNB) is used for the configuration of Uu RLC channel if available in Relay UE. Otherwise, default configuration is used. |
| LG | Agree, Option 2 |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Apple | Agree |  |

**Summary:**

On RRC There are still 2 FFS points in the following agreement related to PC5 RLF and Uu RLF.

Agreement:

Proposal 8: RAN2 confirm that remote UE triggers relay reselection if PC5 RLF with current relay UE is detected by remote UE. FFS if there is any impact to other RLF handling activities.

Agreement:

Proposal 4: When Uu RLF is detected by relay UE, relay UE may send a PC5-S message (similar to LTE) to its connected remote UE(s) and this message may trigger relay reselection. FFS other indication/message can also be used for notification.

Although the above agreement was discussed and reached in the AI of 8.7.3 Relay re/selection, but, they may have some impact to the RRC re-establishment procedure of Remote UE. Based on contributions submitted, the impact to RRC re-establishment may be related to:

* Uu RLF detected by Relay UE
* PC5 RLF detected by Remote UE
* Remote UE re-establishes towards a suitable cell or suitable relay UE

And the following proposals were summarized:

***Proposal 6： [Easy] The indication of Relay UE upon detecting Uu RLF may trigger the Remote UE connection re-establishment.***

***Proposal 7： [Easy] Remote UE may trigger the Remote UE connection re-establishment upon detecting PC5 RLF.***

***Proposal 8： [For discussion] The Remote UE performs RRC re-establishment procedure as follows:***

* *If a suitable cell is available, the Remote UE initiates RRC re-establishment procedure towards the suitable cell;*
* *If a suitable relay is available, the Remote UE initiates RRC re-establishment procedure towards the suitable relay UE’s serving cell;*
* If both a suitable cell and a suitable relay are available, the remote UE can select either one to initiate RRC re-establishment procedure based on implementation.

In case that the Relay UE Uu RLF, majority companies think that this situation can be indicated to Remote UE instead of using existing PC5-S message (i.e., PC5 link release similar to LTE).

But details of the indication/message e.g., PC5 RRC or adaptation layer control PDU may need further study. Moreover, the Remote may treat it as end-to-end radio link failure based on the indication and trigger re-establishment. Therefore,

**Q4-1: Do companies agree that the indication of Relay UE upon detecting Uu RLF may trigger the Remote UE connection re-establishment?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | We think either PC5 RLF or Uu RLF can be regarded as failure of “End-to-End link failure” of remote UE. |
| ZTE | Agree | We basically agree with the idea of this proposal. However, it is suggested to rephrase the proposal as follows to make it more clear:  “The Uu RLF indication from relay UE may trigger the remote UE connection re-establishment” |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree, but… | We also think remote UE may choose not to trigger the re-establishment in certain cases. For example, if the relay UE performs reestablishment to the serving cell. If the reestablishment is successful, remote UE’s connection could also be recovered. There is no spec impact. |
| Samsung | Agree |  |
| vivo | Agree |  |
| Ericsson | Agree | We think that reestablishment is of course one of the remote UE actions. However, we think that other actions should also not be excluded (similar to the scenario described by Xiaomi). |
| InterDigital | Agree, but | We agree with ZTE that the wording needs clarification. We would be ok with the wording proposed by ZTE. |
| Spreadtrum | Agree |  |
| Intel | Agree |  |
| Nokia | Agree | We think that RAN2 will have to speficy more delails of the meaning of “may trigger” in this sentence (e.g., conditions when UE should (not) trigger re-establishment). The indication from relay UE may happen either before or after relay UE’s connection re-establishment. |
| Lenovo, Motorola Mobility | Agree | RRC Reestablishment message is transparent for relay UE. |
| CATT | Agree | When either PC5 RLF or Uu RLF happens, the E2E link between remote UE and network will be broken. Then RRC\_CONNECTED remote UE should trigger RRC re-establishment procedure after cell reselection/relay reselection procedure. |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree | We think no need to introduce more optimization e.g. for the case relay UE reestablish its own RRC soon. |
| Apple | Agree |  |

In case of the PC5 RLF detected by Remote UE itself, the Remote may also treat it as end-to-end radio link failure and trigger re-establishment. Thus, similar to Uu RLF we have:

**Q4-2: Do companies agree that Remote UE may trigger the Remote UE connection re-establishment upon detecting PC5 RLF?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | We think either PC5 RLF or Uu RLF can be regarded as failure of “End-to-End link failure” of remote UE. |
| ZTE | Agree | When RRC\_CONNECTED remote UE detects PC5 RLF, it is natural for the remote UE to re-select a new relay UE or select a cell to perform the RRC re-establishment procedure in order to recover the Uu RRC connection with gNB. |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree |  |
| Samsung | Agree |  |
| vivo | Agree |  |
| Ericsson | Agree |  |
| InterDigital | Agree |  |
| Spreadtrum | Agree |  |
| Intel | Agree |  |
| Nokia | Agree | Please see comments in 4-1 |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree |  |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Apple | Agree |  |
|  |  |  |
|  |  |  |

Since Remote UE performs relay (re)selection and cell (re)selection independently. The suitable cell condition and/or suitable relay condition may be fulfilled when the Remote UE initiates the RRC re-establishment procedure. It is not clear for now that Remote UE re-establishes towards a suitable cell or suitable relay UE when either or both conditions are met. To simplify the Remote UE behaviour, rapporteur suggest the following methods can be considered as baseline.

The Remote UE may perform RRC re-establishment procedure as follows:

* If a suitable cell is available, the Remote UE initiates RRC re-establishment procedure towards the suitable cell;
* If a suitable relay is available, the Remote UE initiates RRC re-establishment procedure towards the suitable relay UE’s serving cell;
* If both a suitable cell and a suitable relay are available, the remote UE can select either one to initiate RRC re-establishment procedure based on implementation.

Therefore, companies are invited to feedback on the following question:

**Q4-3: Does company agree the Remote UE may perform RRC re-establishment procedure as follows?**

* **If a suitable cell is available, the Remote UE initiates RRC re-establishment procedure towards the suitable cell;**
* **If a suitable relay is available, the Remote UE initiates RRC re-establishment procedure towards the suitable relay UE’s serving cell;**
* **If both a suitable cell and a suitable relay are available, the remote UE can select either one to initiate RRC re-establishment procedure based on implementation.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comments** |
| Qualcomm | Agree | We think it is the consequence if we follow agreements made in last meeting:  Proposal 8: If both a suitable cell and a suitable relay are available, the remote UE can select either one (or both, for L3 relay only) based on its implementation in this release (i.e. TS 38.304 will not specify any additional procedure for selecting between the cell and the relay). FFS whether any enhancements to the cell (re)selection procedure for L2 relay.  Whether to configure a priority to re-establish via relay or gNB can be discussed further |
| ZTE | Agree | Agree with QC that we have already agreed that it is up to remote UE’s implementation to select either one if both both a suitable cell and a suitable relay are available. |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree |  |
| Samsung | Agree | Same understanding as Qualcomm. |
| vivo | Agree |  |
| Ericsson | Agree but | In principle we do not need this proposal since we already took an agreement on this in the next meeting.  RAN2 should further discussion if we need a priority on the UE on whether to prioritize selecting a new cell or a new relay UE. |
| InterDigital | Agree, but | We think RAN2 should discuss whether a UE should search for a suitable cell or a suitable relay first, specifically for the case of re-establishment following failure. |
| Spreadtrum | Agree |  |
| Intel | Agree |  |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | See Comments | If one candidate relay (connected to the same source serving cell) is suitable and one neighbor cell belonging to another gNB is suitable, we think remote UE reselects to a suitable relay of the same/ current serving cell since:  a) this avoids a possible re-establishment failure that may have occurred if the UE chose a neighbor cell belonging to another gNB for re-establishment (no Xn/ not prepared).  b) avoids a possible service interruption since the service continuity will not supported in the case of inter-gNB |
| CATT | Agree | It has been agreed in the last RAN2 meeting as QC mentioned. |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Apple | Agree |  |

**Summary:**

With regard to Remote UE TAU and RNAU, RAN2 made the following agreement.

Agreement：

Proposal 5: [23/23] [Cross group] [Easy] The remote UE should perform TAU/RNAU procedure while in RRC\_INACTIVE and RRC\_IDLE. No LS to be sent from this meeting to SA2/ CT1/RAN3 on the remote UE’s TAU/RNAU procedure.

For OOC case, whether the OOC Remote UE should perform TAU/RNAU procedure or not needs to be clarified. With regard to this OOC Remote UE case, there was proposals to address whether Remote should perform TAU/RNAU. companies’ proposals view differ on this issue. And the summary captured the following proposals:

***Proposal 9： [For discussion] For OOC case, RAN2 to discuss whether Remote UE should perform TAU/RNAU procedure.***

Companies are invited to address the above proposal in the following question:

**Q5: Do companies agree that for OOC case, Remote UE should perform TAU/RNAU procedure?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Yes | We think legacy TAU/RNAU procedure can work for OOC remote UE without spec change. We think relay can send its serving cell’s TAI and RAN area ID to the Remote UE. It can be signalled via SIB forwarding or dedicated PC5-RRC. Then, based on them, OOC remote UE performs TAU/RNAU procedure |
| ZTE | See comment | We think this proposal is not necessary. Actually, we have agreed in last RAN2 meeting that “The remote UE should perform TAU/RNAU procedure while in RRC\_INACTIVE and RRC\_IDLE. ” My understanding with this agreement is that no matter remote UE is IC or OOC, it needs to perform TAU/RNAU if it is in RRC\_INACTIVE or RRC\_IDLE state. So it is not clear why we repeat this discussion.  **[Rapp] The agreement mentioned by ZTE is made for RRC\_INACTIVE and RRC\_IDLE which is applicable only to IC case. Even though OOC L2 Remote UE can mimic RRC\_INACTIVE and RRC\_IDLE by receiving system information via Relay UE’s serving cell, some clarification is still needed on the OOC case. Moreover, according to company contributions R2-2104960 (P6) and R2-2105773 (P10), the views are different for the OOC case. Therefore, as Rapportuer we think it is worthwhile checking all companies in this offline discussion.** |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree |  |
| Samsung | See comments | We need clarification about the Remote UE states – does the question refer to the Remote UE which is OOC but in RRC\_IDLE or RRC\_INACTIVE (i.e., Remote UE is connected to NW via Relay UE)? |
| vivo | Agree |  |
| Ericsson | See comments | We believe that this proposal as such is not entirely correct.  If the RRC state of remote UE is IDLE or INACTIVE than the remote UE can do TAU/RNAU procedures by itself.  However, if the remote UE is OOC, if there is no RRC state for the UE the only way to perform TAU/RNAU is if the relay UE performs this procedure on behalf of the remote UE.  Another issue is related to the UE context in case the remote UE has no RRC state…how this it would work on the network side? |
| InterDigital | Not-agree | Whether the UE performs TAU/RNA for OOC case depends on whether the remote UE has a PC5-RRC connection with a relay. If the relay has no connection, it has no RRC state, and therefore there is no need for such a procedure. If the relay has a PC5-RRC connection, then it has an RRC state, and as for legacy, it performs TAU/RNAU in RRC\_IDLE/RRC\_INACTIVE respectively.  We think we can just stick with the agreement made last meeting, as it was clear what the intention was. |
| Spreadtrum | Agree |  |
| Intel | See comment | Agree with some company views above that we need to clarify Remote UE’s RRC state. We already made the following agreement and we believe it is independent of IC or OOC.  “The remote UE should perform TAU/RNAU procedure while in RRC\_INACTIVE and RRC\_IDLE.” |
| Nokia | Agree with comments | We believe that the UE should be able to be configured to maintain PC5 connection or not, and this will implicitly determine whether or not to enable TAU/RNAU. As we mentioned in R2-2103310 of RAN2#113bis-e, maintaining the connection mat prove power inefficient. |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | See comment | OOC remote UE which is in RRC\_INACTIVE or RRC\_IDLE state via U2N relay shall perform TAU/RNAU procedure. |
| LG | Agree | Does the proposal mean that the Remote UE is OoC but connected with Relay UE? Then, we surly agree with the proposal. |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree | Our understanding is if a remote UE has established a connection with core network/RAN before, it should perform TAU/RNAU for downlink reachability no matter it is in the coverage of Uu directly or in the coverage of a relay UE. |
| Apple | See comments | WE think the UE is physically OOC but RRC State is still IDLE/INACTIVE. The question needs to be rephrased. |

**Summary:**

For IC remote UE case, regarding how to judge the Remote UE moves out of its configured TA/RNA, two different cases can be considered.

* Case 1: Remote UE is NOT PC5-connected with Relay UE;
* Case 2: Remote UE is PC5 connected with Relay UE.

For Case 1, it is clear that Remote UE performs TAU/RNAU as legacy, i.e., read SIB1 from its own serving cell to decide the trigger of TAU/RNAU. While for Case 2, Remote UE is controlled by the Relay UE's serving cell. Several companies suggested that Remote UE performs TAU/RNAU based on Relay UE’s serving cell in such case. However, there are also some companies which would like to enhance Relay UE’s TAU/RNAU procedure on behalf of Remote UE. Thus, the following two proposals were capture in the summary:

***Proposal 10： [Easy] For IC case, Remote UE performs TAU/RNAU based on its own serving cell information (i.e., as legacy) if Remote UE is NOT PC5-connected with Relay*** *UE.*

***Proposal 11： [For discussion] For IC case, Remote UE performs TAU/RNAU based on Relay UE’s serving cell information after Remote UE is PC5-connected with Relay UE.***

Companies are invited to address the above two proposals in the following questions:

**Q6-1: Do companies agree that for IC Remote UE case, Remote UE performs TAU/RNAU based on its own serving cell information (i.e., as legacy) if it is NOT PC5-connected with Relay UE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | It is legacy procedure. We don’t see reason to change it |
| ZTE | Agree |  |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree with comments | We agree the intention, however, even if remote UE has PC5 connection, the indirect connection to serving cell via relay UE may not be established yet. There may be a delay due to relay connection establishment or message relay delay. To avoid the ambiguity, we suggest to rephrase as:  ***Proposal 10: [Easy] For IC case, Remote UE performs TAU/RNAU based on its own serving cell information (i.e., as legacy) if Remote UE is NOT connected to serving cell via ~~PC5-connected with~~ Relay*** *UE.*  ***Proposal 11: [For discussion] For IC case, Remote UE performs TAU/RNAU based on Relay UE’s serving cell information after Remote UE is connected to serving cell via~~PC5-connected with~~ Relay UE.*** |
| Samsung | Agree | Same view as Qualcomm. |
| vivo | Agree |  |
| Ericsson | Agree |  |
| InterDigital | Agree |  |
| Spreadtrum | Agree |  |
| Intel | Agree | This does not involve relaying procedure at all – legacy behavior follows as others have noted. |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree | The remote IC UE which is not PC5-connected with Relay UE is legacy UE, it is out of the scope of relay WI. |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree | It is legacy procedure. |
| Apple | Agree |  |

**Q6-2: Do companies agree for IC Remote UE case, Remote UE performs TAU/RNAU based on Relay UE’s serving cell information after it is PC5-connected with Relay UE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | We prefer a unified procedure for OOC remote UE, as indicated in Q5. Here, the serving cell information is serving cell’s TAI and RAN area ID. |
| ZTE | See comment | Actually this depends on whether IC remote UE is allowed to receive the system information directly from Uu after it is PC5 connected with relay UE. If yes, we think remote UE may perform TAU/RNAU based on the info from its camped cell. Otherwise, the remote UE should perform TAU/RNAU based on relay UE’s serving cell information.  We may discuss this issue jointly with Q11. |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree with comments | Same rewording is suggested for this proposal |
| Samsung | Agree with comments | Agree, on the assumption that state of remote UE in OOC is clarified (please see our comments to Q5). |
| vivo | Agree | Disagee with ZTE, We do not think the discussion is related to Q11. According to TR 38.836 as below:  - For L2 UE-to-Network Relay, it is supported as baseline that after Remote UE connects via Relay UE, Relay UE and Remote UE are controlled by the Relay UE's serving cell .  Thus, it is more reasonable that Remote UE judges TAU/RNAU trigger condition based on Relay UE’s serving cell information after it is PC5-connected with Relay UE. |
| Ericsson | See comment | If the IC remote UE when PC5-connected can receive SIB from its serving cell, we do not see the point to not allow the remote UE to perform RNAU/TAU independently.  If the IC remote UE when PC5-connected cannot receive SIB from its serving cell, it should be okay to perform TAU/RNAU based on the relay UE information but if these procedure are done independently, the drawback can be that the PC5 is released by the network and one of the two UE is send (or kept) to RRC\_IDLE (because network retrieve only one UE context and is not aware that the UE has a PC5 connection ongoing). |
| InterDigital | Partially agree (see comments) | For the scenario of mobility (e.g. the remote UE moves from one relay UE to another relay UE, where the TA/RNA changes), the remote UE can perform TAU/RNAU based on the relay UE’s serving cell information. However, for the case of periodic TAU/RNAU, it would be preferrable if the relay UE performs TAU/RNAU on behalf of its attached remote UEs (to avoid excessive signaling). We should therefore not exclude a relay UE performing TAU/RNAU on behalf of a remote UE based on this question. |
| Spreadtrum | Agree |  |
| Intel | See comment | Agree with ZTE and Samsung’s comments. The TR had considered inter-gNB scenario; assuming only intra-gNB case, we understand that for L2 relaying, the remote UE and relay UE serving cell is the same when remote UE is PC5-connected to the relay UE. |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree | The UE behavior shall be clear to avoid confusion in spec. For IC Remote UE, it shall treat relay UE’s serving cell as serving cell of itself after it is PC5 connected with relay UE. Hence, it shall perform TAU/RNAU based on relay UE’s serving cell information. |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree | Share the same view as Vivo. Following SI agreement, once the remote UE connects the relay UE, it should be controlled by the relay UE’s serving cell, which means the remote UE needs to follow the SI/paging forwarded by the relay. |
| Apple | Partial agree | Same view as InterDigital. ). We do not need to exclude a relay UE performing TAU/RNAU on behalf of a remote UE based on this question. |

**Summary:**

In case the Relay perform HO to another gNB, RAN2#113-bisRAN2 has made the following agreement

***“When relay performs HO to another gNB, relay UE may send a PC5-S message (similar to LTE) to its connected remote UE(s) and this message may trigger relay reselection. FFS other indication/message can also be used”***

There some considerations of remaining issue related to this agreement open issue “FFS other indication/message can also be used” in term of:

* Retrieval of a remote UE’s context to a new gNB
* Indicates to the new gNB that the UE context of both the remote UE and relay UE should be retrieved

One can argue that gNB may keep UE context for the remote UE and another gNB for the relay UE, in that case during the Retrieve UE Context procedure, the UE context of the remote UE and relay UE may be retrieved towards different gNBs. In order the UE context of both the remote UE and relay UE to be retrieved, the new gNB should be aware that there is a relay connection on-going. As if the new gNB may retrieve both the remote and relay UE context, this case may involve some Cross WG works, thus, the summary capture two proposals as follows:

***Proposal 12： [Cross WG] In case of remote UE RRC resume, RAN2 to discuss when the Retrieve UE Context procedure is performed, the new gNB may retrieve both the*** *remote and relay UE context.*

***Proposal 13： [Cross WG] If it is agreed that when the Retrieve UE Context procedure is performed, the new gNB may retrieve both the remote and relay UE context, RAN2 to send a Ls to RAN3 on whether UE Context has inter-gNB specification impact***

Rapporteur is skeptical whether agreeing to above proposals may require further Inter-gNB works that may not be in the scope of this WI. thus, companies are invited to address the above two proposals in the following questions:

**Q7-1: Do companies agree that in case of Remote UE RRC resume to a new gNB, when the Retrieve UE Context procedure is performed, the new gNB may retrieve both the Remote and Relay UE context?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Disagree | First, we think the independent handling of UE context from remote UE and relay UE can work, i.e. if remote UE performs resume, target gNB only retrieves UE context of remote UE; if relay UE performs resume, target gNB only retrieves UE context of relay UE. Such solution will not require any spec impact in RAN3.  Then, we regard the proposed solution as an optimization to reduce inter-node signaling, and it will incur spec impact in RAN3. In addition, such optimization is a kind of group mobility, which is out of scoping. Thus, we don’t think it is an essential optimization to pursue in this release. |
| ZTE | Disagree | Suppose the RRC\_INACTIVE remote UE re-selects to a new RRC\_INACTIVE relay UE and establish the PC5 connection, It is very likely that the remote UE’s context and relay UE’s context are stored in different gNBs.The gNB which stores the relay UE’s context does not know the association between RRC\_INACTIVE relay UE and this PC5 connected RRC\_INACTIVE remote UE. In this case, the RRC resume of remote UE and relay UE can only be performed independently. It is not necessary to consider the context retrieval issue of both remote UE and relay. |
| MediaTek | Disagree | It is an optimization and make the things complicated. |
| OPPO |  | We understand the UE Context retrieval procedure is to be triggered by remote and relay UE independently, no difference compared to legacy from Xn interface perspective, and there is no need for the re-establishment procedure of one UE to trigger the UE context retrieval procedure for the other UE. |
| Xiaomi |  | We understand this is up to gNB’s implementation, i.e. whether to maintain the remote and relay UE’s context in an independent way or joint way. |
| Samsung | Disagree | This has impact on RAN3 and we are not sure that the time that we have and benefits which are unclear justify this joint retrieval of the context.  Additionally, this issue is related to service continuity support in inter-gNB for Remote UE’s mobility in RRC\_INACTIVE. Since service continuity is limited to intra-gNB, this does not have to be supported. |
| vivo | Disagree | Agree with QC. |
| Ericsson | Agree | If there is an existing PC5 link between remote UE and relay UE and the RNAU/TAU procedure are done independently, the network will just retrieve one UE context (the one of the UE that triggered the procedure) and the result would be that the PC5 link between UE is first released and then established again.  If this is the common understanding we are okay to keep legacy procedure as it is. |
| InterDigital | Disagree | We should down-prioritize group mobility for this release, which includes group mobility while in RRC\_INACTIVE. |
| Spreadtrum | Disagree | Independent procedure for remote UE and relay UE is preferable. |
| Intel | Disagree | Our understanding is that the Remote UE’s first request message is buffered at the Relay UE and not forwarded to the gNB until Relay UE enters RRC\_CONNECTED. Therefore, we are not sure if this is a viable solution. |
| Nokia | Disagree | There is no need for this as we will be using legacy procedures. Furthermore, we agree with above observations that this is essentially group mobility, which is an optimization to not be handled in Rel-17 |
| Lenovo, Motorola Mobility | Disagree | Any optimizations here are up to gNB. From the UE’s perspective the context retrieval are specific to that UE (remote or relay). |
| CATT | Disagree | It should be clarified that Remote UE’s context contains both PC5 and Uu configurations. We also think that RRC resume shall be handled independently for remote UE and relay UE. |
| LG | Disagree | We think the context retrieval procedure of relay UE and remote UE happen independently. So, we can use the legacy Xn interface without any change. |
| ETRI | Disagree | Share with Samsung’s view |
| Huawei, HiSilicon | Disagree | We failed to understand why the remote UE and relay UE’s context needs to be retrieved together. The legacy procedure works well, i.e. network retrieve remote and relay UE’s context independently. |
| Apple | Disagree | Same view as Saumsung |

**Q7-2: If the ANS to Q7-1 is Agree, do companies agree to send a LS to RAN3 on whether UE Context has inter-gNB specification impact?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| OPPO |  | We do not see a reason for RAN3 impact, i.e., only if there is majority view in R2 room that there is indeed R3 impact foreseen by R2, this LS is needed, otherwise, no need for the LS. |
| Xiaomi |  | We understand this is RAN3 issue, which is not originated from RAN2. |
| Ericsson | Agree | We think is good to consult RAN3 on whether this is an issue from RAN3 point of view or not. |

**Summary:**

With regard to Remote UE IDRAN2 has agreed that the UE ID in adaptation layer header is local temporary ID. But, which node, relay UE or Remote UE serving gNB, assign the local UE ID tis FFS as shown below:

Agreements:

Proposal 3b: The UE ID in the adaptation layer header is a local, temporary remote UE ID. FFS whether the local, temporary remote UE ID is assigned by the relay UE, or the serving gNB of the relay UE. (23/24)

There are many companies addressing this FFS. Based on proposals on this FFS, there is slightly more companies who prefer the network controlled Remote UE ID allocation. This is also in line with legacy Uu that all radio protocol layer configuration is under the network control. Therefore, rapporteur suggested that we take one step further to make one choice based on above agreement. Thus, the summary captures the following proposal:

***Proposal 14： [For discussion] The serving gNB of the Relay UE allocates Remote UE ID to be used in adaptation layer. FFS details.***

As decision on which node allocate the remote UE temporary ID may require sending ls to SA3, Rapporteur suggests companies to strive for an agreement at this meeting by addressing the following question:

**Q8: Do companies agree that the serving gNB of the Relay UE allocates Remote UE ID to be used in adaptation layer?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Disagree | We think it will be simpler if remote UE to allocate and update temporary ID, as illustrated in below Figure:    We see some companies argue that relay UE may not allocate non-overlapping temp remote UE ID. However, we don’t think it is an issue because gNB just needs to maintain a mapping from (relay UE ID, temp remote UE ID) to remote UE’s GUTI, i.e. no need to have 1:1 mapping between temp remote UE ID and its GUTI in gNB |
| ZTE | Disagree | Although both gNB and relay UE can be used to allocate the local ID for remote UE, we think it is more natural for the relay UE to allocate the local ID. For example, when relay UE receives the first RRC ignaling from remote UE, it may allocate the local ID, carry it in the adaptation subheader associated with the first RRC ignaling and then deliver it to gNB via Uu RLC channel. Upon receiving the first RRC ignaling, the gNB may associate the remote UE with the local ID and use it for the subsequent remote UE’s DL ignaling/data forwarding. |
| MediaTek | Agree |  |
| OPPO | Agree | It is beneficial   * By following IAB solution * And it is more future proof that when later this is extended to multi-hop/path relay, the NW controlled temp ID allocation can achieve global uniqueness of the temp ID, which cannot be achieved by relay UE since it is a local entity |
| Xiaomi | Disagree | We understand the gNB allocation method would introduce delay due to waiting for configuration. We prefer relay UE to allocate the temp ID. |
| Samsung | Agree | Since typically Remote UE’s configuration is controlled by the NW, Remote UE ID allocation in adapt layer should be controlled by the NW as well. |
| Vivo | Agree | According to our analysis (R2-2104961), we do not prefer the Relay UE allocating solution due to its unreliability, e.g. when the first Uu SRB0 message carrying assigned local UE ID is missed or relay UE and gNB is asynchronized to each other about local UE ID assignment. The allocation solution by serving gNB of relay UE may have higher reliability and the delay issue can rely on parallel procedures, e.g. before the first SRB0 message of remote UE arrives, the relay UE reports requirement for local ID assignment for the remote UE. |
| Ericsson | Agree | We agree with Samsung and OPPO. |
| InterDigital | Agree |  |
| Spreadtrum | Disagree | It is a natural solution to allocate the Remote UE ID by the Relay for the transmission of the first relaying message. |
| Intel | See comment | We think that both relay UE and gNB may be able to allocate the local ID for the remote UE. It is tied to whether adaptation layer is enabled for remote UE’s first message forwarding and also whether relay UE sends a SUI message to the gNB before forwarding remote UE’s request. It may be easier if gNB allocates the ID, however, then the first message from remote UE may need special handling; therefore we need to consider the whole picture before making this decision for e.g. whether we want consistent adaptation layer support or not. |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Agree | Considering Oppo’s future proof multi-hop scenario. |
| CATT | Disagree | For the current case, the requirement is the unique remote UE for the relay UE, so it is natural to let Relay UE allocates Remote UE ID to be used in the adaptation layer. |
| LG | Agree | We think that NW can control the remote UE ID using on adaptation layer uniquely. |
| ETRI | Agree | We consider a network-controlled procedure. |
| Huawei, HiSilicon | Disagree | It is simpler to let relay UE to allocate the remote UE ID, so that it could be carried in AL header when relaying MSG3 to network for distinguish which remote UE the MSG3 (and the follow-up MSG4) belonging to by gNB (and relay UE). |
| Apple | Disagree | We think this local UE ID can be allocated by relay UE itself |

**Summary:**

## SIB delivery

With regard to whether the SI can be delivered to remote UE before vs after PC5 connection, the ollowing proposals are left as open issues due to lack of online time for discussion:

*Proposal 10-1: [18/23] Remote UE can receive the system information via PC5 both before and after PC5 connection establishment with relay UE.*

*Proposal 10-3: [20/23] [Easy] If remote UE can receive the system information via PC5 before PC5 connection establishment with relay UE, broadcast can be used for the system information forwarding via PC5.*

*Proposal 10-4: [22/23] [Easy] If remote UE can receive the system information via PC5 after PC5 connection establishment with relay UE, at least unicast can be used for the system information forwarding via PC5.*

Companies have further considered those proposals with more details and the corresponding proposals were captured in [1].

Based on those proposals, more companies suggest that Remote UE can receive the system information via PC5 before and after PC5 connection establishment with Relay UE. But there are also companies who think limiting the system information delivery after PC5 connection establishment with Relay UE is simple and avoid potential WG impact. As a result, the following proposal was captured:

***Proposal 15： [For discussion] Remote UE can receive the system information via PC5 before and after PC5 connection establishment with Relay UE.***

Companies are invited to address the above proposal with the following question:

**Q9: When can Remote UE receive the system information via PC5?**

* **Option 1: before PC5 connection establishment with Relay UE**
* **Option 2: after PC5 connection establishment with Relay UE**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option(s)** | **Comment** |
| Qualcomm | Option 1 and Option 2 | Option 2 is straight forward.  We do think Option 1 is also necessary at least for OOC remote UE for its initialization of RRC establishment; Otherwise, OOC remote UE has to establish unicast PC5 connection to get necessary SIB info related to RRC establishment. It will introduce extra latency for OOC remote UE to start its RRC establishment, which may be inefficient and time consuming because the serving cell of relay may not a good choice for the remote UE.  For Option 2, some companies have concern that broadcasting it may bring large overhead. However, we think only a small set of MIB+SIB1 (only 16.3%) is required. It should resolve the concern of overhead |
| ZTE | Option 2 | For the system information other than those included in the relay discovery message, we prefer option 2 only. We have agreed several AS criteria for relay (re)selection should be included in discovery message. These information is enough for remote UE before it establish the PC5 connection with relay UE. It is not necessary to design a new broadcast PC5 signalling to deliver other system information of the UE-to-Network Relay's serving cell to nearby potential remote UE. |
| MediaTek | Both options |  |
| OPPO | Both 1 and 2 | It is straight forward that remote UE should receive the system information after PC5 connection establishment. For the before PC5 connection establishment scenario, system information is also needed since:   * The cell access parameters (e.g. PLMN identity, cell identity, TAI list, cellBarred) are needed for relay selection; * The UAC configuration is needed for access control and also for relay selection; |
| Xiaomi | Both | Information in SI may be used before PC5 connection establishment for relay selection. |
| Samsung | Option 2 | OOC remote UE which does not have a PC5 connection can use pre-configuration for PC5 connection establishment. |
| vivo | Both 1 and 2 | For Option 1, before PC5 connection establishment with Relay UE, we prefer that the system information can only be carried via discovery message. The intent by some companies to additionally introduce some new PC5 RRC message in broadcast fashion is not acceptable for us. This may further involve other WG e.g., SA2 on L2 ID allocation dedicated for SI delivery.  For Option 2, the Remote system information request and forwarding can be implemented by unicast PC5-RRC message/procedure which is more resource efficiency. |
| Ericsson | Option 2 | We think that remote UE OOC can use pre-configuration to establish the PC5 connection and then get the necessary SIB from the relay UE.  Sending SIB before establishing PC5 is just an optimization that is not needed as it involved more standardization work in order to specify e.g., the triggering conditions on when the relay UE should send such information beforehead. |
| InterDigital | Both option 1 and 2 | We agree with Qualcomm that some system information (apart from what is required for cell selection) is needed, and that it could be delivered with minimal overhead. |
| Spreadtrum | Both | The system information delivery before the PC5 connection is carried by discovery message only. |
| Intel | Option 1 and 2 | We think that option 1 would be helpful for OOC remote UE to make access check decision before establishing PC5 connection for relaying. |
| Nokia | Option 1 and 2, with comments | If we agree on the remote UE to be allowed to receive system information via PC5 before the connection establishment, the information delivered should only be “essential” information needed for the Relay selection and connection establishment |
| Lenovo, Motorola Mobility | Both | “Before” for deciding on a useful relay that connects to a serving cell that supports features/ SIBs of interest to the remote UE. |
| CATT | Both | Remote UE can acquire uac-BarringInfo in SIB1 forwarded by relay UE before it establishes the PC5 connection with relay UE if option 1 is agreed. And remote UE can select a relay UE in the cell which it is not barred for the remote UE. |
| LG | Option 2 only | It’s not clear what the technical advantages are when the remote UE receives the system information via PC5 before PC5 connection establishment with relay UE. Useless SIB broadcast from remote UE occurs interference. Especially the remote UE and relay UE can be in different cells. The uselss interference should be prohibited.  The remote UE before the PC5 connection is not considered at all as in-coverage UE of the relay UE’s serving cell. Did we make an assumption that the remote UE is regarded as in-coverage UE of the remote UE’s serving cell before the PC5 connection? We don't think so.  So, the remote UE should follow its camping cells configuration before the PC5 connection. If the remote UE is OoC, in this case, the remote UE should follow pre-configuration. |
| ETRI | Both |  |
| Huawei, HiSilicon | Option 2 | Since we already agreed the information for relay (re)selection AS criteria will be included in discovery message, we do not see the need of SI forwarding during relay (re)selection. Then the remote UE can read system information from the relay UE after PC5 link establishment. |
| Apple | Both |  |

**Summary:**

At last RAN2#113bis-e meeting, with regard to which SIB(s) can be forwarded by Relay UE to Remote UE, there are quite divergent views. Therefore, no agreement has been achieved on this issue yet.

Companies have further considered this issue with more details and arguments, as captured in [1].

It is noticeable that among all the existing system information, e.g., MIB and SIB1~14, for which SIB(s) can be forwarded, we can consider the concept of minimum SI or essential SIB(s) and other SI. Because for the minimum SI or essential SIB(s) which is used for camping on a cell, they are always periodically broadcasted by default, and for the other SI which is used for specific purpose, they canl be acquired on demand. Moreover, considering minimum SI or essential SIB(s) may also impact RAN2 design on how SIB(s) can be forwarded. Therefore, Rapporteur suggests to firstly decide whether minimum SI or essential SIB(s) needs to be defined for Remote UE. Otherwise, all system information may be delivered in a on-demand fashion. The summary captures two proposals as:

***Proposal 16： [For discussion] RAN2 to decide whether minimum SI or essential SIB(s) should be defined for Remote UE.***

***Proposal 17： [For discussion] If minimum SI or essential SIB(s) is supported, whether the minimum SI or essential SIB(s) should be defined before or after the remote UE PC5 connection establishment with Relay UE***

Companies are invited to address these two proposals as follows:

**Q10-1: Do companies agree that minimum SI or essential SIB(s) should be defined for Remote UE, i.e. forwarded by default?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Yes before PC5 connection;  No after PC5 connection | Before PC5 connection, because it has to be broadcast by relay, we think it is necessary to reduce payload size. We prefer to only broadcast minimum SI (i.e. a small set of SIB1+MIB) via "Relay Discovery Additional Information” as agreed in SA2. It is intended for OOC remote UE to initialize its RRC establishment. Specifically, the small set of SIB1 + MIB is with ~367bit, which includes PLMN ID (~75bit), TAC (24bit), ranac (7bit), cell ID (36bit), t300 (3bit), t319 (3bit), *useFullResumeID* (1bit) and UAC config (~217bit). It is only 16.3% compared with total payload size of MIB+SIB1. We can further discuss whether UAC config is needed. If without UAC config, it is only ~150bit.  After PC5 connection, cconsidering different remote UEs may have different interest/capability, we think there is no need to restrict which SIBs should be forwarded by relay, i.e. when to forward and which SIB to forward can be left to relay UE implementation. |
| ZTE | See comments | It is suggested to first clarify which info is regarded as the minimum SI or essential SIB(s) from remote UE’s perspective first. Then we may discuss whether it should be forwarded by default. |
| MediaTek | No | We see that there is no need to define the minimum SI or essential SIB(s). |
| OPPO | Agree | The following SIBs can be forwarded by default to remote UE, at least including   * MIB and SIB1 which are related to access to the NW; * SIB6/7/8 are related to safety; * SIB12 related to sidelink configuration |
| Xiaomi | No | It’s not future proof to define minimum SI for relay purpose. |
| Samsung | No | Remote UE needs SIB1 once it has connected via Relay UE to get SI-scheduling info for other SIBs. But there is no need for explicit definition about minimum SI or essential SIB, since Remote UE can request on-demand via Relay UE if it is required/related SIB is not acquired. |
| vivo | Agree | In NR Uu, according to TS 38.300 definition as below:  Minimum SI comprises basic information required for initial access and information for acquiring any other SI. Minimum SI consists of:  - *MIB* contains cell barred status information and essential physical layer information of the cell required to receive further system information, e.g. CORESET#0 configuration. *MIB* is periodically broadcast on BCH.  - *SIB1* defines the scheduling of other system information blocks and contains information required for initial access. SIB1 is also referred to as Remaining Minimum SI (RMSI) and is periodically broadcast on DL-SCH or sent in a dedicated manner on DL-SCH to UEs in RRC\_CONNECTED.  The purpose of defining Minimum SI for Remote UE are similar as legacy, i.e., basic information required for initial access and information for acquiring any other SI (SIB2~SI14). The only difference is that Minimum SI for Remote UE comes from Relay UE’s serving cell information instead of its own serving cell. |
| Ericsson | No | We believe that sending the entire SIB or the SI is a more future proof solution.  If we decide essential SIB or SI this means that we need to maintain these SIBs or SI updated every time that new fields or IEs are added in the legacy SIBs or SI. |
| InterDigital | Yes (before PC5-RRC connection), No (after PC5-RRC connection) | We agree with Qualcomm. Furthermore, after PC5-RRC connection, the relay UE is aware of the SIBs needed by the remote UE, and so forwarding SI by default is not needed. |
| Spreadtrum | No |  |
| Intel | Agree | We think it would be helpful to define minimum or essential SIBs as outlined by OPPO and Vivo above. This information can be transparently forwarded by the relay UE without any modification. This can then be utilized by remote UE OOC and before PC5 connection establishment to check for access barring for example. |
| Nokia | Postpone | We think more time is needed to evaluate this option |
| Lenovo, Motorola Mobility | Yes | At least some information as QC listed (with/ without UAC) needs to be provided by a relay UE to even remote UEs that are not yet linked to it. We need to cut down such information to a minimum e.g. including only first PLMN Id of the Relay’s serving cell. |
| CATT | Yes before PC5 connection;  No after PC5 connection | MIB, SIB1 and SIB12 can be essential SIB(s). Essential SIB(s) should be forwarded by relay UE before PC5 connection establishment. After PC5 connection establishment, remote UE can acquire any SIB from relay UE via PC5 on-demand SI procedure. |
| LG | Yes, only after PC5 connection | The SIB for relaying operation should be delivered after the PC5 connection.  So, the following SIB can be included:   * MIB and SIB1 which are related to access to the NW; * After PC5 connection, Remote UE’s serving cell turns to the Relay UE’s serving cell. So, this information should deliver after the PC5 connection between Relay UE and Remote UE. Before PC5 connection, Remote UE in coverage should use MIB/SIB1 of its camping cell. Meanwhile, the Remote UE OoC doesn’t have any possibility to use MIB/SIB1 because the remote UE can’t access the NW directly. * SIB12 is related to SL configuration. * This SIB can deliver after the PC5 connection. Before the PC5 connection, there is no problem Remote UE uses pre-configuration. After PC5 connection, the remote UE is regarded as in-coverage UE, the Remote UE should follow SIB from the SIB of Relay UE’s serving cell.   \*\*\* in the case of SIB6/7/8(warning and safety)  When relay UE receives these warning/safety SIBs, the Relay UE can broadcast it using a general SL message generated by the upper layer. Why should it be delivered only by SIB? |
| Huawei, HiSilicon | Agree | The classification and definition of SI could just align with the ones defined for Uu. |
| Apple | Yes (before PC5-RRC connection), No (after PC5-RRC connection) | Same view as QC and InterDigital |

**Q10-2: If ANS to Q10-1 is YES, do companies think that minimum SI or essential SIB(s) should be forwarded for Remote UE:**

1. **Before the Remote UE PC5 connection establishment with Relay UE**
2. **After the Remote UE PC5 connection establishment with Relay UE**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option?** | **Comment** |
| Qualcomm | a) | As we indicated in Q10-1. |
| ZTE | See comments | As we mentioned before, for the system information other than those included in the relay discovery message, it is suggested to forward them to remote UE only after remote UE establishes the PC5 connection with relay UE. |
| OPPO | A and b for different cases | Option a) for MIB and SIB1 which are related to access to the NW;  Option b) for SIB12;  For 6/7/8, we are open to both a) and b) |
| vivo | b) | The Minimum SI for Remote UE is used for initial access (i.e. RRC establishment procedure). As the Remote UE *RRCSetupRequest* is initiated just after successful PC5 RRC connection, we don’t see usage to forward Minimum SI in advance. Moreover, unlike Other SI which is provided on-demand, the Minimum SI can be forwarded by Relay UE after successful PC5 RRC connection without Remote UE’s request. |
| InterDigital | a) only | As explained in our answer in 10-1, this is not needed after PC5-RRC connection, and would lead to unnecessary overhead. |
| Intel | a) or both | This information is primarily useful for initial access check of the network. |
| Lenovo, Motorola Mobility | a) but… | “Before” and “After” are from a new remote UE’s perspective. A relay needs to BROADCAST such minimum SI on a regular basis. |
| CATT | a) | See our comments in Q10-1. |
| LG | b) | Useless SIB delivery should be prohibited. |
| Huawei, HiSilicon | b) | Same comment to Q9. |
| Apple | a) |  |

**Summary:**

On how SIB(s) can be forwarded, RAN2 agreed to use PC5 RRC message to forward SIB(s). However, the cast type(s) of the PC5 RRC message has not been decided yet.

Agreements:

Proposal 10-2: [23/23] [Easy] PC5-RRC message can be used to carry the system information forwarding via PC5.

There was many proposals addressing this issue, including unicast, broadcast or groupcast. But, from rapporteur point of view, how SIB(s) can be forwarded has dependency on whether minimum SI or essential SIB(s) is defined or not. In other words, if minimum SI or essential SIB(s) is defined for Remote UE, then they can be broadcasted periodically by Relay UE similar as legacy. Otherwise, unicast may be more suitable for SI delivery based on Remote UE’s request. Thus, is was proposed in the summary that:

***Proposal 18： [Lower priority] RAN2 to discuss how SIB(s) can be forwarded after decision on if minimum SI or essential SIB(s) is defined for Remote UE.***

For in-coverage Remote UE, the allowed SIB delivery path is a left issue from the last meeting.

*Proposal 2-6: [Lower priority] RAN2 to discuss whether in coverage remote UE is allowed to directly receive the system information via Uu after connected to relay UE.*

Companies still have divergent views on whether IC remote UE shall be allowed to directly receive the system information via Uu after connection relay UE. it was proposed:

***Proposal 19： [Lower priority] For IC, RAN2 to discuss whether Remote UE shall be allowed to request and receive SI over direct (Uu) path. FFS on any enhancement to Remote UE if both direct (Uu) path and indirect (relay) path are available for SI request and reception.***

Thus, to address this issue and strive for some progress, companies are invited to address the following question:

**Q11: Do companies think that IC Remote UE can be allowed to request and receive SI over direct (Uu) path?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | Although we prefer a simpler remote UE behavior to always receive SIB from indirect path after PC5 connection, it is indeed tricky that remote UE needs to also receive SIB of neighbor cell which should be allowed to receive via direct path.  To avoid further discussion (i.e. specifying when to receive SIB from direct path), we prefer to agree that it is up to remote UE implementation whether to receive SIB from direct or indirect path. |
| ZTE | Agree | For in coverage Remote UE, we think it can directly receive the system information from the network. It is not necessary to prohibit the remote UE from doing so. |
| MediaTek | Agree |  |
| OPPO | See comments | Remote UE will perform cell reselection procedure in additional to relay procedure, so SIB reading from neighbouring cells (if any) is needed for remote UE, and the following two are both needed and independent from each other. There is no need/possibility to see one as the substitute of the other.   * Relay forwarding SIB for remote UE camping on indirect connection; * Remote UE reading SIB from neighbouring cells for cell reselection, i.e., for camping on direct connection. |
| Xiaomi | Disagree | We understand there is only one RRC connection for remote UE. If we allow this on demand SI for remote UE, this would result in UE has two RRC path, one via indirect path, the other via direct path. This is not aligned with the agreement.  A compromised way is to allow remote UE to receive SI via direct path, which is similar as neighbor SIB reception. But the SI request shall only be allowed in one way. |
| Samsung | Agree | We do not limit Remote UE’s operation to receive/monitor SIs over Uu link, but for SI request it may be better to simplify UE operation with on-demand SI request over PC5 as agreed in RAN2#113bis-e meeting. |
| vivo | Agree |  |
| Ericsson | Agree |  |
| InterDigital | Agree |  |
| Spreadtrum | Agree |  |
| Intel | Agree | We have similar view as Qualcomm. |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Agree | It is not useful to restrict SIB acquisition only via Relay UE – which also has some capacity limitation. If the Uu is reasonable, some direct SIB acquisition may be done. |
| CATT | See comments | We share the same view as OPPO. The current question should be further clarified firstly. We can’t rush to a conclusion for an unclear target. |
| LG | See comments | Remote UE will prepare cell reselection procedure even though the remote UE is connected with relay UE. When the link quality via relay UE turns bad or occurs RLF urgently, the remote UE has to decide whether make a direct link. So, remote UE may keep monitoring MIB/SIB1. But, remote UE may not need to monitor other SIBs. Just monitoring and request via relay UE may be enough when the remote UE is connected with relay UE. |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree | It can be left to UE implementation without spec impact as long as the remote UE is still under control by the relay UE’s serving cell. |
| Apple | See comments | Whether using direct or in-direct path for SIB retrieval can be left to UE implementation |

**Summary:**

## Paging

Based on Relay UE RRC state, i,e., IDLE/INACTVE/CONNECTED, Relay may monitor and forward CN paging for an IDLE remote UE connected through PC5 or monitor and forward RAN paging for an INACTIVE remote UE connected through PC5. With regard to relay paging monitoring paging for remote UE connected through PC5.

With regard to Paging monitoring when Relay UE in IDLE/INACTVE/CONNECTED, there common understanding that Relay UE in RRC IDLE or RRC INACTVE can monitors paging occasions of its PC5-RRC connected Remote UE. But, for Connected mode Relay UE, UE behavior may not the same. The remote UE in UEs in RRC\_CONNECTED may have to monitor for SI change indication or for indication about PWS notification in any paging occasion. Thus, the summary proposed:

***Proposal 20： [Easy] When a Relay UE in RRC IDLE or RRC INACTVE, the Relay UE monitors paging occasions of its PC5-RRC connected Remote UEs.***

***Proposal 21： [For discussion] When Relay UE in RRC CONNECTED and Remote UE in RRC\_IDLE/RRC\_INACTIVE, whether the Relay UE monitors PO of its PC5-RRC connected Remote UE(s) or receive paging message of the Remote UE(s) through dedicated RRC message.***

***Proposal 22： [For discussion] When Relay UE in RRC CONNECTED and remote UE in RRC CONNECTED, Relay UE may monitor only for SI change indication and/or PWS notifications in any PO.***

Companies are invited to address the above proposals in:

**Q12-1: Do companies agree that when Relay UE in RRC IDLE/RRC INACTVE and Remote UE in RRC IDLE/RRC INACTIVE, the Relay UE monitors paging occasions of its PC5-RRC connected Remote UE(s)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | In addition, we prefer to make the proposal clearer:   * INACTIVE relay UE can monitor and forward CN paging for an IDLE remote UE, without transition to IDLE state due to CN paging for remote UE. * IDLE relay UE can monitor and forward RAN paging for an INACTIVE remote UE. |
| ZTE | Agree | It is definitely necessary for RRC\_IDLE/RRC\_INACTIVE relay UE to monitor the remote UE’s paging occasion for paging message when the remote UE is in RRC\_IDLE/RRC\_INACTIVE state. |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree |  |
| Samsung | Agree |  |
| vivo | Agree |  |
| Ericsson | Agree |  |
| InterDigital | Agree |  |
| Spreadtrum | Agree |  |
| Intel | Agree |  |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Conditionally Agree (can’t be mandatory for a relay UE) | A remote UE may not always need its paging to be monitored by a relay UE e.g., when in-coverage. In-coverage means that UE can detect cell (and S-criteria is fulfilled) and therefore it is likely that Paging is also receivable (paging reception reliability should define the actual cell boundary). But a OOC remote UE or an IC UE barely in-coverage (at the very cell edge) may need the relay to receive/ forward paging on its behalf.  At the same time, a relay UE also has limited capacity on how many POs (for how many linked remote UEs) it can monitor the paging for.  Therefore, we prefer a clear handshake procedure to clarify between remote<->relay when paging will be monitored by the relay on remote UE’s behalf. |
| CATT | Agree | Agree with QC. |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Apple | Agree |  |

**Q12-2: Which option is preferable when Relay UE in RRC CONNECTED and Remote UE in RRC\_IDLE/RRC\_INACTIVE?**

* **Option 1: The Relay UE monitors PO of its PC5-RRC connected Remote UE(s)**
* **Option 2: The Relay UE receives paging message of the Remote UE(s) through dedicated RRC message**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option?** | **Comment** |
| Qualcomm | Option 2 | The fatal issue of Option 1 is that it will mandate Network to configure common CORESET and common Search Space for paging in all BWPs. Note that 38.300 has captured that  “*In case of BA, a UE in RRC\_CONNECTED only monitors paging channels on the active BWP with common search space configured.*”  Then, it is almost impossible for Network because only up to 3 common CORESET and up to 10 common search space can be configured across all BWPs in one cell, according to 38.331. If we have totally 4 BWPs, it is impossible to support.  Furthermore, option 2 has benefit to save relay UE’s power caused by paging monitoring, especially when many remote UEs are connected to the relay.  [QC2] We are confused by companies’ comments that “avoid different paging monitoring solutions in different RRC states”. Please note that we are discussing **relay UE**’s paging monitor behavior. If we agree that CONNECTED relay doesn’t monitor paging for CONNECTED remote UEs, then Option 1 will make different paging behaviour for relay UE depending on remote’s different RRC state: when remote UE in IDLE/INACTIVE, CONNECTED relay needs to monitor their paging while when remote UE in CONENCTED, CONNECTED relay doesn’t monitor paging for them. And it implies that remote UE needs to notify relay its change on RRC state (and PC5 RRC signalling impact is required). On the contrary, Option 2 makes unified behaviour when relay is in CONNECTED state, i.e. not monitor paging from remote UE if it is CONNECTED state, irrespective of remote UE’s RRC state. |
| ZTE | Option 1 | As agreed in SI phase, the Option 2 as studied in TR36.746 [7] for FeD2D paging is selected as the baseline paging relaying solution for L2 UE-to-Network relaying case (i.e. Relay UE monitors the Remote UE's Paging Occasion(s) in addition to its own Paging Occasion(s).) . We think Option 1 is enough for paging monitoring and relaying of relay UE in any RRC state. Option 2 is actually an optimization which may be postponed. |
| MediaTek | Option 1 |  |
| OPPO | Option 1 | Option 1 should be as the baseline since it would be adopted for IDLE/INACTIVE UE anyway while Option 2 seems like an optimization on the top of the basic procedure and need more spec impact. We should focus on the basic functionality first. |
| Xiaomi | Option 1 | Option 1 is the baseline. |
| Samsung | Option 2 |  |
| vivo | Option 1 | Option 1 as baseline. We should avoid different paging monitoring solutions in different RRC states. Besides, we think Option 2 also requires the Relay UE to report Remote UE IDs to the NW which may have security issue as SA3 LS we sent in the last meeting. |
| Ericsson | Option 2 | As QC mentioned, if we go for Option 1 this is a big change with respect to how the legacy procedure works. Not only this, but it will mandate the network to configures CORESET and common Search Space for paging in all BWPs.  We completely oppose to have such a big impact in a procedure that is used also for normal Uu operations. |
| InterDigital | Option 1 | With option 2, there is a risk that the paging is missed by the remote UE if it occurs when the UE has moved to Uu (or a different relay). Regarding the CORESET configuration, we think the NW can always ensure the common search space is configured in the BWP where the relay UE is operating. |
| Spreadtrum | Option 1 | We see significant spec impact to support Option 2. The relay UE needs to inform and update the identities of its connected IDLE/INACITVE remote UE regularly to the gNB, otherwise, the gNB has to send paging information via dedicated message to all RRC\_CONNECTED relay UE, which leads to large signaling overhead. |
| Intel | Option 1 | While it is worthy to consider the issue of configuring CORESET/common search space, it is not clear how gNB will maintain/keep track of RRC\_IDLE Remote UE information and forward it over dedicated RRC message. |
| Nokia | Option 2 |  |
| Lenovo, Motorola Mobility | Not straightforward | 1. As in the previous case a handshake is useful. 2. QC pointed a reasonable problem and in addition to option 2) one can still use option 1) but allow/ enable BWP switching to initial BWP when the network knows which POs the relay is monitoring as described in R2-2105074.   Option 2 can also be considered – this is some specification work but could be helpful for smooth functioning both from relay-remote UE and network’s perspective. |
| CATT | Option 1 | Option 2 is optimization and should be deprioritized in Rel-17. |
| LG | Option 1 | Option 1 is consistent method regardless Relay UE’s sate. |
| ETRI | Option 2 |  |
| Huawei, HiSilicon | Option 1 | Option 1 has less spec impact. |
| Apple | Option 2 | Agree with QC.  From NW perspective, it does not make sense to broadcast CN/RAN paging when knowing that there is established connected path reaching the UE. The Option 1 can be used only when Option 2 fails to reach the remote UE. |

**Q12-3: Do companies agree that when Relay UE in RRC CONNECTED and Remote UE in RRC CONNECTED, Relay UE may monitor for SI change indication and/or PWS notifications in any PO?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | According to 38.300, a CONNECTED UE only needs to monitor paging for PWS and SIB update in any PO.  *“When in RRC\_CONNECTED, the UE monitors the paging channels in any PO ignaled in system information for SI change indication and PWS notification.”*  Then, relay UE anyway needs to monitor paging for PWS and SIB update (and forward necessary ones to remote UE) because SIB change is common to relay and remote UE. We don’t need relay to use extra power to monitor remote UE’s paging on PWS/SIB update. |
| ZTE | See comments | According to TS 38.331, not only the RRC\_IDLE/INACTIVE UE, but also RRC\_CONNECTED UE shall monitor the short message within UE’s PO. As we know, short message can be transmitted on PDCCH using P-RNTI with or without associated *Paging* message using Short Message field in DCI format 1\_0. The short message may carry the systemInfoModification, etwsAndCmasIndication, and stopPagingMonitoring. Generally speaking, if the SI change indication and the ETWS/CMAS notification is sent in remote UE’s PO, the same indication should also be also sent in relay UE’s PO. From this perspective, the relay UE need to only monitor the Pos of itself to obtain the short message instead of any PO. |
| MediaTek | Agree |  |
| OPPO | Agree | Follow legacy mechanism. |
| Xiaomi | Agree |  |
| Samsung | Agree |  |
| vivo | Agree |  |
| Ericsson | Agree | This is the legacy procedure. |
| InterDigital | Agree | We agree that this is legacy behavior. |
| Spreadtrum | Agree |  |
| Intel | Agree |  |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree | As mentioned by QC, RRC\_CONNECTED UE can acquire SI change indication and the ETWS/CMAS notification via monitoring the paging channels in any PO. It is unnecessary to change the UE behavior of RRC\_CONNECTED relay UE. |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree | It is a legacy behavior. |
| Apple | Agree |  |

**Summary:**

On whether Short message forwarding should be supported, companies’ proposals views are split, thus, it was proposed to discuss this issue in:

***Proposal 24： [For discussion] RAN2 to decide whether Short Paging message forwarding over sidelink is supported in Rel-17.***

In NR Uu , Short Messages can be transmitted on PDCCH using P-RNTI with or without associated Paging message using Short Message field in DCI format 1\_0 (see TS 38.212 [17], clause 7.3.1.2.1). Similarly, supporting Short Message over sidelink may require extra specification impact, e.g., RAN1 involvement. Thus, simplify the work Rapporteur think we should avoid supporting Short Message forwarding over sidelink, thus companies are invited to provide their view on following question:

**Q13: Do companies agree that Short Message forwarding over sidelink is not needed in Rel-17?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | See comments | We think the question is not quite clear: does “short message forwarding” means the DCI or one indication on PWS/SIB-update? If it is former, we don’t think it can work because it implies to introduce a new PC5 physical. For the later, we are neutral to allow relay UE to notify remote UEs on PWS and SIB-update so that remote UE can initialize on-demand SIB procedure (if needed), especially when some SIBs are not broadcasted by relay. |
| ZTE | Disagree | Suppose the systemInfoModification or etwsAndCmasIndication in the short message is set to 1, we think it is necessary for the relay UE to forward the change indication to remote UE via PC5. Upon receiving the systemInfoModification or etwsAndCmasIndication, RRC\_Connected remote UE may send the *DedicatedSIBRequest* message to gNB to acquire the updated SIB. For RRC\_Idle/INACTIVE remote UE, remote UE informs relay UE on requested SIB type(s) via PC5 RRC message. Then, relay UE may trigger legacy SI acquisition procedure according to its own RRC state (if needed) and sends the acquired SIB to remote UE. |
| MediaTek | Agree |  |
| OPPO | Agree | Agree with Rapp that Short Message forwarding is not needed, and the relay UE can forward the updated SIBs to remote UE if needed. |
| Xiaomi | Disagree | It’s premature to exclude short message forwarding. It’s dependent on how remote UE obtains the SI. If similar mechanism in Uu is reused on PC5, short message is beneficial for power reduction for remote UE.  We don’t think there is RAN1 impact to forward short message. As QC commented, relay could include the short message in RRC message, which has no RAN1 impact. |
| Samsung | Agree | We think that Short Message does not have to be forwarded over sidelink (which would cause the extra RAN1 impact). |
| vivo | Agree | Proponent. |
| Ericsson | Agree | Information in the short message can simply be forwarded over PC5-RRC and we do not need to introduce short messages (as in Uu) also over PC5. |
| InterDigital | Disagree | At least for a remote UE in RRC\_CONNECTED, we agreed to use legacy SIB request mechanism. So for this release, we can assume that systemInfoModification or etwsAndCmasIndication should be forwarded to the remote UE. |
| Spreadtrum | Agree |  |
| Intel | Agree |  |
| Nokia | Disagree |  |
| Lenovo, Motorola Mobility | Agree | The emergency SIBs need to be broadcasted by the relay UE. |
| CATT | Agree | Remote UE can acquire SI change indication and the ETWS/CMAS notification via paging forwarding by relay UE. |
| LG | Agree |  |
| Huawei, HiSilicon | Agree | Relay UE needs to inform remote UE the change of SI and ETWS/CMAS notification. |
| Apple | Disagree | Not sure why this must be prohibited. The relay UE can forward the message to remote UE over PC5-RRC |

**Summary:**

With regard to PO overlapping, there was some discussion there may be cases that: Relay UE and remote UE POs are overlapping and Relay UE and remote UE POs are NOT overlapping. In case the POs of the relay UE and remote UE are not, it easier for the relay UE to distinguish what is for himself and what is for the remote UE. But, in case Relay UE and remote UE POs are overlapping it may not be easier.

Based on proposals submitted, on how the relay UE can distinguish what is for himself and what is for the remote UE may require some consideration from network side when sending the paging message for remote UE. A specified solution or network implementation are possible, thus, the summary captured:

***Proposal 25： [Lower priority] RAN2 to study if any potential issue and solution needed on Remote UE and Relay UE PO overlapping case****.*

Companies are invited to address this proposal as:

**Q14: Do companies agree that Remote UE and Relay UE PO overlapping case should be considered later, e.g. after paging forwarding mechanism is clear?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | No | We don’t see any issue when PO is overlapping. Our understanding is that relay UE will anyway decode paging record to get the included 5G-S-TMSI or I-RNTI (as legacy). So, it knows whether paging of remote UEs are included. If yes, relay can forward the paging record to all possible remote UEs associated to the PO. |
| ZTE | No | We think it is not necessary to consider the PO overlapping case. Relay UE could definitely identify which PO is for itself based on its paging parameter. It is not clear why we need to consider how the relay UE can distinguish what is for himself and what is for the remote UE. |
| MediaTek | No |  |
| OPPO | No need to discuss this issue | We didn’t see the needed to discuss the issue of whether Remote UE and Relay UE’s PO overlapping or not. The PO of Remote UE and Relay UE are independent of each other. |
| Xiaomi | Yes | Our understanding is PO overlapping case any exists. After paging forwarding mechanism is clear, we can see whether there is something to do without much spec impact. It’s premature to exclude this case for now. |
| Samsung | No | Same understanding as Qualcomm. |
| vivo | No | We think it can be resolved up to NW implementation to notify either one or both. |
| Ericsson | Yes with comments | In principle, we are with QC that there is no particular issue for the relay UE to decode both paging messages and understanding which one should be forwarded to the remote UE. However, the drawback is that the relay UE needs to decode two messages to understanding which is for itself and which is for the remote UE.  To solve this, a possible solution is for the network to include the remote UE paging message in an OCTET STRING within the paging message of the relay UE (when these two message are sent together). |
| InterDigital | No | We don’t think this is an issue to be discussed. Depending on the relay UE behavior, the relay could either forward any paging message received on the remote UE’s PO to the remote UE, or check the UE ID in the paging message. In either case, the behavior would be the same regardless of whether the relay UEs PO overlaps with that of the remote UE. |
| Spreadtrum | No |  |
| Intel | No | We do not see this as a major issue to be considered. |
| Nokia | No | This is a low priority issue |
| Lenovo, Motorola Mobility | No | We do not see any issue even of the POs are overlapping (it is indeed better from power perspective of the relay UE). |
| CATT | No | We share the same view as QC and ZTE. Relay UE shall monitor and decode paging record in all POs of RRC\_Idle/INACTIVE remote UEs and its own. If PO is overlapping, the UE behavior is not impacted. |
| LG | Yes | We think it can be helpful to save the power of remote UE. |
| ETRI | No |  |
| Huawei, HiSilicon | No |  |
| Apple | No |  |

**Summary:**

On how paging message is forwarded, in RAN2#113bis meeting, it is agreed that unicast can be used for paging forwarding via PC5 as follows.

|  |
| --- |
| Proposal 13: [23/23] [Easy] Unicast can be used for the paging forwarding via PC5. |

On how the paging message is forwarded is further considered on whether a new PC5 RRC is used and whether Broadcast and group cast can also be used for the paging forwarding. Based on proposal submitted it was proposed:

***Proposal 26： [Lower priority] A new PC5-RRC message is needed to relay the paging information from relay UE to Remote UE for unicast.***

Rapporteur thinks this should be addressed but not with urgency, but companies are still invited to express their view on:

**Q15: Do companies agree that A new PC5-RRC message is needed to relay the paging information from Relay UE to Remote UE for unicast?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | We think forwarded paging is different from existing SL-SRB0/1/2/3. And it is good to introduce a new SL-SRB for better resource management. The logical channel priority of the new SL-SRB is fixed and higher than SL-SRB3 |
| ZTE | Agree | We think new PC5-RRC message is needed, but it does not mean a new SL-SRB is needed. |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree |  |
| Samsung | Disagree | SL-SRB3 can be reused. |
| Vivo | Agree |  |
| Ericsson | Postpone | This is a stage 3 issue and can be discussed later. |
| InterDigital | Postpone | We agree with Ericsson that this is not a critical issue at this stage. |
| Spreadtrum | Agree |  |
| Intel | Agree | Proponent |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree | New PC5-RRC message is needed. Whether it is carried in SL-SRB3 or new SL-SRB can be further discussed. |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Apple | Agree |  |

**Summary:**

## UAC

On UAC check of remote UE, In RAN2#113b-e [3], the following WA on UAC was made:

**“WA: Proposal 15: [23/23] [Easy] Remote UE can reuse legacy access control and no need to enhance the access control procedure of Remote UE. FFS whether the relay UE performs UAC”**. With regard to this WA, there are some proposals to confirm the WA as follows:

As the WA is in line with legacy procedure, and this WA is also related to other WG, RAN2 should confirm the WA. Thus, we had:

**Proposal 27： [Cross WG] Confirm the WA that Remote UE performs UAC based on legacy procedure independently.**

Rapporteur encourage companies to strive for confirming this proposal in the following question:

**Q16: Do companies agree to confirm the WA that Remote UE performs UAC based on legacy procedure independently?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree | It has already been agreed in SI |
| ZTE | Agree |  |
| MediaTek | Agree |  |
| OPPO | Agree |  |
| Xiaomi | Agree |  |
| Samsung | Agree |  |
| vivo | Agree |  |
| Ericsson | Agree |  |
| InterDigital | Agree |  |
| Spreadtrum | Agree |  |
| Intel | Agree |  |
| Nokia | Disagree | We should check with SA2/CT1, and do not think this can be discussed seperatly with Q17-1 |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree |  |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Apple | Agree |  |
|  |  |  |

**Summary:**

With regard to UAC check of Relay UE, on whether Relay UE can skip the UAC check when Relay UE intends to access NW only for relaying data or RRC signalling of Remote UE without any service for itself, there are many contributions, but, companies view on this issue are split as follows:

Relay UE Skip UAC: vivo, ZTE, Xiaomi, Spreadtrum, LG, OPPO

Relay performs UAC: Qualcomm, CATT, Futurewei, Huawei

Neutral: Intel, apple

Thus, it was proposed:

***Proposal 28： [Cross WG] RAN2 to discussion whether Relay UE should perform UAC or can skip UAC when it intends to access network only for the purpose of relaying but not for its own service.***

***Proposal 29： [Cross WG] Send a LS to SA2 to ask SA2 view on whether Relay UE should*** ***perform UAC or can skip UAC when it intends to access network only for the purpose of relaying but not for its own*** *service*

This skipping or performing UAC is also related to SA2, thus Rapporteur proposes to address this and inform related WG ASAP, if necessary, thus:

**Q17-1: Which option is preferable when Relay UE intends to access network only for the purpose of relaying but not for its own service?**

* **Option 1: Relay UE should perform UAC**
* **Option 2: Relay UE** **can skip UAC**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option?** | **Comment** |
| Qualcomm | Option 2 | After careful consideration, we changed our mind due to below reasons:   * Remote UE will actually go a double UAC, which will equivalently deprioritize remote UE’s RRC connection request * If agreed to support UAC in relay, RAN2 needs to introduce complex failure handling for different cases, e.g. remote UE UAC passed but relay doesn’t pass.  We try to avoid such complex discussion.   Meanwhile, as we indicated in Q2-1, assuming we do only UAC for remote UE, we think a new single establishment cause makes sense. |
| ZTE | Option 2 | Suppose that relay UE perform UAC, it may happen that the remote UE is not barred while the connected relay UE is barred. In this case, the first RRC message from remote UE may be buffered at the relay UE. As we know, if the access attempt is barred for relay UE, T390 timer ( (0.7+ 0.6 \* *rand*) \* *uac-BarringTime)* shall be started. The relay UE shall not attempt to access until the T390 time expires. On the other hand, when remote UE transmit the RRCSetupRequest/RRCResumeRequest message, it shall start the T300/T319 timer respectively. When the T300/T319 timer expires, the remote UE shall inform upper layers about the failure to establish the RRC connection. As we can see, the uac-barring-timer is much longer than the T300/T319 timer.  T300 ENUMERATED {ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000},  t319 ENUMERATED {ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000},  uac-BarringTime ENUMERATED {s4, s8, s16, s32, s64, s128, s256, s512},  It is very likely that the T300/T319 timer expires before the UAC barring timer of relay UE. In this case, the access of remote UE is also failed. Based on this observation, it is suggested that the relay UE is not under UAC control when relay UE access the network just for relaying purpose. |
| MediaTek | Option 1 |  |
| OPPO | Option 2 | It is captured in TR that relay UE doesn’t perform for remote UE’s data.  And there will be some further issues for option 1, for example the UAC of relay UE may be barred. |
| Xiaomi | Option 2 | According to the TR, relay UE does not perform UAC check for RRC-CONNECTED remote UE’s access attempt, which is remote UE’s data. To keep aligned behavior, relay UE shall not perform UAC. Otherwise, the access attempt from remote UE would be controlled by double UAC check at remote UE and relay UE respectively. This would result in that for the same access category and access identity, the access probability for remote UE is different when relay UE is in CONNECTED and non-CONNECTED. |
| Samsung | Option 2 |  |
| vivo | Option 2 | we suggest that the Relay UE can skip the UAC check mainly for the following two reasons:   1. Before receiving the request for relaying data or RRC ignaling from Remote UE, the UAC check has already been performed in Remote UE for the same request. Duplicated check should be avoided, which may bring very long latency for relaying data or RRC ignaling of Remote UE. 2. According to CT1 specification TS 24.501, the UE operating as an IAB-node skips the access control checks. For the case when Relay UE intends to access NW only for relaying purpose, we believe that the Relay UE can follow similar rule as an IAB-node. |
| Ericsson | Option 1 | Is never good for network perspective if a UE skip the UAC and we don’t see the point to do it differently here. |
| InterDigital | Option 2 |  |
| Spreadtrum | Option 2 |  |
| Intel | Option 2 | We can confirm with CT1 whether relay UE can skip UAC. From our perspective, since we agreed that remote UE will perform UAC for its traffic, it is sufficient, as the relay UE is simply acting as a forwarding agent for the same data in the same cell. |
| Nokia | None | Ask SA2/CT1 |
| Lenovo, Motorola Mobility | Option 2 | Each UE (remote or relay) performs UAC for it’s own purpose (if relay is purely establishing connection for remote UE – then it’s for the purpose of remote UE not relay UE). |
| CATT | Option 1 | If relay UE is allowed to skip UAC to access the network in the case without its own service, this mechanism can be misused which is not accepted by vendors and operators. |
| LG | Option 2 | It seems a redundant task that relay UE performs again UAC of remote UE’s data which has already done UAC at remote UE. |
| ETRI | Option 2 |  |
| Huawei, HiSilicon | Option 1 | In general UAC should be able to apply to any RRC state and UE types, so we prefer option 1. However, we also think CT1 should be involved to evaluate if the relay UE needs to perform UAC, and if so what AI and AC should be used. |
| Apple | Option 1 with comments | If a Relay UE is privileged to skip UAC, this need some cross-WG discussion. We think it is better to send LS to SA2/CT1 before making a final decision on this. |

**Summary:**

**Q17-2: Do companies agree to send a LS to SA2/CT1 to either inform them about RAN2 decision or to ask their view on whether perform UAC or can skip UAC when Relay UE intends to access network only for the purpose of relaying but not for its own service?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Not-agree** | **Comment** |
| Qualcomm | Agree |  |
| ZTE | Agree |  |
| MediaTek | Agree |  |
| OPPO | Agree in case R2 cannot converge on Q17-1 |  |
| Xiaomi | Agree |  |
| Samsung | Agree |  |
| vivo | Agree |  |
| Ericsson | Agree | We prefer to ask them if they see any issue in skipping the UAC and then RAN2 can make a decision. |
| InterDigital | Agree | Would prefer to try to converge on 17-1 before, however. |
| Spreadtrum | Agree |  |
| Intel | Agree |  |
| Nokia | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| CATT | Agree |  |
| LG | Agree |  |
| ETRI | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Apple | Agree |  |

**Summary:**

# Conclusion

The summary concludes with the following proposals:

**[Easy]**

**[Cross WG]**

**[For discussion]**

**[Lower priority**]

1. Reference
2. R2-2104738 Summary on agenda item 8.7.4.1 on L2 relay control plane vivo (Rapporteur)