**3GPP TSG-RAN WG2 Meeting #115-e R2-210xxxx**

**E-Meeting, 16th - 27th August 2021**

**Source: vivo (Rapporteur)**

**Title:****Summary of [Post114-e][605][Relay] SI and paging forwarding**

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

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

# Introduction

At RAN2#114-e meeting, an offline discussion was triggered as follows [1]:

* [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, in R2-2106577

 Deadline: 2021-05-25 1000 UTC

This email discussion is to continue discussion on the controversial part of paging and system information forwarding for L2 U2N relay:

* [Post114-e][605][Relay] SI and paging forwarding (vivo)

      Scope: Continue discussion of paging and system information forwarding from L2 relay UE to L2 remote UE, including:

* Possibility of receiving system information before establishing PC5-RRC connection
* Which SIBs need to be forwarded and potential concept of minimum SI
* Direct reception of SI via Uu for in-coverage remote UE
* Paging occasion monitoring for relay UE in RRC\_CONNECTED
* Handling of short message

      Intended outcome: Report to next meeting

      Deadline:  Long

The Rapporteur proposes to conduct this email discussion as follows:

* **Phase 1**: Companies are kindly asked to provide feedback on the questionnaire of this email discussion by **2021-07-02 1000 UTC, to finish this phase 1 before RAN2 silent period**
* **Phase 2**: Rapporteur submit a summary and proposals based on the feedback and companies can comments on the summary and proposals by **2021-08-05 1000 UTC, to allow time for final proposals reshaping and Tdoc submission.**

Company contact information for further follow up comments.

|  |  |  |
| --- | --- | --- |
| **Company** | **Contact Name** | **Contact email** |
| vivo | Boubacar | kimba@vivo.com |
| MediaTek  | Xuelong Wang | xuelong.wang@ mediatek.com |
| OPPO | Bingxue Leng | lengbingxue@oppo.com |
| Qualcomm  | Peng Cheng | chengp@qti.qualcomm.com |
| ASUSTeK | Lider Pan | lider\_pan@asus.com |
| CATT | Hao Xu | xuhao@catt.cn |
| Xiaomi | Xing Yang | Yangxing1@xiaomi.com |

# Requested Input format

*To avoid duplication arguments, and try to progress more than what is possible to conclude from RAN2#114-e meeting offline summary in [1], some questions request your input in a new format. It is also noted that the following format refers to the other offline summary in [2].*

**Question 0: Do you support solution#1?**

|  |  |
| --- | --- |
| **Arguments in favor** | **Arguments opposing** |
| Example 1: This works well in in-coverage situation (Optional: company name) | Example 5: Does not work for Out of coverage UE (Optional: company name) |
| Example 2: This is efficient since…(Optional: company name) |  |
| Example 3: ~~Works excellent in in-coverage~~ (the argument has already been made, no need to repeat) |  |
| Example 4: Actually, works for Out of coverage cases as well since/ when/ if… |  |

**Position for Question 0:**

|  |  |
| --- | --- |
| **Support** | Company A, Company B |
| **Do not support** | Company C |
| **Neutral/ flexible** | Company D |

Please take note of the following guidelines:

* Please **do not repeat arguments** already presented by someone [Example 3]
* One may (and should) however present a **counterargument to an argument** already made [Example 4 arguing against Example 5].
* Please make **meaningful** but **short arguments** for readability purpose.
* Company name [A][B][C][D] is filled by contact delegate in the above Question and Position Tables.

# Discussion

##  Possibility of receiving system information before establishing PC5-RRC connection

At RAN2#114-e meeting, it has been agreed that the Remote UE can receive the system information via PC5 after PC5 connection establishment with Relay UE.

|  |
| --- |
| RAN2#114-e Agreements:Proposal 13： [18/18][Easy] the Remote UE can receive the system information via PC5 after PC5 connection establishment with Relay UE. |

Meanwhile, with regard to whether the system information can be received by Remote UE before PC5 connection, the following proposal is left as an open issue due to lack of online time for discussion.

*Proposal 14：[13/18][Discussion] the Remote UE can receive the system information via PC5 before PC5 connection establishment with Relay UE.*

In the offline discussion [1], the companies who support the above proposal mainly identify necessity as follows:

* For access control check, the UAC parameters (e.g., *uac-BarringInfo* in TS 38.331) in SIB1 needs to be forwarded from Relay UE to Remote UE before PC5 connection establishment with Relay UE.
* For relay (re-)selection, the cell access parameters (e.g., *cellAccessRelatedInfo* in TS 38.331) in SIB1 needs to be forwarded from Relay UE to Remote UE before PC5 connection establishment with Relay UE.

The companies who do NOT support the above proposal have the following concern:

* Potential SA2 impact and signalling overhead by Groupcast/Broadcast than Unicast PC5 RRC to deliver system information from Relay UE to Remote UE before PC5 connection establishment with Relay UE.

Besides, it is noticeable that RAN2 has already agreed that Discovery message is used to deliver the information required for additional AS criteria for relay (re-)selection. The corresponding agreements are as below:

|  |
| --- |
| RAN2#113bis-e Agreements:Proposal 16: Include the information required for agreed additional AS criteria in discovery message.Proposal 2-2 [easy]: For L2 relay, PLMN ID supported as additional AS criteria for relay (re)selection. Whether cell ID is used can be further discussed by RAN2.RAN2#114-e Agreements:Proposal 4: For L2 U2N relay, cell ID can be used as additional AS criteria for relay (re)selection. RRC states under which the cell ID may be applied by L2 remote UE and how to use it by L2 remote UE are left to be addressed for L2 specific discussions. And the usage of cell ID by gNB for RRC CONNECTED L2 remote UE is handled by CP procedure and service continuity topic for L2 relay. |

Given that the agreed information (i.e., PLMN ID and cell ID) in Discovery message also comes from the system information of relay UE’s serving cell and can be transmitted before PC5 connection establishment with relay UE, the Rapporteur suggest to further check company view on the possibility of receiving system information before establishing PC5-RRC connection on top of what has been agreed for Discovery.

**Question 1-1: Do you support that the L2 Remote UE can receive the system information via PC5 before PC5 connection establishment with L2 Relay UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor** | **Arguments opposing** |
| [MediaTek] Receiving the system information via PC5 before PC5 connection establishment with L2 Relay UE is particularly useful for OOC Remote UEs | [Xiaomi] First, I’d like to clarify the remote UE shall establish PC5 unicast establishment right after relay selection, since remote UE at least needs to send paging related information to relay UE. The PC5 unicast connection shall not be released as long as indirect path is not released. Therefore, the scenario raised by the question is actually whether remote UE can receive SIB before relay selection. From this respect, I don’t think there is any need for SI information for relay selection. We already agreed the additional AS criteria information for relay selection is included in discovery message. |
| [OPPO] The following information should also be forwarded to remote UE to decide whether camp on a relay or not:1. UAC related configurations;
2. Cell-barring information;
3. Cell-access information (Besides the agreed information (PLMN ID, cell ID) in discovery message, TAC and RANAC are also needed)
 |  |
| [Qualcomm] We think it is necessary to allow 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 is quite inefficient.Because it has to be broadcast by relay before PC5 connection, it is necessary to reduce payload size. Thus, 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)
* 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. |  |
|  |  |

**Position for Question 1-1:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT |
| **Do not support** | Xiaomi |
| **Neutral/ flexible** |  |

**Summary:**

**Question 1-2: If Support in the Position Table for Question 1-1, which option(s) of the PC5 signalling is used to carry the system information from L2 Relay UE to L2 Remote UE?**

**Option 1: Discovery message**

**Option 2: Groupcast PC5 RRC message**

**Option 3: Broadcast PC5 RRC message**

**Option 4: Unicast PC5 RRC message**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option(s)** | **Comment** |
| MediaTek | Option 3 | The transmission SL discovery is based on the discovery model (e.g. Model or Mode B).The SI transmission over PC5 is based on the AS need from the Remote UE. Then these two type of messages may be transmitted at different occasion. Then the SI transmitted in broadcast manner by Relay UE is independent from the Relay discovery message sent by Relay UE.Meanwhile, we see some difficult to use groupcast based approach, as the Relay UE may be not aware of the Remote UEs.  |
| OPPO | Option 3 or Option 1 if the information is carried via RRC container | Among broadcast and groupcast, just like the SI in Uu, broadcast is enough – groupcast is not proper considering according to SA2 design, so far the group-cast relies APP layer for the group management, yet here it is for a AS layer functionality, so lack of APP-layer based group management support.For discovery message, although it is also broadcast-based, yet it may lead to frequency RAN2/CT1 interaction on the stage-3 design for the discovery message content design, so it is preferred to rely on RAN2 to handle it. Or one can save the inter-WG interaction if the information is carried in discovery message via a RRC container, for which RAN2 can be still in charge of the stage-3 design. |
| Qualcomm | Option 1 | *First*, note that SA2 has agreed “"Relay Discovery Additional Information” as example to carry system information (in TS 23.304):“*Additional information used for the UE-to-Network Relay (re)selection and connection maintenance can be advertised using a separate discovery messages of type "Relay Discovery Additional Information". This may include for example the related system information of the UE-to-Network Relay's serving cell, as defined in TS 38.300 [12].* “It is similar to LTE discovery meta data message. We think it is straight forward to use it for SIB forwarding.*Secondly*, because design of NR discovery has been finalized, we can just reuse it for "Relay Discovery Additional Information”, i.e. we don’t need extra spec work on design new groupcast PC5 RRC message (Option 2) or new broadcast PC5 RRC message (Option 3). *Thirdly,* if either Option 2 or Option 3 is agreed, it implies that remote UE is required to monitor two broadcast messages (i.e. discovery message and broadcast/groupcast PC5 RRC) before PC5 connection, which introduces extra complexity for remote UE.*Lastly,* we think Option 2/Option3 have RAN1 impacts because it is new PC5-RRC message. Because there is no RAN1 TU, we think it is NO way to work it out in this release. |
| ASUSTeK | Option 4 | Since RAN2 agreed that the remote UE can receive the SI via PC5 after connecting to the relay UE, the unicast manner anyway will be supported. We think the unicast manner is also feasible for the remote UE to receive SI via PC5 RRC before connecting to the relay UE because the remote UE has learned the relay UE’s L2ID during the discovery phase. Please refer to following text in TS23.304 from SA2:“*In step 1, the 5G ProSe Remote UE determines the destination Layer-2 ID for PC5 unicast link establishment based on the unicast source Layer-2 ID of the selected 5G ProSe UE-to-Network relay (as specified in clause 5.8.3) during UE-to-Network Relay discovery as specified in clause**6.3.2.3.*”We see more efforts on specification if RAN2 considers Option 2/3 since RAN2 will need to discuss e.g. broadcast periodicity and when to start/stop broadcasting SI in the broadcast/groupcast manner. On the other hand, Option 2/3 would also require SA2 to specify the L2IDs used for purpose of broadcasting/groupcasting SI via PC5 RRC.We also think it is RAN2’s scope to specify how to forward SI content via PC5 RRC. If SI is forwarded through discovery manner (i.e. Option 1), RAN2 will need to negotiate with SA2 for determining the payload size of SI content and broadcast periodicity.Thus, we prefer to consider Option 4 (i.e. the unicast manner) for the remote UE to receive SI via PC5 RRC before connecting to the relay UE. |
| CATT | Option 1 or Option 3  | For option 1, there is not extra latency for relay selection and access control to acquire SIBs via relay UE if all access information is contained in discovery message. If option 1 is not agreed, we can accept to use broadcast PC5-RRC message to carry sidelink SIBs.  |

**Summary:**

##  Which system information need to be forwarded and potential concept of Minimum SI

##  Which system information need to be forwarded

According to TS 38.300 subclause 7.3, the system information in NR Uu can be categorized as below:

* **MIB**: contains cell barred status information and essential physical layer information of the cell required to receive further system information;
* **SIB1**: defines the scheduling of other SIs and contains information required for initial access;
* **SIB2/SIB3/SIB4/SIB5**: contain cell re-selection information;
* **SIB6/SIB7/SIB8**: contain public warning information related to ETWS/CMAS;
* **SIB9**: contains information related to GPS time and Coordinated Universal Time (UTC);
* **SIB10**:contains information related to NPN;
* **SIB11**: contains information related to idle/inactive measurements;
* **SIBpos**: contains positioning assistance data;
* **SIB12**: contains information related to NR sidelink communication;
* **SIB13/SIB14**: contain information related to LTE V2X sidelink communication.

The same issue on which system information need to be forwarded has been discussed at RAN2#113bis-e meeting [3], but there was no conclusion. In order to achieve a clearer outcome than the previous offline discussion, the Rapporteur would like to check company view on the system information as categorized above.

**For MIB forwarding**: some companies think at least part of the MIB content related to access to the NW (e.g., *systemFrameNumber* and *cellBarred* in TS 38.331) is useful for Remote UE, while the other companies don’t see the need of MIB forwarding [3]. From Rapporteur’s view, whether it is part of the MIB content or full MIB content forwarding as a container can be discussed later in future meetings if RAN2 agreed to support MIB forwarding in the first place. Therefore, the Rapporteur would like to check company view on the necessity and use case to support MIB forwarding from Relay UE to Remote UE in the following Question 2-1.

**Question 2-1: Do you support MIB (at least part of the MIB content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported MIB field(s) if necessary)** | **Arguments opposing****(list the NOT supported MIB field(s) if necessary)** |
| (MediaTek) The Remote UE may need be aware of the cell barred status as included within MIB |  |
| [OPPO] MIBshould be forwarded to remote UE by default since some information, i.e. at least *cellbarred* is needed to let the remote UE know whether the cell is available. |  |
| [Xiaomi] Although we agree MIB information is not needed for remote UE, we see additional complexity to exclude MIB from the frame work. It’s more future proof to support MIB from the beginning and the cost is negligible. | [Qualcomm] If you carefully check all the fields in MIB, you will find NONE of them are useful for remote UE:* SFN: Remote UE is not required to SFN-sync with gNB. It just needs to sync with relay UE.
* Uu PHY IEs (*subCarrierSpacingCommon ssb-SubcarrierOffset, dmrs-TypeA-Position, pdcch-ConfigSIB1*): Remote UE doesn’t need them because remote UE just use PC5 resource for communication.
* Cell barring (*cellBarred, intraFreqReselection*): If a L2 relay can work, it can’t camp in a “barred” cell.

However, we prefer remote UE can acquire any MIB/SIB by implementation, but no MIB/SIB is specified as mandatory to forward |
|  |  |

**Position for Question 2-1:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, ASUSTeK, CATT, Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** | Qualcomm (we think remote UE can acquire any MIB/SIB by implementation, but no MIB/SIB is specified as mandatory to forward) |

**Summary:**

**For SIB1 forwarding**: most companies see the need of at least part of the SIB1 content forwarding related to access control (e.g., *uac-BarringInfo* in TS 38.331), relay (re-)selection (e.g., *cellAccessRelatedInfo* in TS 38.331) [3]. From Rapporteur’s understanding, whether it is part of the SIB1 content or full SIB1 content forwarding as a container also can be discussed later in future meetings if RAN2 agreed to support SIB1 forwarding in the first place. Therefore, the Rapporteur would like to check company view on the necessity and use case to support SIB1 forwarding from Relay UE to Remote UE in the following Question 2-2.

**Question 2-2: Do you support SIB1 (at least part of the SIB1 content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported SIB1 field(s) if necessary)** | **Arguments opposing****(list the NOT supported SIB1 field(s) if necessary)** |
| (MediaTek) The Remote UE may use the access control info as included within SIB1  |  |
| [OPPO] SIB1 should be forwarded to remote UE by default since as rapp said it is needed for access control and relay selection. |  |
| [Qualcomm] Some IEs in SIB1 are useful for remote UE (e.g. UAC) while some IEs are not useful (e.g. *ServingCellConfigCommon*). However, if it is SIB forwarding after PC5 establishment, we think forwarding entire SIB1 is simpler |  |
| [CATT] Remote UE should be able to receive/request any SIB as legacy UE. |  |
| [Xiaomi] At least, UAC is needed |  |

**Position for Question 2-2:**

*NOTE: Delegates please fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** |  |

**Summary:**

**For SIB2/SIB3/SIB4/SIB5 forwarding**: some companies think they are related to cell (re-)selection and thus useless to Remote UE. Meanwhile, some companies express a general view that the Remote UE should be able to receive/request any SIB [3]. Therefore, the Rapporteur would like to check company view on the necessity and use case to support SIB2/SIB3/SIB4/SIB5 forwarding from Relay UE to Remote UE in the follow Question 2-3.

**Question 2-3: Do you support SIB2/SIB3/SIB4/SIB5 (at least part of the SIB2/SIB3/SIB4/SIB5 content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported SIB2/SIB3/SIB4/SIB5 field(s) if necessary)** | **Arguments opposing****(list the NOT supported SIB2/SIB3/SIB4/SIB5 field(s) if necessary)** |
| (MediaTek) The Remote UE should be able to receive/request any SIB | [OPPO] Cell re-selection info is only meaningful to a UE if it can directly access the cell, and we have already agreed that the UE has to perform independent cell reselection and relay reselection operation. |
| [Qualcomm] Same view as MediaTek. We don’t think it is good idea to forbid remote UE to receive these SIB in specification. On which SIB to forward, we prefer to leave it to UE implementation (i.e. no specification). |  |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. |  |
|  |  |

**Position for Question 2-3:**

*NOTE: Delegates please fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** | OPPO |
| **Neutral/ flexible** |  |

**Summary:**

**For SIB6/SIB7/SIB8 forwarding**: several companies think SIB6/SIB7/SIB8 should be forwarded as it’s important to support public warning for Remote UE. Besides, some companies express a general view that the Remote UE should be able to receive/request any SIB [3]. Therefore, the Rapporteur would like to check company view on the necessity and use case to support SIB6/SIB7/SIB8 forwarding from Relay UE to Remote UE in the following Question 2-4.

**Question 2-4: Do you support SIB6/SIB7/SIB8 (at least part of the SIB6/SIB7/SIB8 content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported SIB6/SIB7/SIB8 field(s) if necessary)** | **Arguments opposing****(list the NOT supported SIB6/SIB7/SIB8 field(s) if necessary)** |
| (MediaTek) The Remote UE should be able to receive/request any SIB |  |
| [Qualcomm] Same view as MediaTek. Furthermore, we don’t see any point to disallow remote UE to use emergency service. |  |
| [Xiaomi] It’s essential to relay ETWS indication to remote UE. |  |
|  |  |

**Position for Question 2-4:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** |  |

**Summary:**

**For SIB9 forwarding**: there is no clear motivation for Remote UE to acquire system information related to GPS and UTC time. However, some companies express a general view that the Remote UE should be able to receive/request any SIB [3]. Therefore, the Rapporteur would like to checking company view on the necessity and use case to support SIB9 forwarding from Relay UE to Remote UE in the following Question 2-5.

**Question 2-5: Do you support SIB9 (at least part of the SIB9 content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported SIB9 field(s) if necessary)** | **Arguments opposing****(list the NOT supported SIB9 field(s) if necessary)** |
| (MediaTek) The Remote UE should be able to receive/request any SIB |  |
| [OPPO] It can be on-demand requested by the remote UE. |  |
| [Qualcomm] Same view as MediaTek. We don’t think it is good idea to forbid remote UE to receive these SIB in specification. On which SIB to forward, we prefer to leave it to UE implementation (i.e. no specification). |  |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. |  |

**Position for Question 2-5:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** |  |

**Summary:**

**For SIB10 forwarding**: as it is related to NPN, there is also no clear motivation for Remote UE to acquire such system information. However, some companies express a general view that the Remote UE should be able to receive/request any SIB [3]. Therefore, the Rapporteur would like to check company view on the necessity and use case to support SIB10 forwarding from relay UE to Remote UE in the following Question 2-6.

**Question 2-6: Do you support SIB10 (at least part of the SIB10 content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported SIB10 field(s) if necessary)** | **Arguments opposing****(list the NOT supported SIB10 field(s) if necessary)** |
| (MediaTek) The Remote UE should be able to receive/request any SIB |  |
| [OPPO] It can be on-demand requested by the remote UE. |  |
| [Qualcomm] Same view as MediaTek. We don’t think it is good idea to forbid remote UE to receive these SIB in specification. On which SIB to forward, we prefer to leave it to UE implementation (i.e. no specification). |  |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. |  |

**Position for Question 2-6:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** |  |

**Summary:**

**For SIB11 forwarding**: it is also not crystal clear why Remote UE needs SIB11 considering that it is introduced to support idle/inactive measurement configuration for SCell/SCG fast activation purpose. However, some companies express a general view that the Remote UE should be able to receive/request any SIB [3]. Therefore, the Rapporteur would like to check company view on the necessity and use case to support SIB11 forwarding from relay UE to Remote UE in the following Question 2-7.

**Question 2-7: Do you support SIB11 (at least part of the SIB11 content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported SIB11 field(s) if necessary)** | **Arguments opposing****(list the NOT supported SIB11 field(s) if necessary)** |
| (MediaTek) The Remote UE should be able to receive/request any SIB | [OPPO] Remote UE doesn’t need to measure Uu interface. |
| [Qualcomm] Same view as MediaTek. Although EMR is not supported for remote UE in this release, we don’t think it is good idea to forbid remote UE to receive these SIB in specification. On which SIB to forward, we prefer to leave it to UE implementation (i.e. no specification). |  |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. |  |
|  |  |

**Position for Question 2-7:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** | OPPO |

**Summary:**

**For *SIBpos* forwarding**: it is not mentioned in previous offline discussion [3]. And the Rapporteur thinks it had better to check company view on the necessity and use case to support *SIBpos* forwarding from Relay UE to Remote UE in the following Question 2-8.

**Question 2-8: Do you support *SIBpos* (at least part of the *SIBpos* content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported *SIBpos* field(s) if necessary)** | **Arguments opposing****(list the NOT supported *SIBpos* field(s) if necessary)** |
| (MediaTek) The Remote UE should be able to receive/request any SIB |  |
| [OPPO] It may be needed for SL-positioning in the future |  |
| [Qualcomm] Same view as MediaTek. We don’t think it is good idea to forbid remote UE to receive these SIB in specification. On which SIB to forward, we prefer to leave it to UE implementation (i.e. no specification). |  |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. |  |

**Position for Question 2-8:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** | OPPO |

**Summary:**

**For SIB12 forwarding**: some companies believe that SIB12 should be forwarded to Remote UE for NR sidelink communication configuration. Besides, some companies express a general view that the Remote UE should be able to receive/request any SIB [3]. Therefore, the Rapporteur would like to check company view on the necessity and use case to support **SIB12** forwarding from Relay UE to Remote UE in the following Question 2-9.

**Question 2-9: Do you support SIB12 (at least part of the SIB12 content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported SIB12 field(s) if necessary)** | **Arguments opposing****(list the NOT supported SIB12 field(s) if necessary)** |
| (MediaTek) The Remote UE should be able to receive/request any SIB |  |
| [OPPO] As agreed, this information is necessary for IDLE/INACTIVE UEx’ TX and all UEs’ RX. |  |
| [Qualcomm] Same view as MediaTek. We don’t think it is good idea to forbid remote UE to receive these SIB in specification. On which SIB to forward, we prefer to leave it to UE implementation (i.e. no specification). |  |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. |  |

**Position for Question 2-9:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** |  |

**Summary:**

**For SIB13/SIB14 forwarding**: most companies don’t express a clear view on the support of SIB13/SIB14 forwarding. However, according to Rapporteur’s understanding, the WID scope is focused on NR sidelink-based relay. On the other hand, SIB13/SIB14 contain information related to LTE sidelink communication. Consequently, there may be no need to support the SIB13/SIB14 forwarding. However, some companies express a general view that the Remote UE should be able to receive/request any SIB [3]. Therefore, Rapporteur would like to check company view on the necessity and use case to support SIB13/SIB14 forwarding from Relay UE to Remote UE in the following Question 2-10.

**Question 2-10: Do you support SIB13/SIB14 (at least part of the SIB13/SIB14 content) forwarding from L2 Relay UE to L2 Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor****(list the supported SIB13/SIB14 field(s) if necessary)** | **Arguments opposing****(list the NOT supported SIB13/SIB14 field(s) if necessary)** |
| (MediaTek) The Remote UE should be able to receive/request any SIB | [OPPO] As rapp said, they are for LTE sidelink communication. |
| [Qualcomm] Same view as MediaTek. We don’t think it is good idea to forbid remote UE to receive these SIB in specification. On which SIB to forward, we prefer to leave it to UE implementation (i.e. no specification). |  |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. |  |
|  |  |

**Position for Question 2-10:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Do not support** | OPPO |
| **Neutral/ flexible** |  |

**Summary:**

##  Potential concept of Minimum SI

In the offline discussion [1], the company views are quite divergent on whether Minimum SI (i.e., the most essential system information) should be defined for Remote UE. According to company comments, the Rapporteur observed that the potential concept of Minimum SI is also coupled with other issues related to the basic system information procedure for Remote UE, for example:

* Issue 1: Possibility of receiving system information before establishing PC5-RRC connection in Section 3.1
	+ Rapporteur comments: some companies think that Minimum SI should be defined for Remote UE before PC5 connection establishment with Relay UE, but not after PC5 connection establishment with Relay UE. However, the possibility of receiving system information before establishing PC5-RRC connection is depending on the outcome of discussion in Section 3.1.
* Issue 2: Which system information need to be forwarded in Section 3.2.1
	+ Rapporteur comments: Some companies think it’s premature to decide and suggest to first clarify which info is regarded as the Minimum SI from Rmote UE’s perspective. This is depending on the outcome of discussion in Section 3.2.1.
* Issue 3: Direct reception of SI via Uu for in-coverage Remote UE
	+ Rapporteur comments: If direct reception of SI via Uu is allowed for in-coverage Remote UE, it is natural that at least the Minimum SI concept for Uu is needed in this case. However, it is also depending on the outcome of discussion in Section 3.3.

Based on above observations, it is suggested that we leave the discussion and decision on the potential concept of Minimum SI for Remote UE to stage 3 phase. This issue is not urgent and can be resolved after the basic system information procedure for Remote UE is pretty clear.

**Question 3: Do you agree with Rapporteur’s suggestion i.e., RAN2 to discuss and decide on the potential concept of Minimum SI for L2 Remote UE during stage 3 phase?**

|  |  |  |
| --- | --- | --- |
| **Company** | **YES or NO** | **Comment** |
| MediaTek | YES | In general, we think defining the Minimum SI concept for PC5 make the things unnecessarily complicated for L2 Relay operation.  |
| OPPO | See comments | If we support SI acquisition before PC5 connection establishment, the support of Minimum SI will be necessary since it means the relay has to deliver SI to the UEs in proximity without an established PC5 connection. |
| Qualcomm | See comments | Similar view as OPPO. If we support SIB forwarding before PC5 connection establishment, we must support Minimum SI because at least Uu MIB+SIB (if assuming all other SIBs are not forwarded) typically have ~2400 bit. It is impossible to broadcast these 2400 bit periodically by each relay, which will cause heavy interference.If we don’t support SIB forwarding before PC5 connection, we think there is no point to support Minimum SI. |
| ASUSTeK | See comment | We share the same view with OPPO and Qualcomm. |
| CATT | See comments | Just Issue 1 is the key to determine whether Minimum SI should be supported or not. After we have a conclusion for this part, we can determine Q3 immediately, we don’t think it is necessary to leave it to stage 3 phase. |
| Xiaomi | No | As discussed in Q1, we don’t see necessity for remote UE to acquire SIB before PC5 unicast connection establishment. |

**Summary:**

##  Direct reception of SI via Uu for in-coverage Remote UE

Regarding whether direct reception of SI via Uu is allowed for in-coverage Remote UE, the following proposal was summarized [1].

*Proposal 16：[13/18][Discussion]For IC case, Remote UE can be allowed to request and receive SI over direct (Uu) path.*

The companies who support direct reception of SI via Uu for in-coverage Remote UE mainly because anyway Remote UE needs to perform legacy cell (re-)selection procedure independently even though it is PC5 connected with Relay UE. Meanwhile, the companies who do NOT support the above proposal have concern on the potential specification impact e.g., when to receive SI from direct path, how to apply the SI from both direct and indirect path. To achieve a clearer outcome than previous meeting, the Rapporteur suggest to further check company view on this issue with the new input format.

**Question 4: For L2 U2N relay, do you support direct reception of SI via Uu for in-coverage Remote UE?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor** | **Arguments opposing** |
| (MediaTek) Without the support of direct reception of SI via Uu, in-coverage Remote UE is not able to perform some legacy behavior (e.g. cell reselection).  |  |
| [OPPO] **The SIBs related to cell reselection** (SIB2/3/4/5) should be allowed since it’s agreed that the cell (re)selection and relay (re)selection should be performed separately. **The other SIBs** can only be acquired via PC5 if already connected with a relay UE. |  |
| [Qualcomm] We discussed this issue for too long time without consensus. We think the only way forward is to agree “it is up to remote UE implementation whether to receive SIB from direct or indirect path.” |  |
| [CATT] For IC Remote UE, once it switches to indirect link, it shall change to the serving cell of the Relay UE it linked which may be same or not of its source cell. Therefore, Remote UE shall only acquire the SIBs from the Relay UE when it switches to U2N relay link. Legacy cell reselection procedure includes acquire SIBs of neighbor cells can be reused for remote UE. Hence, IC remote UE can receive the system information over direct (Uu) path for cell reselection purposes. |  |
| [Xiaomi] SI reception over direction path is fine. However, we want to clarify that IC-coverage remote UE shall only send on demand request over indirect path, not over direct path. |  |

**Position for Question 4:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO (restricted to SIB2/3/4/5), Qualcomm (leave to UE implementation), ASUSTeK, CATT(for cell reselection), Xiaomi |
| **Do not support** |  |
| **Neutral/ flexible** |  |

**Summary:**

##  Paging occasion monitoring for Relay UE in RRC\_CONNECTED

At RAN2#114-e meeting, agreements on paging occasion monitoring for Relay UE reached as follows.

|  |
| --- |
| Agreements:Proposal 17： [17/18][Easy]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)Proposal 19： [17/18][Easy]When Relay UE in RRC CONNECTED and Remote UE in RRC CONNECTED, the Relay UE may monitor for SI change indication and/or PWS notifications in any PO as legacy.Proposal 22： [15/18][Easy] A new PC5-RRC message is needed to relay the paging information from Relay UE to Remote UE for unicast. |

There was no consensus for the scenario when Relay UE in RRC CONNECTED and Remote UE in RRC\_IDLE/RRC\_INACTIVE. Generally, there are two candidate options on how Relay UE performs paging occasion monitoring, which are listed as below:

* 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.

According to offline discussion [1], the following proposal is summarized but without enough online time for discussion.

*Proposal 18：[11/18][Discussion]when Relay UE in RRC CONNECTED and Remote UE in RRC\_IDLE/RRC\_INACTIVE, the Relay UE monitors PO of its PC5-RRC connected Remote UE(s) as baseline. [6/17] FFS whether The Relay UE receives paging message of the Remote UE(s) through dedicated RRC message is also introduced.*

The Rapporteur would like to check company views based on the above proposal.

**Question 5-1: When L2 Relay UE in RRC CONNECTED and L2 Remote UE(s) in RRC\_IDLE/RRC\_INACTIVE, do you support that the Relay UE can monitor PO of its PC5-RRC connected Remote UE(s)?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor** | **Arguments opposing** |
|  | (MediaTek) Monitoring the PO of its PC5-RRC connected Remote UE(s) will put a big burden on Relay UE in connected.  |
| [OPPO] Relay UE monitor PO of the remote UE is anyway needed for IDLE/INACTIVE case, so the dedicated signaling for CONNECTED is just an optimization adding spec effort including both UL report and DL notification. |  |
|  | [Qualcomm] 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. 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. |
| [CATT] gNB doesn’t store context of remote UE in RRC\_IDLE state, and for the remote UE in RRC\_INACTIVE UE, gNB does not know whether it changed to other relay UE or gNB before resume procedure. Hence, gNB don’t know which relay UE can forward the paging to the remote UE in RRC\_IDLE/ RRC\_INACTIVE UE. gNB can’t send the paging of remote UE in RRC\_IDLE/ RRC\_INACTIVE to relay UE.  |  |
| [Xiaomi] Regarding QC’s comment, we think remote UE doesn’t directly occupy any Uu radio resource. It should be fine to configure all remote UE’s paging in the same BWP as relay UE’s active BWP. |  |

**Position for Question 5-1:**

*NOTE: Delegates please fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | OPPO, CATT, Xiaomi |
| **Do not support** | MediaTek, Qualcomm, ASUSTeK |
| **Neutral/ flexible** |  |

**Summary:**

**Question 5-2: When L2 Relay UE in RRC CONNECTED and L2 Remote UE(s) in RRC\_IDLE/RRC\_INACTIVE, do you support that the Relay UE can receive paging message of the Remote UE(s) through dedicated RRC message?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor** | **Arguments opposing** |
| (MediaTek) We assume the network knows the association between Relay UE and Remote UEs. And then if Relay UE is in connected state, the network can simply find the Remote UE via Relay UE in terms of dedicated signaling. | [OPPO] Relay UE monitor PO of the remote UE is anyway needed for IDLE/INACTIVE case, so the dedicated signaling for CONNECTED is just an optimization adding spec effort including both UL report and DL notification. |
| [Qualcomm] We have provided the fatal issue of Option 1 in last question. The benefits of Option 2 are: 1. The RRC signaling spec change is simple and straight forward: include paging record in *RRCReconfiguration* same as Uu SIB. Actually, in NR Rel-15, the main intention to allow Uu SIB included in dedicated RRC was to resolve the fatal issue of BWP/CORESET we list in last question.2. We have agreed that CONNECTED relay doesn’t monitor paging for remote UE in CONNECTED. Then, Option 2 will have unified relay UE behavior in CONNECTED (i.e. not monitor paging for MT data irrespective of RRC state of remote UE). Otherwise, PC5 spec change is required to allow relay UE to know RRC state of remote UE.3. Option 2 has benefit to save relay UE’s power caused by paging monitoring, especially when many remote UEs are connected to the relay.  |  |
|  | [CATT] gNB doesn’t store context of remote UE in RRC\_IDLE state, and for the remote UE in RRC\_INACTIVE UE, gNB does not know whether it changed to other relay UE or gNB before resume procedure. Hence, gNB don’t know which relay UE can forward the paging to the remote UE in RRC\_IDLE/ RRC\_INACTIVE UE. gNB can’t send the paging of remote UE in RRC\_IDLE/ RRC\_INACTIVE to relay UE. |
|  | [Xiaomi] The essential requirement of this solution is to enable gNB to maintain association between relay UE and IDLE/INACTIVE remote UE. To achieve this, IDLE/INACTIVE remote UE has to send indication to gNB after relay re-selection, so that gNB can update the association. We think this would result in much signaling overhead and additional spec impact. |

**Position for Question 5-2:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK |
| **Do not support** | OPPO, CATT, Xiaomi |
| **Neutral/ flexible** |  |

**Summary:**

##  Handling of Short message

In the offline discussion [1], the following proposal is left as an open issue for further discussion.

*Proposal 20：[11/18][Discussion] The Short Message forwarding over sidelink in respect of using Short Message field as in DCI format 1\_0 is not needed in Rel-17.*

In fact, companies have different views on the definition of “Short message forwarding over sidelink” from Relay UE to Remote UE. According to Rapporteur’s understanding, there can be two candidate solutions on the handling Short message over sidelink:

* Solution 1: introduce Short message field in SCI similar to DCI format 1\_0 (see TS 38.212 [17], clause 7.3.1.2.1);
* Solution 2: introduce PC5 RRC message to forward the systemInfoModification or etwsAndCmasIndication carried in the Short Message.

Moreover, some companies who do NOT support Short massage forwarding is mainly against the first solution which has RAN1 impact. The supporting rate for the second solution is not very clear. Only a few companies express that both solutions for Short message forwarding is not needed as the Relay UE can simply forward the updated SIBs to Remote UE if needed. As above, the Rapportuer would like to check company view on each solution for the Short message handling over sidelink as above.

**Question 6-1: Do you support Short message forwarding from L2 Relay UE to L2 Remote UE with Solution 1 i.e., introduce Short message field in SCI similar to DCI format 1\_0 (see TS 38.212 [17], clause 7.3.1.2.1)?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor** | **Arguments opposing** |
|  | [MediaTek] If the expectation of short message forwarding via SCI to Remote UE is to trigger the Remote UE to get the SI/SIB, Relay UE can simply forward the SI/SIB via PC5, which avoids the bi-way signaling over PC5.  |
|  | [OPPO] The necessity of short message on Uu interface comes from the design of modification-period (MP) based SI delivery, yet the MP concept is not used at PC5 interface, so that the short message is not useful either. I.e., when there is a SI change, the network/relay can directly send the updated SI to the remote UE.Besides, please note that this Q6-1 leads to something that has great RAN1 impact. |
|  | [Qualcomm] It has RAN1 impact. There is no way in this release. |
|  | [Xiaomi] L1 short message on PC5 is impossible and unnecessary. |

**Position for Question 6-1:**

*NOTE: Delegates please fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** |  |
| **Do not support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi |
| **Neutral/ flexible** |  |

**Summary:**

**Question 6-2: Do you support Short message forwarding from L2 Relay UE to L2 Remote UE with Solution 2 e.g., introduce PC5 RRC message to forward the *systemInfoModification* or *etwsAndCmasIndication* carried in the Short Message?**

*NOTE: Proponents please explain your solution in the Arguments Table, if necessary.*

|  |  |
| --- | --- |
| **Arguments in favor** | **Arguments opposing** |
|  | [MediaTek] If the expectation of short message forwarding via PC5 RRC to Remote UE is to trigger the Remote UE to get the SI/SIB, Relay UE can simply forward the SI/SIB via PC5, which avoids the bi-way signaling over PC5 RRC.  |
|  | [OPPO] The necessity of short message on Uu interface comes from the design of modification-period (MP) based SI delivery, yet the MP concept is not used at PC5 interface, so that the short message is not useful either. I.e., when there is a SI change, the network/relay can directly send the updated SI to the remote UE.Besides, please note that this Q6-1 leads to something that has great RAN1 impact. |
| [Qualcomm] We assume that remote UE may rely on on-demand SIB procedure to acquire necessary SIB (i.e. relay UE may not be willing to proactively forward Uu SIB to remote UE). Then in this case, if without notification of SIB-update/PWS, remote UE will not know when to trigger on-demand SIB procedure to obtain updated SIB. |  |
| [Xiaomi] UE shall update the SI upon SI modification. If short message is not supported, how would remote UE decides to acquire SIBs which are already stored? The drawback of always sending updated SI proposed by MTK and OPPO is relay UE doesn’t know whether there is remote UE interested in updated SIB. There would be signaling waste if relay UE always transmit every updated SIB each time. |  |

**Position for Question 6-2:**

*NOTE: Delegates, please, fill in your Company name in the Position Table.*

|  |  |
| --- | --- |
| **Support** | Qualcomm, Xiaomi |
| **Do not support** | MediaTek, OPPO, ASUSTeK, CATT |
| **Neutral/ flexible** |  |

**Summary:**

# Conclusion

The offline discussion summary concludes with the following proposals:

**[Easy] [Cross WG] [For discussion] [Lower priority**]

1. Reference
2. R2-2106577, Summary on agenda item 8.7.4.1 on L2 relay control plane, vivo (Rapporteur).
3. R2-2102184 , Summary of [AT113-e][708], Lenovo, Motorola Mobility (Rapporteur).
4. R2-2104405, Summary report of [AT113bis-e][603][Relay] Proposals from summary of agenda item 8.7.4.1, ZTE (Rapporteur).