**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** |
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# 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) | [Ericsson] This looks like an optimization that can be left out from the time being. In fact, once the discovery procedure is done and the remote UE had selected a suitable relay UE, the necessary system information can be forwards once the PC5 link has been established. Given that the system information are used to send mostly Uu message, we do not see a real benefits to forward this beforehand. Further, if we go on this direction we would need to specific how and when a UE will start to broadcast this system information and this it may also mean higher spec impact and higher power consumption for the UE(s). Also, an aspect that needs to be considered is the impact that this will have on other WGs like SA2 or CT1. We can discuss this optimization at the end of the release once that all the basic features are in place. |
| [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. | [Huawei, HiSilicon] First, we’d like to clarify the question. For sure, L2 Remote UE can receive some parameters in system information via PC5 before PC5 connection establishment, carried in discovery message, which was already agreed. The FFS point here is whether we support SIB forwarding (all the required SIBs, rather than just some essential parameters) before PC5 connection.  Please note the UAC parameters is not used by the remote UE for cell camping, these can be obtained after PC5 connection establishment. Only those parameters which are essential for relay selection (and cell camping maybe) is needed before PC5 connection is established. Inclusion of such essential parameters can be discussed as the contents of the discovery message, rather than SIB forwarding.  The baseline behavior should be that remote UE selects one relay UE and sets up PC5 connection and then checks the UAC, cell barring and other related access parameters. |
| [Intel] We think that the cell barring and access control information are specifically applicable to L2 relaying and we have so far agreed that: “RAN2 understand that the L2/L3 common parts of the relay discovery and (re)selection objectives are complete at stage 2 level from RAN2 perspective.”  We feel that more information than what is agreed for additional criteria may be needed to efficiently choose the relay before PC5 RRC connection establishment. Our understanding is that the system information mentioned here is not all of the system information but only necessary information, primarily UAC, cell barring information for efficient relaying connection establishment. However, we are fine to discuss the scope of the additional discovery message type to be introduced by SA2 and if that is deemed sufficient, we do not need to consider additional RAN2 impact. | [Apple] The question is equivalent to ask whether the remote UE need to receive MSI before relay selection. I do not think so. All the relay selection criteria discussion so far has been focused on a very limited set of information to be shared in discovery message to help remote UE to choose a relay. MSI broadcasted in PC5 contains much more information than what has been agreed for common solution for L2/L3 relays. So, it seems to me that if we agree on this, then we change the earlier agreement about relay selection proedures for L2 case to allow an additional L2-specific discovery broadcast to be utilized in L2 relay selection process.  Another problem is that this will force relay UE to rebroadcast MSI in SL interface blindly, at least for model A discovery case, which is not going to be power-efficient for relay UE. |
|  | [Samsung] OOC Remote UE can get SI for RRC connection establishment via its Relay UE after the Remote UE has discovered and selected the Relay UE. For Remote UE, the required information including AS criteria for Relay discovery and Relay selection is provided via pre-configuration and discovery message. So we do not see a need to get SI before establishing PC5 RRC connection with the selected Relay UE. |

**Position for Question 1-1:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Spreadtrum, Intel |
| **Do not support** | Xiaomi, Ericsson, Huawei, HiSilicon (other than the agreed discovery content), Apple, ZTE, Samsung |
| **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. |
| Ericsson | Option 3 | We do not support sending system information before the PC5 connection establishment. However, we think that this can be done via simply broadcasting them and avoiding cross-WG interactions. |
| Huawei, HiSilicon | Need clarification. | We do not support Option 2/3, which requires SA2 to define new L2 ID for the SIB forwarding.  In our understanding, discovery message including some parameters in SI for additional AS criterion was already agreed. If the option 1 refers to forward the SIB message (e.g. as RRC container), then we do not support option 1 either.  Also for the QC’s comment, it seems the SA2 Relay Discovery Additional Information only includes the required information, but does not have to be the whole SIB messages. |
| Apple | Option 1 | If RAN2 agrees to support MSI broadcast, then this can be defined as an additional L2 container in existing discovery message. |
| Spreadtrum | Option 3 | Before PC5 connection between Remote UE and Relay UE, the broadcast manner can be used for Relay UE to forward system information, since there is no PC5 connection and the Relay UE doesn’t know how many Remote UEs are in proximity. |
| Intel | Option 3 or Option 1 | For option 1, we need to understand the optional message ‘Relay Discovery additional information’ option being introduced by SA2 and determine if it is sufficient for our purposes. However, this will introduce additional delay in spec work, and in that sense, we agree with OPPO’s suggestion.  For option 3, it is natural to use this option before PC5 is established and during initial discovery, groupcast may not be a possibility. |
| ZTE | Option 1 | SA2 has already agreed the serving cell info may be included in the Relay Discovery Additional Information. The Relay Discovery Additional Information is used for relay (re)selection and connection maintenance. If RAN2 agrees to support other system information to be delivered to remote UE before PC5 connection is setup, relay discovery message can be reused and it is not necessary to define system information broadcast mechanism in U2N relay any more. |

**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 |
|  | [Ericsson] As also explained by Qualcomm, we do not see a strong reason on why the MIB needs to be forwarded. |
|  | [Apple] If L2 remote UE does want to know the MIB (i.e., via a request), there is no harm for relay UE to share it with the remote UE. But voluntary forwarding is not needed. |
| [Intel] Our understanding is that the L2 Remote UE can be in a different cell than Relay UE and hence it may help to know the basic cell barring information of Relay UE’s serving cell to proceed with relay (re)selection. It would be beneficial to know this information before performing PC5 connection establishment. | [ZTE]For the cellBarred information, it is unnecessary to be forwarded by relay UE since the relay UE may refrain from acting as relay UE and accepting the PC5 connection request from remote UE if the cell is barred. |
|  | [Samsung] It seems that the contents in current MIB are not necessary for Remote UE behind Relay UE. So MIB does not have to be forwarded to Remote UE. |

**Position for Question 2-1:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, ASUSTeK, CATT, Xiaomi, Intel |
| **Do not support** | Ericsson, Apple (No mandatory MIB forwarding needed), ZTE, Samsung |
| **Neutral/ flexible** | Qualcomm (we think remote UE can acquire any MIB/SIB by implementation, but no MIB/SIB is specified as mandatory to forward), Huawei, HiSilicon, Spreadtrum |

**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 |  |
| [Ericsson] In principle is necessary to forwards the SIB1, but we believe that the whole content of SIB1 is not necessary. RAN2 should carefully check which fields and informations of SIB1 are necessary for the case of SL relay. |  |
| [Intel] At least the cell access relation information, UAC barring information and whether to use full Resume ID information are needed. We can discuss further whether part of SIB1 is sent before PC5 connection establishment and whether all or part of it is sent when Remote UE requests the SIB. |  |
| [Samsung] At lease SI scheduling information, UAC, relay (re)selection if any, are 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, Ericsson (only for necessary fields in SIB1 for SL relay), Huawei, HiSilicon, Apple, Spreadtrum, Intel, ZTE, Samsung |
| **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). | [Ericsson] We agree with OPPO that cell re-selection infos are only useful is the UE is able to access the cell. Otherwise, the risk is that the UE when performing cell (re)selection and relay (re)selection will always select the relay UE. This is not a reasonable behavior. |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. | [ZTE] SIB2-5 contain parameters used to control intra-frequency, inter-frequency and inter-RAT cell reselection. For the remote UE connected with relay UE, if PC5 RLF is detected it may consider to select a cell to camp/connect. However, this case happens only when the remote UE is in coverage. In coverage remote UE may receive the related SIB from the network directly. Therefore, the SIB2~SIB5 do not need to be forwarded to remote UE. |
| [Huawei, HiSilicon] we want to clarify that any SIB (other than MIB/SIB1) can be forwarded, if required by the remote UE. All these SIBs can be acquired by the remote UE using the on-demand SI mechanism. We do not need to exclude any. It is up to remote UE whether to request those. Relay UE can decide whether to forward those SIBs to remote UE, based on remote UE’s request/indication. |  |
| [Intel] Assuming this is after PC5 connection establishment, we have already agreed that the SIBs can be forwarded by Relay UE to Remote UE using PC5-RRC. We think it may be more spec impact to restrict certain SIBs. If the Remote UE considers it to be power-efficient to receive them over PC5 rather than directly over Uu (when in-coverage), it would have the flexibility to do so for any of the SIBs. |  |
| [Samsung] These SIBs do not have to be always forwarded, but they can be forwarded based on Remote UE’s request. |  |

**Position for Question 2-3:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, CATT, Xiaomi, Huawei, HiSilicon (in on-demand manner), Spreadtrum, Intel, Samsung (on-demand manner) |
| **Do not support** | OPPO, Ericsson, ZTE |
| **Neutral/ flexible** | Apple (we support on-demand retrieval of those SIBs) |

**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 | [Ericsson] PWS regulations establish that a warning can be cell specific or geo-target certain mobile devices (using the phone’s geolocation capability). On top of this, the warning message should not be forwarded to mobile devices that are not the recipient of the warning and this is to keep a certain level of trust for the end-users when the warning message is received. If we allow the UE to receive SIB6/SIB7/SIB8 from a cell in which it is not camping, not only we allow the sending of false warning for the UE, but we may also go against current regulations. |
| [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. |  |
| [Huawei, HiSilicon] See comments in Q2-3 |  |
| [Intel] See comment to Q2-3; Also, agree with MediaTek |  |
| [Samsung] Since some Remote UEs do not support ETWS/CMAS, these SIBs can be forwarded when requested by 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, Huawei, HiSilicon (in on-demand manner), Spreadtrum, Intel, ZTE, Samsung (on-demand manner) |
| **Do not support** | Ericsson |
| **Neutral/ flexible** | Apple (we support on-demand retrieval of those SIBs) |

**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 | [Ericsson] We fail to understand how time reference information of a gNB in which the UE is not camping are useful for the remote UE. SIB9 is mostly used for the synchronization but what is the benefit for the remote UE to receive such information. We should not support whether to forward or no a certain SIB without a reasonable motivation behind. |
| [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. |  |
| [Huawei, HiSilicon] See comments in Q2-3. We also want to clarify this does not mean remote UE has to support the SIB9 related features. |  |
| [Intel] See comment to Q2-3; Also, agree with MediaTek and Huawei. |  |
| [Samsung] This SIB can be forwarded when requested by Remote UE. |  |

**Position for Question 2-5:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi, Huawei, HiSilicon (in on-demand manner), Spreadtrum, Intel, ZTE, Samsung (on-demand manner) |
| **Do not support** | Ericsson |
| **Neutral/ flexible** | Apple (we support on-demand SI retrieval of SIB9) |

**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 | [Ericsson] We don’t a technical motivation to forwards this SIB to the UE. |
| [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. |  |
| [Huawei, HiSilicon] See comments in Q2-3. We also want to clarify this does not mean remote UE has to support the SIB10 related features. |  |
| [Intel] See comment to Q2-3; Also, agree with MediaTek and Huawei. |  |
| [ZTE] SIB10 contains the HRNNs of the NPNs listed in SIB1. This information can be used to judge whether a remote UE is allowed to access the dedicated cell. Thus, it may be necessary to be forwarded to remote UE. |  |
| [Samsung] This SIB can be forwarded when requested by Remote UE. |  |

**Position for Question 2-6:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi, Huawei, HiSilicon (in on-demand manner), Spreadtrum, Intel, ZTE, Samsung (on-demand manner) |
| **Do not support** | Ericsson |
| **Neutral/ flexible** | Apple (we support on-demand SI retrieval of SIB10) |

**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). | [Ericsson] EMR is not support for the remote UE and we do not see the point to forward this SIB. |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. | [ZTE] SIB11 contains information related to idle/inactive measurements, which is used for early measurement for fast DCCA setup. For the remote UE connected with relay UE, it does not support fast DCCA setup so that it is not necessary to perform the early measurement. Therefore, the SIB11 does not need to be forwarded to remote UE. |
| [Huawei, HiSilicon] See comments in Q2-3. We also want to clarify this does not mean remote UE has to support the SIB11 related features. |  |
| [Intel] See comment to Q2-3; Also, agree with MediaTek and Huawei. |  |
| [Samsung] This SIB can be forwarded when requested by Remote UE. |  |

**Position for Question 2-7:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, CATT, Xiaomi, Huawei, HiSilicon (in on-demand manner), Spreadtrum, Intel, Samsung (on-demand manner) |
| **Do not support** | Ericsson, ZTE |
| **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 | [Ericsson] We never discussed to forward positioning SIB in SL relay and this is something that it does not have anything to do for SL relay operations. We should not try to agree something that is not explicitly mentioned in the WID. |
| [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. |  |
| [Huawei, HiSilicon] See comments in Q2-3. We also want to clarify this does not mean remote UE has to support the related features. |  |
| [Intel] See comment to Q2-3; Also, agree with MediaTek and Huawei. |  |
| [Samsung] This SIB can be forwarded when requested by Remote UE. |  |

**Position for Question 2-8:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, CATT, Xiaomi, Huawei, HiSilicon (in on-demand manner), Spreadtrum, Intel, Samsung (on-demand manner) |
| **Do not support** | Ericsson |
| **Neutral/ flexible** | OPPO, Apple (we support on-demand SI retrieval of SIB11), ZTE |

**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. |  |
| [Ericsson] This is needed for SL relay |  |
| [Huawei, HiSilicon] See comments in Q2-3 |  |
| [Intel] See comment to Q2-3. |  |
| [Samsung] The SIB contents are necessary for Remote UE for SL communication and SL relay discovery. |  |

**Position for Question 2-9:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, OPPO, Qualcomm, ASUSTeK, CATT, Xiaomi, Ericsson, Huawei, HiSilicon (in on-demand manner), Apple, Spreadtrum, Intel, ZTE, Samsung |
| **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). | [Ericsson] We do not support SL relay for LTE and we should not forwards these SIBs to the remote UE. We should avoid to agree something that is not part of the WID. |
| [Xiaomi] It’s not future proof to define minimum SI for relay purpose. OSI can be requested on demand. | [ZTE] SIB13-14 contain configurations of LTE V2X sidelink communication. For the NR remote UE, it does not use the V2X sidelink communication configuration so is not necessary for the relay UE to forward this info. |
| [Huawei, HiSilicon] See comments in Q2-3. We also want to clarify this does not mean remote UE has to support the SIB13/14 related features. |  |
| [Intel] See comment to Q2-3; Also, agree with MediaTek and Huawei. |  |
| [Samsung] These SIBs can be forwarded when Remote UE requests. |  |

**Position for Question 2-10:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, CATT, Xiaomi, Spreadtrum, Intel, Samsung (on-demand manner) |
| **Do not support** | OPPO, Ericsson, ZTE |
| **Neutral/ flexible** | Huawei, HiSilicon, Apple (in on-demand manner and/or up to remote UE implementation) |

**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. |
| Ericsson | No | As replied in Q1, this looks like an optimization that can be left out from the time being. In fact, once the discovery procedure is done and the remote UE had selected a suitable relay UE, the necessary system information can be forwards once the PC5 link has been established. Given that the system information are used to send mostly Uu message, we do not see a real benefits to forward this beforehand. Further, if we go on this direction we would need to specific how and when a UE will start to broadcast this system information and this it may also mean higher spec impact and higher power consumption for the UE(s). Also, an aspect that needs to be considered is the impact that this will have on other WGs like SA2 or CT1. We can discuss this optimization at the end of the release once that all the basic features are in place. |
| Huawei, HiSilicon | See comment | Regardless whether we specify this concept for relay, the Minimum SI is clear, which means as in legacy MIB (if agreed in relay) and SBI1, and those needs to be forwarded to remote UE by default. This has no relationship with whether support the SIB forwarding before PC5. The baseline should be relay UE always forward the minimum SI via PC5 RRC by default, without the need of request from remote UE.  I guess companies have different understanding on the “concept of Minimum SI”. It should be the pair concept to “on-demand SI”, which is forwarded from relay UE to remote UE based on request. |
| Apple | Neutral | We do not support “MSI acquisition before PC5 connection establishment”, but if there is a benefit to reduce signaling overhead in PC5 interface for SI forwarding of essential information extracted from SIB1+SIB12, we are fine. As we explained earlier, MIB information is not needed as part of PC5 MSI. |
| Spreadtrum | See comment | We share the same view with OPPO. |
| Intel | See comment | We have the same view as OPPO. This is tied to Q1-2 and we need to conclude on this aspect and should not wait until stage-3. |
| ZTE | Yes | Whether the concept of minimum SI should be defined can be discussed later when the pending issues mentioned by rapporteur have been determined. |
| Samsung | See comment | We also think that RAN2 can discuss and decide the need of minimum SI based on this email discussion about necessity of SI acquisition before establishing PC5 RRC connection with Relay UE. |

**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. |  |
| [Ericsson] The UE should not be forbidden to acquire SIB in the cell in which is camping. Further, certain SIBs are necessary to be acquire by the UE. One example are the cell re-selection SIB but also SIB6/SIB7/SIB8 in order to comply with the PWS regulations. |  |
| [Huawei, HiSilicon] Direct reception should always be allowed by implementation. But it has no impact to the reception over relay UE. Also, for L2 relay, it is required that direct cell should be same as the relay UE’s serving cell. |  |
| [Intel] Since we have agreed that cell reselection and relay reselection are independent procedures, the UE may need to obtain SIBs via Uu when in-coverage; at the same time, we think it is better to have the flexibility to allow the UE to obtain system information via either Uu or relay UE. |  |
| [Samsung] We think that SI acquisition via Uu can be up to Remote UE without any additional specification impact. |  |

**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, Ericsson (SIB2/3/4/5/6/7/8 should be mandatory to be acquired on the direct path), Huawei, HiSilicon (allowed by UE implementation), Apple (leave to UE implementation, no spec impact), Spreadtrum, Intel, ZTE, Samsung |
| **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.  (MediaTek-2)  We can probably to split the discussion into Remote UEs in RRC\_INACTIVE and into Remote UEs in RRC\_IDLE.  For the L2 Remote UE(s) in RRC\_INACTIVE, it would be easy for the gNB to initiate a RRC signaling to notify the L2 Relay UE via RAN based paging, since the Remote UE-Relay UE association is stored locally at gNB (the context of the Relay UE is always there at the serving gNB, so there is some linkage to the related Remote UEs, even if their contexts are held at a different gNB.).  For the L2 Remote UE(s) in RRC\_IDLE, we assume the core network can store the Remote UE-Relay UE association. When the core network sends the paging to reach Remote UEs, the gNB can identify this is a paging for Remote UEs and he can use dedicated signaling to notify the Relay UE as it is connected. In this case, Relay UE’s power consumption is controllable.  Alternatively (option 1), if we ask the Relay UE to monitor the PO during RRC\_CONNECTED, BWP switching needs to perform frequently and then may impact the UE transmission and reception at its dedicated BWP. |
| [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. | [Ericsson] We agree with Qualcomm and MediaTek that monitoring the PO while in RRC\_CONNECTED will put a high burden on the UE and on the Network. Further, in addition to the fact that this deviates completely from the framework that has already been specified since Rel-15, it requires also a big impact on the specification since the number of CORESET and common search space should be increased. |
| [Huawei, HiSilicon] For QC’s comments, it indeed adds some restrictions to the NW configuration. But, it is quite possible, “*The number of Search Spaces per BWP is limited to 10 including the common and UE specific Search Spaces*” “*The network configures at most 3 CORESETs per BWP per cell (including UE-specific and common CORESETs)*”. | [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. | [Apple] The remote-relay UE association is visible to gNB and this is actively maintained. gNB shall use this information wisely to avoid conduct CN or RAN paging in multiple cells. gNB just need to send a RRC siganling to relay UE to trigger the page forwarding via the Uu link. Hence, we think it is unreasonable for RRC\_CONNECTED relay UE to still monitor paging in this case. If remote UE is no longer connected (e.g, PC5 RLF), then gNB will be notified by relay UE and the usual paging will be used by gNB. In either case, the L2 relay UE does not need to monitor paging for remote 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. |  |
| [Intel] As long as the Remote UE is PC5-connected to the Relay UE, its PO is to be monitored by the Relay UE. |  |
| [ZTE]We think Option 1 can be used for paging monitoring and relaying of relay UE in any RRC state. Option 2 is actually an optimization. Option 2 can be considered if time allows. |  |
| [Samsung] Anyhow Relay UE in RRC\_IDLE/RRC\_INACTIVE should monitor paging for its Remote UEs so paging monitoring by Relay UE in RRC\_CONNECTED for its Remote UEs seems not a big burden. Rather we have concerns on that gNB keeps the context of Remote UEs in RRC\_IDLE or RRC\_INACTIVE and the association of Remote UE and Relay UE should be kept updated at gNB to generate dedicated paging message. But this option is only applicable if active DL BWP of Relay UE is configured with common search space. |  |

**Position for Question 5-1:**

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

|  |  |
| --- | --- |
| **Support** | OPPO, CATT, Xiaomi, Huawei, HiSilicon (at least allowed as baseline), Spreadtrum, Intel, ZTE, Samsung (if active DL BWP of Relay UE is configured with common search space) |
| **Do not support** | MediaTek, Qualcomm, ASUSTeK, Ericsson, Apple, |
| **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. |  |
| [Ericsson] Using a dedicated RRC message is the simplest and clean solution to use in this case. The network is aware of the relay UE since it is in RRC\_CONNECTED and can reach it anytime. | [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. |
| [Apple] As explained earlier, this is a very efficient solution to reduce the wasterful paging overhead. | [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. |
|  | [Huawei, HiSilicon] Even if gNB knows the association between remote UEs and relay UE, gNB does not know the remote UE for which the paging message is sent, because gNB does not know the S-TMSI of remote UE. |
|  | [Intel] We think it somewhat breaks the fundamental understanding of how e.g. RRC\_IDLE paging is handled. Even if we assume that the gNB maintains remote UE ID information (e.g. S-TMSI) as part of Relay UE context, it is not clear to us how the gNB handles the CN paging for corresponding IDLE remote UE ID; however, if we determine that it could be supported by the network handling i.e. it stores the remote UE information as part of the relay UE context, we are flexible in our view to reduce network restriction when relay UE has to monitor paging while in RRC\_CONNECTED. |
| [Samsung]  This option should be supported for the case active DL BWP of Relay UE is not configured with common search space. |  |

**Position for Question 5-2:**

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

|  |  |
| --- | --- |
| **Support** | MediaTek, Qualcomm, ASUSTeK, Ericsson, Apple, ZTE, Samsung (if active DL BWP of Relay UE is not configured with common search space) |
| **Do not support** | OPPO, CATT, Xiaomi, Huawei, HiSilicon, Spreadtrum |
| **Neutral/ flexible** | Intel |

**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.  [Huawei, HiSilicon] Agree with MediaTek. Updated SI and SIB 6/7/8 can be directly forwarded from relay UE to remote UE. |
|  | [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.  [Intel] Agree with Qualcomm view that we cannot consider a solution with any form of RAN1 impact in this topic. |
|  | [Xiaomi] L1 short message on PC5 is impossible and unnecessary. |
|  | [Ericsson] In order to support this we most likely need to define a new SCI with a consequent big impact on RAN1. We should not pursue this in Rel-17. |
|  | [Samsung] This option impacts on RAN1. |

**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, Ericsson, Huawei, HiSilicon, Apple, Spreadtrum, Intel, ZTE, Samsung |
| **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.  [Huawei, HiSilicon] Agree with MediaTek. Updated SI and SIB 6/7/8 can be directly forwarded from relay UE to remote UE. |
|  | [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. | [Apple] It is possible that the updated part of SI is not relevant for remote UE operation. So, the relay UE shall not blindly forward the short message to remote UE to trigger SI retrieval, this can save the power consumption especially for remote UE which is not in RRC\_CONNECTED state. |
| [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. | [Intel] We think that this support depends on the overall SI forwarding design (e.g. whether we support SIB forwarding using PC5 broadcast or not). At the same time, although we are of the view that if the Remote UE has requested for certain SIBs to be relayed and receives them over unicast PC5, it is reasonable to assume it is interested in receiving updated SIB as well, we are open to consider majority view in this aspect. |
| [Ericsson] The relay UE may simply forward the indications received in the short message (over Uu) to the remote UE. | [Samsung]  We do not see a need to forward SI/emergency notifications in the Short Message to Remote UE. Relay UE will forward the required SIB(s) or actual ETWS/CMAS instead. |
| [ZTE] Suppose the systemInfoModification or etwsAndCmasIndication in the short message is set to 1, the relay UE may notice the change and then 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. |  |

**Position for Question 6-2:**

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

|  |  |
| --- | --- |
| **Support** | Qualcomm, Xiaomi, Ericsson, Spreadtrum, ZTE |
| **Do not support** | MediaTek, OPPO, ASUSTeK, CATT, Huawei, HiSilicon, Apple, Samsung |
| **Neutral/ flexible** | Intel |

**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).