3GPP TSG-RAN WG2 Meeting #118 Electronic R2-220xxxx

Online, 09 – 20 May 2022

**Agenda item: 6.7.2.7**

**Source: Huawei, HiSilicon**

**Title: Report of [AT118-e][633][Relay] Remaining ASN.1 review issues (Huawei)**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report of the following offline discussion:

* [AT118-e][633][Relay] Remaining ASN.1 review issues (Huawei)

Scope: Discuss the remaining issues from R2-2206077, prioritising the high and medium priority issues.

Intended outcome: Report to Monday week 2 session

Deadline: Friday 2022-05-13 1800 UTC

# 2 Contact points

|  |  |
| --- | --- |
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# 3 Discussion

During Pre-118-e #602, several open issues are identified, and the proposals are given as shown in Annex. After Monday WI online discussion, the higher priority issue 18/20 have been concluded, and issue 4/17 have discussed with initial agreements and FFS points which need further discussion.

**3.2 Higher priority issues (class 2)**

### Issue 4: PC5 RLC bearer and SRAP configuration for remote UE’s SRB1 transmission/reception at PC5 hop

Agreements:

Proposal 1 (modified): Regarding the configuration used for SRB1 transmission/reception at PC5 hop, RAN2 to agree:

– All SRB1 messages are allowed to use default SL-RLC1, i.e. remove the dedicated configuration of PC5 RLC from RRCReestablishment message;

– Discuss offline in [AT118-e][633] whether to remove the dedicated configuration of PC5 RLC from RRCSetup message;

– Define default configuration of SRAP used for reception of RRCResume/RRCReestablishment at PC5 hop, in order to establish SRAP entity and pass the messages to RRC layer.

During online discussion, there is no absolute clear view on whether RRCSetup can include dedicated PC5 RLC configuration used for SRB1 transmission/reception at PC5 hop. The concern to include it is mainly on security risk. However in Uu interface, cellGroupConfig and radioBearerConfig are allowed to be included for SRB1.

RRCSetup-IEs ::= SEQUENCE {

radioBearerConfig RadioBearerConfig,

masterCellGroup OCTET STRING (CONTAINING CellGroupConfig),

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension RRCSetup-v1700-IEs OPTIONAL

}

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| ***masterCellGroup***  The network configures only the RLC bearer for the SRB1, *mac-CellGroupConfig*, *physicalCellGroupConfig* and *spCellConfig*. |
| ***radioBearerConfig***  Only SRB1 can be configured in RRC setup. |

Then following the Uu logic, it could be acceptable to include the following remote UE specific dedicated configuration as what are in the current RRC specification.

RRCSetup-v1700-IEs ::= SEQUENCE {

sl-ConfigDedicatedNR-r17 SetupRelease {SL-ConfigDedicatedNR-r16 } OPTIONAL, -- Cond L2RemoteUE

sl-L2RemoteUEConfig-r17 SetupRelease {SL-L2RemoteUEConfig-r17 } OPTIONAL, -- Cond L2RemoteUE

nonCriticalExtension SEQUENCE {} OPTIONAL

}

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| ***sl-ConfigDedicatedNR***  The network configures only the PC5 Relay RLC channel and *sl-PHY-MAC-RLC-Config* for the SRB1. |
| ***sl-L2RemoteUEConfig***  The network configures only the *sl-ServingCellInfo* and SRAP configuration for the SRB1. |

**Q1: Do companies agree to keep the dedicated configuration in *RRCSetup* message for remote UE’s SRB1 transmission/reception at PC5 hop as the current RRC specification?**

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| **Company** | **Agree/Disagree** | **Comments** |
| OPPO | Agree | Have not identified blocking issue here, prefer to stick to the agreement at the current stage |
| Xiaomi | Agree | There is more spec impact to exclude the dedicated configuration. |
| Apple | Agree | 1. We understand RAN2 agreed to include dedicated configuration in RRCSetup in RAN2#117-e due to the trigger of RAN3 LS  2. For the security concern raised by some company, we think RAN2 should avoid SA3 invovlement at this late stage. So, the simplest way is to follow the way of Uu RRCSetup message, i.e. can include dedicated configuration on SRB1. |
| ZTE | Agree | There is no sufficient reason to overturn the previous agreement. |
| vivo | Partially agree | We are OK to keep the dedicated configuration in *RRCSetup* message for remote UE’s SRB1 transmission/reception at PC5 hop. But the current RRC specification includes more than that, i.e., *sl-ServingCellInfo* within *sl-L2RemoteUEConfig* used for shortMAC-I calculation, see in yellow.  ***sl-L2RemoteUEConfig***  The network configures only the *sl-ServingCellInfo* and SRAP configuration for the SRB1.  Actually, the earliest RRC re-establishment procedure will be initiated only after Initial AS security activation and RRC reconfiguration procedure with SRB2 and at least one DRB setup. Therefore, keep the *sl-ServingCellInfo* in *RRCReconfiguration* message is enough for shortMAC-I calculation andthe *sl-ServingCellInfo* in the *RRCSetup message* can be removed.  [Rapp] The question is more about the SL RLC config and SRAP config. Once the PCI is agreed to be included in an earlier message, we agree it is not needed anymore in RRCSetup. |
| Samsung | Agree with comment | We share the comment by vivo that *sl-ServingCellInfo* is not need in *RRCSetup* message. |
| CATT | Agree | We would like to keep the previous agreement if there is no tech issue found. |
| Huawei, HiSilicon | Agree |  |
| Qualcomm | Agree | Uu supports sending SRB1 config in RRCSetup message. From a Remote UE standpoint, we should not make any exceptions to its Uu behaviour, i.e. it should receive PC5 RLC config for SRB1 as well. This also aligns with the RAN2#117-e agreement to include SRB1 dedicated configuration in RRCsetup message. |
| LG | Agree |  |
| Lenovo | Agree | We are not sure if there’s any security risk here: the relay must be already in RRC Connected at this point and therefore the Uu link is secured (security active) and the PC5 link must also be secured since the remote and relay UEs would have established PC5 RRC Connection. So, if the RRCSetup itself is not protected (no security context of the remote yet in the gNB), it is not a real security risk as this message does not leave a secure environment. |
| Intel | Prefer not to | The Uu interface signalling ASN.1 for RRCSetup re-used the IEs defined for reconfiguration but the intention was to only provide essential configuration to set up SRB1. Inclusion of these parameters in the ASN.1 does not in itself compromise security – it is only an issue if it is used.  In terms of SL configuration in RRCSetup, if something is essential, it can be considered for inclusion in RRCSetup message. However, it seems possible to use default configurations for SRB1 during Setup (as for re-establishment). And RRC re-establishment following RRCSetup can’t happen before security – so there is no motivation to carry any information related to RRC Re-establishment in RRCSetup message. Hence we don’t see it essential to provide any SL related configuration in RRCSetup.  In general, our understanding is that SA3 guidance is to avoid providing UE configuration before security activation. If we do include additional parameters beyond the essential RLC bearer and SRAP configuration for SRB1, we would need to check with SA3 on what can actually be provided to the remote UE. It is simpler to not provide any considering it is not essential and use default configuration, especially if it is used for re-establishment.  Hence our preference is to not include any SL related parameters in RRCSetup. |
| Nokia | Agree |  |

Summary:

13 companies participated in the discussion. 12/13 companies agree the proposal, i.e. keep the current dedicated configuration for SRB1 transmission at PC5 hop. 1/13 companies prefer not to include it. By reading the comments from opponent company, the rapporteur understands they can accept to include essential RLC bearer and SRAP configuration for SRB1, the concern is on other parameters for RRC re-establishment, i.e. *sl-ServingCellInfo*. If so, the compermise could be removing the *sl-ServingCellInfo* from *RRCSetup* message to the first *RRCReconfiguration* message. Furthermore, we can consider to apply the unified handling to *RRCReestablishment/RRCResume* message. In order to make progress, the rapporteur suggests:

**[12/13] Proposal 1a: Keep the dedicated SL RLC and SRAP configuration in *RRCSetup* message for remote UE’s SRB1 transmission/reception at PC5 hop as the current RRC specification.**

**Proposal 1b: Remove the *sl-ServingCellInfo* from *RRCSetup* message to the first *RRCReconfiguration* message. Make the same change to *RRCReestablishment/RRCResume* message.**

### Issue 17a: Missing information of PCI and ARFCN-DL for key derivation during RRC resume/reestablishment procedure

Proposal 2 (modified): PCI and ARFCN-DL should be provided to remote UE to derive KgNB before remote UE receiving RRCResume/RRCReestablishment message. Discuss offline in [AT118-e][633] whether to use PC5-RRC or the RRC container in discovery message; the availability of target cell ID can also be checked if an issue is found.

As agreed, the inputs to derive the new key used in the cell for RRC reestablishment/resume procedure include the PCI and ARFCN-DL of that cell, therefore the information should be provided to the remote UE, which seems possible via either PC5-RRC or discovery message.

There are some follow-up questions for the alternatives.

* If we go with discovery message, the information can be included in the RRC container, the potential RRC specification change could be as follows, assuming all the UEs can get the information via discovery procedure.

SL-AccessInfo-L2U2N-r17 ::= SEQUENCE {

cellAccessRelatedInfo-r17 CellAccessRelatedInfo OPTIONAL, -- Need R

...,

sl-PCI-ARFCN-r17 ::= SEQUENCE {

physCellId-r17 PhysCellId,

carrierFreq-r17 ARFCN-ValueNR

}

}

* If we go with PC5-RRC, RAN2 needs to further decide at least following issues:
  + 1. which PC5 RRC message to use, new or existing message.
  + 2. when/how the relay UE decide to send the PC5-RRC message to the UE.

**Q2: Which message do companies prefer to be used for delivery of PCI and ARFCN-DL to the remote UE, RRC container in discovery, or PC5-RRC message?**

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| **Company** | **Discovery/PC5 RRC** | **Comments** |
| OPPO | Discovery | Slightly prefer discovery message since it means the related info can be acquired by remote UE before PC5-RRC connection, and can save the discussion on the following left-overs on the current stage.  Otherwise, can follow majority. |
| Xiaomi | Discovery |  |
| Apple | Discovery, but.. | Same view as OPPO that it allows remote UE to acquire the related information before PC5-RRC connection. And the remote UE behaviour will be similar to legacy Uu. And also the extra spec work is minor compared with the approach of PC5 RRC.  Meanwhile, if agreed in discovery, we think it means remote UE will be required to still receive discovery message even after initializing RRC re-establishment procedure.  [Rapp] I understand the spec only says the new key is derived after receiving RRCReestablishment, but does say when to obtain PCI of the new cell, which should be up to UE implementation? Therefore it seems no need to specify UE behaviour specific to remote UE given that no UE behaviour is specified for Uu UE. |
| ZTE | Discovery, but | For general scenario, discovery message is fine.  However, for the remote UE’s re-establishment triggered by relay UE’s serving cell change and remote UE decides to maintain the PC5 connection with relay UE, it would be better for the remote UE to receive the PCI/ARFCN-DL from the relay UE via NotificationNessageSidelink. In this case, it saves the time for discovery message monitoring.  [Rapp] I understand the notification is sent from the relay UE at the timing point of relay UE experiencing Uu issues but not the timing point of recovery Uu link in another cell, which means the relay UE has no information of the recovery cell when sending notification message to the remote UE. |
| vivo | Discovery | Prefer discovery message with minimized specification efforts. |
| Samsung | Discovery | We think that this procedure should be supported before PC5 link establishment with selected Relay UE for RRC\_IDLE/INACTIVE Remote UE. |
| CATT | Discovery |  |
| Huawei, HiSilicon | Discovery |  |
| Qualcomm | None | RAN2#116bis-e made an agreement “PCI of relay UE serving cell can be delivered to remote UE in the same way as for C-RNTI, i.e., using RRCSetup / RRCResume / RRCReestablishment / RRCReconfiguration.” So, PCI is already available to UE and not necessary to send in discovery.  Similarly, we think that ARFCN-DL can be sent in RRC messages, RRCSetup / RRCResume / RRCReestablishment / RRCReconfiguration, from gNB as it is only necessary for UE connecting to the gNB via relay. We do not see a need to send it in discovery.  [Rapp] what we discuss now is a different issue from RAN2#116bis-e agreement. Here, the issue is that before UE receiving/decoding RRCRestablishment/RRCResume message, the UE needs to be provided PCI and ARFCN-DL to derive the key used for security protection on RRCRestablishment/RRCResume message. This means it would not work if the information is provided inside the messages. |
| LG | Discovery | We slightly prefer to minimize spec impact. |
| Lenovo | PC5 RRC message | Discovery is a nice place to put the PCI and ARFCN-DL but we need to think about the overhead of the discovery message and therefore the power consumption of the relay UE esp. since the 36 bit CellIdentity (NCGI) is already to be carried in Discovery message. A relay UE shall transmit discovery message much more often that a competing PC5 RRC message. |
| Intel | PC5 RRC will provide better performance | Firstly, we note that for RRC Re-establishment, communication between the UE and network will be interrupted until UE completes the Re-establishment procedure. Hence it is useful to minimise interruption.  Secondly, these parameters (PCI and ARFCN-DL) are required for KgNB\* generation that happens after the UE sends the RRCReestablishmentReq/RRCResumeReq messages. The UE needs the target Cell Id first to generate the MAC-I. Hence providing PCI and ARFCN-DL before target Cell Id doesn’t reduce interruption time. And the UE requires all three parameters to complete the re-establishment (and also complete the following reconfiguration procedure) before being able to restart sending data to the network.  [Rapp] In fact, CellIdentity is already included in discovery as well. If UE prefers to receive all three parameters together as you suggested, discovery message seems to be the better place.  For the same reasoning provided by ZTE, t is also not clear how frequently discovery messages are broadcast with model A and model B initiation and response with upper layer may consume additional time. Hence, we expect larger delays from using Discovery message compared to using PC5 RRC. |
| Nokia | Discovery |  |

Summary:

13 companies participated in the discussion. 10/13 companies vote for discovery message. 2/13 companies vote for PC5 RRC message, considering discovery overhead. 1/13 company answers none, but the reason seems to be misunderstanding on the issue. 1 company voting for discovery also considers to further optimize on reestablishment procedure by using notification message. To simplify the discussion, the rapporteur suggests to follow majority view.

**[10/13] Proposal 2a: PCI and ARFCN-DL of relay UE’s serving cell is included in the RRC container in discovery message for KgNB derivation.**

**Proposal 2b: PCI is removed from *sl-ServingCellInfo.***

**Q3: If PC5 RRC is chosen in Q2, which PC5 RRC message is preferred, new message or existing message (and please indicate which existing message)?**

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| --- | --- | --- |
| **Company** | **New PC5 RRC message/existing message** | **Comments** |
| ZTE | Existing message | As we mentioned in Q2, for the remote UE’s re-establishment triggered by relay UE’s serving cell change and remote UE decides to maintain the PC5 connection with relay UE, it would be better for the remote UE to receive the PCI/ARFCN-DL from the relay UE via NotificationNessageSidelink. |
| Lenovo | Existing message | ARFCN-DL can be added alongside PCI enhancing the previous RAN2 agreements, SL-ServingCellInfo-r17 (including the source PCI and C-RNTI) is added into RRCSetup. In addition, the NotificationMessageSidelink can be used for the “same relay” cases. |
| Intel | Existing message | NotificationMessageSidelink seems to be the most appropriate message here as it is already carrying the information about the RLF and other scenarios where there is a change in the cell that relay UE is connected to. |
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Summary of Q3/Q4/Q5:

It seems companies think the notification message could be the one include PCI and ARFCN-DC. However, the rapporteur understand the notification message should be sending upon RLF is detected by the relay UE, after that the relay UE will perform cell selection to find a cell to initiate the RRC reestablishment procedure. Therefore, the rapporteur does not think the solution based on notification message can work.

**Q4: If PC5 RRC is chosen in Q2, about when/how the relay UE determine to send the PC5 RRC message to the remote UE, which option do companies prefer?**

* **Option#1: based on remote UE’s request, i.e. similar like SIB request, the remote UE can indicate PCI and ARFCN-DL request via PC5-RRC message so that relay UE can response a PC5 RRC message including the information.**
* **Option#2: based on unsolicited forwarding, i.e relay UE can proactively send the PC5 RRC message without remote UE’s request.**
* **Options#3: when relay UE sends the NotificationMessageSidelink to relay UE**
* **Option#x (please add other options here if any)**

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| **Company** | **Option#1/#2** | **Comments** |
| ZTE | Option 3 |  |
| Lenovo | Option 3 | + RRCSetup for cases when Remote UE selects a new Relay. |
| Intel | Option 2 | The relay UE can proactively send this when required to the remote UEs. |
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**Q5: If option#2 (i.e. unsolicited forwarding) is chosen in Q4, when the relay UE sends the PC5 message to the remote UE?**

* **Option#1: left to relay UE implementation, i.e. it may require to send the message to every remote UE upon PC5 unicast link establishment to ensure the remote UEs have such essential information.**
* **Option#2: after reception of a message via SL-RLC0 which means the remote UE is initiating any of RRCSetup/RRCResume/RRCReestablishment procedure.**
* **Option#3: after reception of the first downlink SRB1 message via Uu and before forwarding the message to the remote UE, i.e. the relay UE needs to first send PCI and ARFCN-DL to the remote UE, and then forward the msg4 to the UE.**
* **Options#x (please add other options here if any)**

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| **Company** | **Option#1/#2/#3** | **Comments** |
| Intel | Option 4 | The current triggers for sending the NotificationMessageSidelink is sufficient. The rest can be left to UE implementation; for example that relay UE sends this message after acquiring this information. |
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### Issue 17b: To check if *VarShortMAC-Input/ VarResumeMAC-Input* is available for remote UE’s RRC restablishment/resume procedure

VarResumeMAC-Input ::= SEQUENCE {

sourcePhysCellId PhysCellId,

targetCellIdentity CellIdentity,

source-c-RNTI RNTI-Value

}

VarShortMAC-Input ::= SEQUENCE {

sourcePhysCellId PhysCellId,

targetCellIdentity CellIdentity,

source-c-RNTI RNTI-Value

}

According to the previous RAN2 agreements, SL-ServingCellInfo-r17 (including the source PCI and C-RNTI) is added into RRCSetup/RRCResume/RRCRestablishment/HO command when the UE accessing the source cell. Then in legacy procedure the target cell identity is included in SIB1 and abstained by UE via acquisition of SIB1. The same procedure should be followed by remote UE. (Note although discovery message also include cellAccessRelatedInfo, reading SIB1 seems enough, which align the remote UE behaviour with the legacy UE behaviour during RRC reestablishment/resume procedure.)

**Q6: Do companies agree the targetCellIdentity is abstained by remote UE via SIB1 acquisition similar like legacy RRC reestablishment/resume procedure?**

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| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| OPPO | Agree |  |
| Xiaomi | Agree with comments | Besides SIB1, Remote UE can also obtain targer cell id via discovery as discussed in previous question. |
| Apple | Agree |  |
| ZTE | Agree |  |
| vivo | **Disagree** | According to definition of the ***targetCellIdentity*** as below, it is already part of the *cellAccessRelatedInfo* contained in the RRC container in the discovery message. We suggest to adopt a single solution(i.e., the same discovery message as replied in Q2 for PCI and ARFCN-DL), then all parameters that are needed for the shortMAC-I calculation input are obtained by one message.  ***targetCellIdentity***  An input variable used to calculate the *resumeMAC-I*. Set to the *cellIdentity* of the first *PLMN-Identity* included in the *PLMN-IdentityInfoList* broadcasted in *SIB1* of the target cell i.e. the cell the UE is trying to resume.  [Rapp] To be clear, do you believe the UE should not execute the following step or do you mean the UE cannot obtain cell identify by executing the following step?   |  | | --- | | 5.3.7.3a Actions following relay selection while T311 is running Upon selecting a suitable L2 U2N Relay UE, the L2 U2N Remote UE shall:  1> ensure having valid and up to date essential system information as specified in clause 5.2.2.2;  … | |
| Samsung | Agree | Since there is no difference from legacy procedure, we understand that there is no additional specification impact. |
| CATT | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Qualcomm | Agree |  |
| LG | Agree |  |
| Lenovo | Disagree | First, SIB1 forwarding is (unfortunately) left to Relay UE implementation. Second, TS 23.304 specifies that NCGI is provided as part of Discovery message. Third, between the discovery message and SIB1 (of the target cell via relay), the discovery message will be available earlier (esp. for a new relay case). So, we think that using Discovery is better. But this choice can also be left to UE implementation esp. since TS 23.304 mentions that NCI “may be” provided in the Discovery message and so there is perhaps no guarantee. |
| Intel | Disagree with comments | While we agree that Discovery or SIB1 acquisition can provide targetCellID, it will increase interruption time.  As pointed out in our previous response, this parameter for MAC-I calculation is needed by the UE before the key derivation parameters. So, even if the UE is provided with the key generation parameters in the NotificationMessageSidelink message, UE has to wait until it receives the target cell id before initiating the RRCRe-establishment message. Any delay in providing this will increase interruption time for RRCRe-establishment.  Remote UE will attempt acquiring SIB1 after it is notified (using the notificationMessageSidelink) of the relay UE Re-establishment procedure. And as mentioned earlier, discovery procedure may take much longer. Hence providing the targetCellId also in the NotificationMessageSidelink will provide the smallest interruption.  In summary, while discovery on its own or discovery+SIB1 acquisition can provide all the information, we think providing all the information (PCI, ARFCN, targetCellID) in the NotificationMessageSidelink will provide the least interruption and a unified handling of all the required information. |
| Nokia | Comment | The Remote UE can use the target cell ID from the CellAccessRelatedInfo included in the Discovery message or from SIB1. Is there a need to specify it (can it be left to UE implementation)?  [Rapp] Agree. If the remote UE already required cell identity from discovery, it can consider it has valid essential information of it, and does not need to require it from SIB1 anymore. My feeling is also no extra specification impact. |

Summary:

13 companies participated the discussion. 9/13 companies agree that the current description of “ensure having valid and up to date essential system information as specified in clause 5.2.2.2’ in 5.3.7.3a can ensure targetCellIdentity is abstained by remote UE. 2/13 companies (vivo, Lenovo) prefer to use discovery. 1/13 company (Nokia) comment the remote UE can read cell identify from either discovery or SIB1 and no need to specify it, which the rapporteur also agree. 1 company (Intel) suggest to use notification message.

Between discovery message and SIB1, the rapporteur understand there is not much difference, because it is the same cellAccessRelatedInfo. The point here is to confirm that the current signalling and procedural text can ensure the cell identity is available to the remote UE. Then which message to be used is up to the remote UE implementation.

**[12/12] Proposal 2c: The cell identity in *cellAccessRelatedInfo* (from either discovery message or SIB1) is used to calculate shortMAC-I at remote UE as legacy, and no extra spec impact is needed.**

**3.2 Medium priority issues (may have asn.1 impact)**

### Issue 6: How to determine serving cell change of target relay UE before path switch

RAN2 has discussed the case that target relay in idle/inactive may perform cell reselection after network sending path switch command to the remote UE and before the remote UE successfully connecting to the target relay UE, and agreed that remote UE triggers RRC reestablishment if it identifies such cell change of target relay. However, regarding how the remote UE identifies such case, there is no absolute consensus, thus the compromise is to leave it to UE implementation (e.g. discovery procedure or measurement procedure). Now companies commented it should clarify the UE behaviour, the potential solutions are:

1. Based on measurement report;

2. Based on cell ID which should be indicated in both of path switch command and discovery message, i.e. NCGI is to be added to path switch command.

For solution 1, during previous discussion it was commented by companies that it is not a must that network configure path switch based on measurement results. With the rapporteur hat on, it is suggested:

**Q7: which option do companies prefer to capture the remote UE’s behaviour on determining target relay UE’s serving cell change?**

* **Solution #1: Based on measurement report;**
* **Solution #2: Based on cell ID indicated in both of path switch command and discovery message, i.e. NCGI is to be added to path switch command.**
* **Solution #3: Keep the current description, i.e. left to UE implementation.** **Note that if the PCI is indicated in discovery message or PC5 RRC message, such information can also help to determine cell change.**

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| **Company** | **Solution#1/#2/#3** | **Comments** |
| OPPO | 3 (2 as second prio) | Our first preference is #3 since it does not seem to be a critical issue that would frequently happen.  Then if R2 really would like to pursue a solution, prefer solution 2, since rigorously, considering the ping-pong of relay UE, only the cell that network has prepared the HO matters, so the explicit indication in HO-command is safer. |
| Xiaomi | 1 or 2 | We think UE behavior should be clarified. There are two understanding of the UE behavior,   1. Determination of relay UE’s cell change is after reception of path switch command, so the remote UE is not required to constantly monitor candidate relay’s cell id before reception of path switch command. 2. Remote UE is required to constantly monitor the candidate relay UE’s cell id change before reception of path switch.   2nd understanding would result in false path switch failure in two cases in [5]. More seriously, this would increase remote UE’s complexity and power consumption, since there may be multiple candidate relay UEs.  Both proposed solutions can resolve this issue. Solution 2 may have larger impact ude to ASN.1 impact. |
| Apple | 1 | First, we also think UE behaviour should be clarified. So, we prefer 1 or 2.  Then, the intention to introduce the new failure handling behavior is because relay UE may perform cell reselection during the time gap after remote UE measurement report and before path switch execution. So, Solution 1 is more suitable. As Xiaomi mentioned, Solution 2 may require remote UE to continusly monitor relay UE's cell ID change, which is unnecessary.  [Rapp] If UE wants to detect cell change, then it needs to check if the to-be-connected relay UE is the same as the one in MR/indicated in path switch command. On this point, there is no difference between option 1 and 2. |
| ZTE | 3 | Discovery message can be used before PC5-RRC established. And Notification message/SIB1 can be used after PC5-RRC established. |
| vivo | 3 |  |
| Samsung | 3 |  |
| CATT | 3 | We would like to follow the previous agreement if no tech issue found. |
| Huawei, HiSilicon | Prefer 2 with the modification that remote UE check cell change based on PCI.  Can accept 3 |  |
|  |  |  |
| Qualcomm | 3 | Keep the current description and leave it to UE implementation |
| LG | 3 |  |
| Lenovo | 3 | Should be a corner case and further we agree with ZTE; and in addition, the cell identity (NCGI) before and after relay selection (PC5 connection est.) will expose the change of serving cell of the relay UE. |
| Intel | 3 | We also think this is corner case which will not happen frequently. Considering this, we think a smart Remote UE will perform model B discovery to confirm the cell ID of the relay UE it is connecting to if it is not yet PC5 RRC connected and/or obtain SIB1 as soon as it is PC5 RRC connected. We wanted to also clarify whether solution#1 indicates that the Remote UE perform measurement report again after receiving path switch command?  [Xiaomi] Solution 1 doesn’t trigger measurement report after path switch command. The measurement report in solution 1 occurs before path switch command, which may be triggered by event Y1/Y2. |
| Nokia | 3 |  |

Summary:

13 companies participated the discussion. 10/13 companies prefer solution 3, i.e. to keep the current wording in spec. 1/13 company prefer solution 2 but can accept solution 3. 2/13 companies prefer solution 1. Considering the cell change before path switch is kind of corner case, and majority believe the current wording is fine, the rapporteur suggests to follow majority view.

**[10/13] Proposal 3: It is left to remote UE implementation on how to identify relay UE’s serving cell change in case of path switch, i.e. keep the current description in spec.**

**3.3 Lower priority issues (class 1)**

Among the left class 1 issues, the rapporteur understands those issues can be treated at best effort. If there is no enough time, they can be handled in CR update, but it would be helpful anyway if company views can be collected before that.

### Issue 2: Whether the concept of PCell/current cell is applicable to L2 remote UE

On this issue, one side is that RAN2 agreed the relay UE’s PCell is remote UE’s PCell as remote UE is controlled by the cell behind relay UE. The other side is the remote UE is not connected directly via the physical cell, thus it is not literally served by the cell. But the rapporteur understand aligning the existing wording in the spec can avoid having more relay specific spec impact, thus suggests RAN2 to keep the concept of PCell/current cell for remote UE if no particular technical issue is found.

**Q8: Do companies agree to keep the concept of PCell/current cell for remote UE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| OPPO | Agree with comment | Intention agreeable, yet:  Checking at the related RILs, it seems the key issue triggering this discussion is whether the related sentence in 5.3.5.7 on applying the PCell based on the dedicated configuration is sufficient for remote UE, or we need to apply an additional sentence on applying the current cell to be PCell as for normal UE. It is more an editorial thing. So we are fine with the intention of, but in order to solve the RILs, we feel a CR-based discussion might be easier. |
| Xiaomi | Agree |  |
| Apple | Agree |  |
| ZTE | Agree |  |
| vivo | See comments | We also suggest to discuss it more clearly by a TP if there is any specification impacts. |
| Samsung | Agree with comment | We share the comment from OPPO and vivo. |
| CATT | Agree |  |
| Huawei, HiSilicon | Agree | Considering the majority view on Q2, if PCI is added to discovery/removed from servingCellInfo, there would be no duplicated step for UE applying PCell. We could agree the principle that the PCell concept is still kept for remote UE, and the spec impact could be discussed in CR update. |
| Qualcomm | Agree |  |
| LG | Agree |  |
| Lenovo | Agree | Try to reuse the legacy description unless some issue is identified. |
| Intel | Agree | So far, we have treated the Remote UE as if it is served directly by the current cell. We are ok with the intention of the raised issue and also think it is better discussed with a corresponding CR. |
| Nokia | Agree |  |

Summary:

All companies agree with the intention. The detailed change can be checked in CR discussion.

**[13/13] Proposal 4: Keep the concept of PCell/current cell for remote UE.**

### Issue 3: Discuss whether L2 relay can be configured with HO without DRB and/or SRB2

In legacy Uu interface, the UE can only be configured with HO when there is at least one DRB and/or SRB2. However, in case of L2 U2N relay operation, it is possible that relay UE has no its own DRB but only configured with Uu Relay RLC channel for relaying service, it is not clear whether the relay UE can be configured with HO. The rapporteur understand as there is no group handover for relay, thus it is not so much useful to allow such handover case, thus for simplicity suggest to keep the same requirement.

**Q9: Do companies agree L2 relay cannot be configured with HO without DRB and/or SRB2 (Same requirement as legacy UE)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| OPPO | Agree |  |
| Xiaomi | Agree | However, we wonder whether these is any spec impact. gNB implementation can ensure this. |
| Apple | Agree |  |
| ZTE | Agree |  |
| vivo | Agree with comments | We think both the L2 Remote UE and the L2 Relay UE should follow such principle as legacy. Thus suggest to confirm that by two questions separately. For example:  **Q9a: Do companies agree L2 Relay UE cannot be configured with HO without DRB and/or SRB2 (Same requirement as legacy UE)?**  **Q9b: Do companies agree L2 Remote UE cannot be configured with HO without DRB and/or SRB2 (Same requirement as legacy UE)?**  [Rapp] Q9b equals to the current spec? and we feel no one is questioning it. |
| Samsung | Agree |  |
| CATT | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Qualcomm | Agree |  |
| LG | Agree |  |
| Lenovo | No strong view | For normal UE, at least one DRB should be configured. For IAB-MT, no DRB is allowed. no strong view to follow the behaviour of normal UE or IAB-MT. |
| Intel | Agree | We think that legacy HO operation should not be affected due to relay operation. |
| Nokia | Agree |  |

Summary:

All companies agree L2 relay cannot be configured with HO without DRB and/or SRB2 (Same requirement as legacy UE).

**[13/13] Proposal 5: RAN2 to confirm that L2 relay cannot be configured with HO without DRB and/or SRB2 (Same requirement as legacy UE).**

### Issue 16: Clarify whether CHO can be configured to relay UE

For remote UE’s CHO, RAN2 has discussed and agreed with no support. But for relay UE’s CHO, there is no discussion/consensus. Assuming CHO can be configured to relay UE, relay UE needs to release the unicast link or send notification message to the UE which will have bad influence on the remote UE’s experience, thus the rapporteur does not see much value to support it.

**Q10: Do companies agree CHO cannot be configured to L2 U2N Relay UE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| OPPO | Agree |  |
| Xiaomi | Disagree | We don't see the difference of relay UE’s behavior upon CHO and normal HO execution. Current tools, e.g. notification message, can be reused to support CHO for relay UE. Except for handover, we think CHO is more beneficial for relay UE to perform CHO recovery after RLF. |
| Apple | Agree | We agree with Rapporteur's analysis. Any further discussion can be done in Rel-18 relay enhancement. |
| ZTE | Agree |  |
| vivo | Agree | We prefer to avoid the cross-WI features in such late stage. |
| Samsung | Agree |  |
| CATT | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Qualcomm | Disagree | Relay UE should not be restricted any of the Uu features. Agree with Xiaomi that existing notifications are sufficient. |
| LG | Agree |  |
| Lenovo | No strong view.  Slightly prefer support CHO. | We are proponent. Our intention is to make specification clear.  If CHO is not supported in relay UE side. We suggest to capture something to clarify it because notification message is triggered upon reception of an *RRCReconfiguration* including the *reconfigurationWithSync* which also applies to CHO case. a note could be needed. 5.8.9.10.2 Initiation The U2N Relay UE can initiate the procedure when one of the following conditions is met:  1> upon Uu RLF as specified in 5.3.10;  1> upon reception of an *RRCReconfiguration* including the *reconfigurationWithSync*;  1> upon cell reselection; |
| Intel | Agree |  |
| Nokia | Disagree | Similar view as Xiaomi |

Summary:

13 companies participate in the discussion. 9/13 companies agree that CHO cannot be configured to L2 U2N Relay UE. 3/13 companies prefer to allow relay UE being configured with CHO. 1 company has no strong view. Considering it is late in Rel-17, to avoid potential spec changes the rapporteur suggest to follow the majority view.

**[10/13] Proposal 6: RAN2 to confirm that CHO cannot be configured to L2 U2N Relay UE.**

### Issue 11: Clarification on the term of “no suitable cell” for OoC case during AS criteria checking, e.g. no serving cell, out of coverage on the frequency used for SL communication, no acceptable cell, no cell to camp on

According to SA2 specification TS23.304, a UE can perform relay operation in limited area if it cannot find a suitable cell, i.e. the remote UE can camp on a Uu acceptable cell. In this case, a UE should check the Uu RSRP to determine if it can perform discovery for acting as a remote.

|  |
| --- |
| **5.9 Support for 5G ProSe for UEs in limited service state**  For UE in limited service state, as defined in TS 23.122 [14], 5G ProSe can be used over PC5 reference point with the following considerations.  UEs that are authorized to use 5G ProSe over PC5 reference point according to clause 5.1 shall be able to use the corresponding services following the principles defined in clause 5.1.2.2 for 5G ProSe Direct Discovery, clause 5.1.3.2 for 5G ProSe Direct Communication, and clause 5.1.4.2 for 5G ProSe UE-to-Network Relay when the UE enters in limited service state in 5GS:  - because UE cannot find a suitable cell of the selected PLMN as described in TS 23.122 [14]; or  - as the result of receiving one of the following reject reasons defined in TS 23.122 [14]:  - a "PLMN not allowed" response to a registration request or;  - a "5GS services not allowed" response to a registration request or service request. |

During the CR update discussion, the wording of “out of coverage” was first used, but companies commented it is not clear, as there are different understanding in the context of OoC in Uu coverage or OoC in sidelink frequency. Then the wording was changed to “serving cell”, but companies commented that if the UE is in IDLE, serving cell is not right thus suitable cell should be used. In the end, the term of “suitable cell” was adopted in the final Relay RRC CR without considering the case of limited service state. As indicated in M106, using “suitable cell” will be interpreted as if the UE has no suitable cell but an acceptable cell, it can directly consider the AS condition is fulfilled without considering the Uu RSRP condition, which is not the intention.

To address this issue, it was proposed to change “no suitable cell” to:

* Option 1. no acceptable cell;
* Option 2. no serving cell;
* Option 3. no cell to camp on;
* Option 4. out of coverage on the frequency used for NR sidelink communication, and the concerned frequency is not included in sl-FreqInfoToAddModList in sl-ConfigDedicatedNR within RRCReconfiguration message or included in sl-FreqInfoList within SIB12

The rapporteur understand option 3 equals to option 2, as in TS38.304 the serving cell is defined as “**Serving cell:** The cell on which the UE is camped.”. Option 1 only cover acceptable cell but not suitable cell, option 4 is not easy to comprehend. Therefore, the moderator suggests to choose option2 which aligns with the Rel-16 V2X style.

|  |
| --- |
| 5.8.15.2 NR Sidelink U2N Remote UE threshold conditions  A UE capable of NR sidelink U2N Remote UE operation shall:  1> if the threshold conditions specified in this clause were not met:  2> if *threshHighRemote* is not configured; or the RSRP measurement of the PCell, or the cell on which the UE camps, is below *threshHighRemote* by *hystMaxRemote* if configured, or  2> if the UE has no ~~suitable~~serving cell:  3> consider the threshold conditions to be met (entry);  … |

|  |
| --- |
| 5.8.15.3 Selection and reselection of NR sidelink U2N Relay UE  A UE capable of NR sidelink U2N Remote UE operation that is configured by upper layers to search for a NR sidelink U2N Relay UE shall:  1> if the UE has no ~~suitable~~serving cell; or  1> if the RSRP measurement of the cell on which the UE camps (for L2 and L3 U2N Remote UE in RRC\_IDLE or RRC\_INACTIVE)/ the PCell (for L3 U2N Remote UE in RRC\_CONNECTED) is below *threshHighRemote* within *sl-remoteUE-Config*:  … |

**Q11: Do companies agree to change “suitable cell” to “serving cell”?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| OPPO | See comment | OK with the intention, yet  Based on Q8, if the output is that we do not diff between the cell definition for direct/indirect connection, here when we say “if the UE has no cell”, it may cause the ambiguity that even if the UE is served by a cell via indirect connection, this condition is not satisfied. So we may want to clarify this condition is only for the direct-connection-based serving cell.  [Rapp] There is definition in 38304 of serving cell as below:  **Serving cell:** The cell on which the UE is camped.  In response to oppo, based on above definition of serving cell of idle, do you still think it has confilict with the PCell concept for connected stated discussed in Q8? |
| Xiaomi | No | The problem of serving cell is still valide, i.e. not cover IDLE/INACTIVE UE. Option 4 is preferred, since it can cover all cases.  [Rapp] There is definition in 38304 of serving cell as below:  **Serving cell:** The cell on which the UE is camped. |
| Apple | No | Our understanding is that Serving cell is only applied to CONNECTED UE.  In addition, "suitable cell" is the wording used in TS 36.331. If we agree the change, we assume the same change should be applied to 36.331. However, we are not sure what is the procedure because LTE Prose is not in scoping of sidelink relay.  [Rapp] There is definition in 38304 of serving cell as below:  **Serving cell:** The cell on which the UE is camped. |
| ZTE | No | Serving cell is only used to describe RRC\_CONNECTED UE, and if remote UE connect network via relay UE, it’s serving cell should be the relay UE’s serving cell.  [Rapp] There is definition in 38304 of serving cell as below:  **Serving cell:** The cell on which the UE is camped. |
| vivo | No, prefer to keep current RRC with reference | For Option 1, if the Remote UE can find an acceptable cell in direct Uu coverage, our understanding is that the Remote UE should be able to perform limited services either over direct Uu cell as legacy or via a Relay UE to the NW. Details can be found in our contribution in R2-2204676. Therefore, Option 1 is not OK for us.  For Option 2, we have similar concern as "serving cell" is only applicable to RRC CONNECTED UEs.  For Option 4, we think it is technically not correct because the concept is not equal to the OoC in sidelink frequency.  As above, we prefer Option 3 i.e., keep current RRC. To avoid any ambiguity, the reference can be added as below to clarify the suitable cell definition, see in red.  5.8.15.3 Selection and reselection of NR sidelink U2N Relay UE  A UE capable of NR sidelink U2N Remote UE operation that is configured by upper layers to search for a NR sidelink U2N Relay UE shall:  1> if the UE has no suitable cell defined in clause 4.5 in TS 38.304; or  1> if the RSRP measurement of the cell on which the UE camps (for L2 and L3 U2N Remote UE in RRC\_IDLE or RRC\_INACTIVE)/ the PCell (for L3 U2N Remote UE in RRC\_CONNECTED) is below *threshHighRemote* within *sl-remoteUE-Config*:  From TS 38.304  **Suitable Cell:** This is a cell on which a UE may camp. For NR cell, the criteria are defined in clause 4.5, for E-UTRA cell in TS 36.304 [7].  [Rapp] There is definition in 38304 of serving cell as below:  **Serving cell:** The cell on which the UE is camped. |
| Samsung | No | We share the concern that serving cell only covers UE in RRC\_CONNECTED.  [Rapp] There is definition in 38304 of serving cell as below:  **Serving cell:** The cell on which the UE is camped. |
| CATT | No | We fail to see the necessity to change the current wording. |
| Huawei, HiSilicon | Agree | In response to ZTE/vivo/Samsung, there is definition in 38304 of serving cell as below:  **Serving cell:** The cell on which the UE is camped.  In response to oppo, based on above definition of serving cell of idle, do you still think it has confilict with the PCell concept for connected stated discussed in Q8? |
| Qualcomm | No |  |
| LG | No | We think the current wording is ok. |
| Lenovo | Agree | The Term “Suitable Cell” has defined meaning from TS 38.304 and a cell must fulfill certain criteria (defined in Ch. 4.5) to qualify as being Suitable e.g., cell selection criteria are fulfilled, see clause 5.2.3.2; cell is not barred or reserved etc. |
| Intel | No with comment | We understand that based on serving cell definition in TS 38.304, using option 2 may be reasonable but wonder if serving cell terminology may be misleading. We do understand the intention here to indicate that the Remote UE has no direct cell to camp on, therefore, we prefer option 3 with addition of ‘Uu or direct or similar wording’ to be straightforward. |
| Nokia | No | I think suitable cell is OK:  1) Serving cell is only for Connected case.  2) A UE may wish to use relay connection even if acceptable cell is found as acceptable cell cannot be used for normal services |

Summary:

2/13 companies agree to use “serving cell” to replace “suitable cell”. 10/13 companies answers no. However, the reason companies saying not to the question is “serving cell is only used for connected case”, which is not true. As the rapporteur clarified, in TS 38.304 there is the definition of serving cell, Cote: “**Serving cell:** The cell on which the UE is camped.” The rapporteur suggest companies further checking on the issue (to cover limited area service/acceptable cell) raised here and the usage of serving cell.

**Proposal 7: RAN2 to discuss if clarification on the term of “no suitable cell” for OoC case during AS criteria checking is needed, (e.g. no serving cell, out of coverage on the frequency used for SL communication, no acceptable cell, no cell to camp on).**

### Issue 5: Clarify the meaning and differentiation of the following term: capable of/acting as/is a L2 U2N Relay UE or Remote UE

In current RRC specification, the definitions of U2N relay UE and U2N remote UE are provided as following:

**U2N Relay UE: A UE that provides functionality to support connectivity to the network for U2N Remote UE(s).**

**U2N Remote UE: A UE that communicates with the network via a U2N Relay UE.**

However, in the exiting procedure text, the usage of U2N remote/relay UE definition is not popular. Instead, there are some other alternative descriptions. Therefore, the descriptions and the definitions should be aligned to avoid possible misunderstanding. Thus the rapporteur suggests:

**Q12: Do companies agree to update the RRC specification as follows?**

* **For the procedural text only applicable to UEs acting as U2N remote UE or U2N relay UE, use “UE is acting as U2N remote/relay UE”**
* **For the procedural text common for UEs acting as U2N remote/relay UE and UEs to be acting as U2N remote/relay UE, use “UE capable of U2N remote/relay UE operation”**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| OPPO | Agree |  |
| Xiaomi | Agree |  |
| Apple | Agree |  |
| ZTE | Agree |  |
| vivo | Agree |  |
| Samsung | Agree |  |
| CATT | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Qualcomm | Agree |  |
| LG | Agree |  |
| Lenovo | Agree |  |
| Intel | Agree |  |
| Nokia | Agree with 1st Disagree with 2nd | Using "capable" means that the UE supports the feature, but it does not mean that the UE is intending to use it (e.g. configured to use it)  [Rapp] But it should be obvious that the UE will not perform relay/remote UE option if it is not intending to be a relay/remote UE. |

**Summary:**

Almost all companies agree with the intention of the clarification. Thus the rapporteur suggest:

**[12/13] Proposal 8: To update the RRC specification as follows:**

**– For the procedural text only applicable to UEs acting as U2N remote UE or U2N relay UE, use “UE is acting as U2N remote/relay UE”**

**– For the procedural text common for UEs acting as U2N remote/relay UE and UEs to be acting as U2N remote/relay UE, use “UE capable of U2N remote/relay UE operation”**

### Issue 9: Regarding measurement reporting on candidate relay, clarify if the strongest relay is among the ones fulfil upper layer criteria.

The rapporteur understands that only the relay UEs met upper layer criteria (e.g. service code) can be configured as target relay UE. Thus it makes sense that the remote UE only reports the relay UEs met both of upper layer criteria and AS layer criteria in the measurement results. Thus the rapporteur suggests to clarify in RRC spec.

**Q13: Do companies agree that remote UE only reports the relay UEs fulfil both of upper layer criteria and AS layer criteria in the measurement results?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| OPPO | Agree |  |
| Xiaomi | Agree |  |
| Apple | Agree, but | We think the question is not exactually same as the Issue. So, we suggest to modify the proposal as below:  **For the reporting of up to N strongest candidate relay UEs, remote UE only reports the relay UEs fulfil both of upper layer criteria and AS layer criteria in the measurement results**  **[Rapp] Fine with the suggestion.** |
| ZTE | Agree |  |
| vivo | Agree | Our understanding is that only candidate suitable relay UEs will be reported in the measurement results which means both of upper layer criteria and AS layer criteria should be checked for the reporting. |
| Samsung | Agree |  |
| CATT | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Qualcomm | Agree |  |
| LG | Agree | It’s RAN2 agreement. |
| Lenovo | Agree | Fine with the suggestion from Apple. |
| Intel | Agree | We have made the following agreement:  Remote UE searches for suitable relay UE candidates which meet all AS-layer & higher layer criteria.  We can clarify the spec as needed. |
| Nokia | Agree |  |

Summary:

All companies agree with the clarification.

**[13/13] Proposal 9: RAN2 to confirm remote UE only reports the relay UEs fulfil upper layer criteria and AS layer criteria in the measurement results in case of reporting up to N strongest candidate relay UEs,**

### Issue 15: Whether to specify remote UE behaviour of re-establish PC5 RLC channel of SRB1 during RRC reestablishment

The rapporteur understands in legacy Uu interface the UE needs to re-establish RLC bearer of SRB1 after sending RRCReestablishmentRequest message. However, there is no PC5 RLC reestablishment in sidelink, therefore either RAN2 define PC5 RLC reestablishment, which impacts RLC spec, or we use release and add of PC5 RLC channel in RRC.

**Q14: Which option do companies prefer in order to capture the remote UE behaviour of re-establish PC5 RLC channel (to align with Uu RLC reestablishment) of SRB1 during RRC reestablishment?**

* **Option1: define PC5 RLC reestablishment in RLC spec;**
* **Option2: use “release the old RLC PC5 channel and establish a new RLC PC5 channel” to achieve RLC reestablishment-like behaviour?**
* **Others**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option1/option2** | **Comments** |
| OPPO | 1 with comment | In legacy, we did not define RLC re-establishment since for PC5, when there is a key change, the Rx UE can diff between PC5-PDCP PDU w/ old-key and w/ new-key from PC5-PDCP header, so RLC re-establishment is not needed.  In R17 SL Relay, since now the PC5-RLC is to carry Uu-PDCP packet, the benefit from PC5-PDCP disappears, and thus there is a need.  Between option-1 and option-2, option-1 is more of legacy, while option-2 seems to do a procedural based operation (which however relies on explicit L2 indicator in Uu).  Anyway, no strong view and can follow majority |
| Xiaomi | 2 |  |
| Apple | Option 1 | Same view as OPPO |
| ZTE | Option 1 |  |
| vivo | Option 2 | Option 2 is more aligned with legacy NR SL operation. |
| Samsung | Option 2 | We share the view with vivo. Since this is about SL procedure we can keep legacy NR SL procedure. |
| CATT | Option 2 | We would like to reuse legacy procedure as much as possible. |
| Huawei, HiSilicon | Option 2, can accept option1 | We do not see the necessity to define SL RLC reestablishment just to align Uu RLC reestablishment during RRC reestablishment, as it may have big impact on RLC spec. But we are ok to follow majority view if it is option1. |
| Qualcomm | Option 2 |  |
| LG | Option 2 |  |
| Lenovo | Option1 | Agree with oppo. |
| Intel | Option 1 |  |
| Nokia | Option 1 is preferred Option 2 is acceptable |  |

Summary:

6/13 companies prefer to define PC5 RLC reestablishment. 7/13 companies prefer to use RLC release and add to avoid defining new PC5 RLC reestablishment behaviour. The rapporteur understand this is not a critical issue, and either way can work. But considering there is no clear majority view, we can further discuss it if time allows, otherwise it can up to RLC spec rapporteur to decide.

**[6/13:7/13] Proposal 10: RAN2 to discuss whether to specify PC5 RLC reestablishment for SRB1 transmission during RRC reestablishment. (If not, “release the old RLC PC5 channel and establish a new RLC PC5 channel” can be used to achieve RLC reestablishment-like behaviour.)**

### Issue 1: Clarify exceptional cases for L2 U2N Relay UE’s to trigger RRC connection establishment by AS layer

**[RIL]**: v200 **[Delegate]**: vivo(Boubacar) **[WI]**: SLrelay **[Class]**: 1 **[Status]**: ToDo **[TDoc]**: None **[Proposed Conclusion]**: v23

**[Description]**: Clarify exceptional cases for L2 U2N Relay UE’s to trigger RRC conncetion establishment by AS layer.

**[Proposed Change]**: See in red.

NOTE: Upper layers initiate an RRC connection (other than the RRC connection initiated at the L2 U2N Relay UE upon reception of a L2 U2N Remote UE’ SL-RLC0 or SL-RLC1 message). The interaction with NAS is left to UE implementation.

**[Comments]**:

The rapporteur understands the intention is to clarify that relay may enter connected state triggered by remote's access but not by relay's own NAS layer, which is true. But in SA2 spec, when AS tells upper layer there is remote UE's access, the upper layer will provide service request to AS as legacy, thus the legacy sentence seems still applicable. For simplicity, the rapporteur suggests to keep the current wording in the spec without change.

**Q15: Do companies think the proposed change in V200/v201 is needed?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| OPPO | Y | Considering the current text is “Upper layers **initiate** an RRC connection”, we tend to agree there might be ambiguity if we keep the NOTE. So would be good to clarify, especially considering this is just a NOTE so no normative impact. |
| Xiaomi | Y |  |
| Apple | Y |  |
| ZTE | N | We think the current description in 5.3.3.1a is clear enough:.  “For L2 U2N Relay UE in RRC\_IDLE, an RRC connection establishment is initiated in the following cases:  1> if any message is received from a L2 U2N Remote UE via SL-RLC0 as specified in 9.1.1.4 or SL-RLC1 as specified in 9.2.4;” |
| vivo | Y | Proponent. |
| Samsung | Y |  |
| CATT | Y | Fine to add this for clarification. |
| Huawei, HiSilicon |  | Fine to follow majority. |
| Qualcomm | Y |  |
| LG | Y |  |
| Lenovo | N | Agree with ZTE |
| Intel | No strong view | Can go with majority |
| Nokia | N |  |

Summary:

10/13 company’s support/fine with the clarification. 3/13 companies answers No but there should be no technical concern on the clarificiaton. Thus the rapporteur suggest to follow majority view.

**[10/13] Proposal 11: Agree the proposed change in V200/v201.**

### Issue 14: Whether to differentiate “cell change” in stop condition of the timers

**[RIL]**: O090 **[Delegate]**: OPPO (Qianxi) **[WI]**:SLrelay **[Class]**:1 **[Status]**: ToDo **[TDoc]**: None **[Proposed Conclusion]: v43**

**[Description]**: R2 did not have agreement on it, we do not see the need of “cell change” here, since even in legacy, the result of cell (re)selection does not necessarily lead to a cell-change, so that it is not needed for relay reselection either

**[Proposed Change]**: remove the cell change restriction in the condition here and in the procedural text.

**[Comments]**:

**Q16: Do companies think the proposed change in O090 is needed?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Y/N** | **Comments** | |
| OPPO | Y | Proponent.  Detailed analysis provided in 6042, where the key observations are: Observation 1 In legacy/non-relay scenario, the UE may experience cell selection without cell change, which would stop T390.  Observation 2 In relay scenario, the UE may still experience relay reselection without cell change.  And the proposed change is to remove the restriction of cell-change, as follows | |
| Xiaomi | N | In legacy, the cell selection during T390 running is triggered by leaving RRC\_CONNECTED, e.g. RLF or RRC release. However, the relay selection during T390 running may be triggered by IDLE/INACTIVE remote UE mobility, i.e. leave cell coverage and enter relay coverage. If the cell doesn’t change during relay selection, it’s like UE moves within the same cell. There is no correspongding stop event in legacy. | |
| Apple | Y | Same view as OPPO | |
| ZTE | Y |  | |
| vivo | See comments | | We think similar issue is under discussing in the email [Offline-632][Relay] Cell change for remote UE (InterDigital). We may revisit it after the output of that email. |
| Samsung | N | We agree with Xiaomi. | |
| CATT | See comments | Same view as vivo. | |
| Huawei, HiSilicon | Y | After more thinking, we feel there is no need to differentiate cell change or not during relay reselection in this case. Therefore prefer to keep remote UE’s behaviour as simpler as possible. | |
| Qualcomm | N |  | |
| LG | See comments | Same view as vivo | |
| Lenovo | Comment | Same view as vivo. | |
| Intel | See comment | Agree with vivo that we can discuss together with the other email discussion where similar issues are considered. In general, we are ok with the proposed change (as relay reselection can happen without cell change). | |
| Nokia | Comment | Wait for outcome of [632] | |

Summary:

4/13 companies agree with the proposed change. 3/13 companies disagree with the change. 6/13 companies suggest to wait for #632. Thus the rapporteur suggest to postpone and we can double check once it is clearer in #632 discussion.

### Others

For B209, B100 and B212, the moderator understands the proposed change in B209 is covered in offline #620. B100 has been discussed in pre#610. B212 is also for SIB forwarding which may be in the scope of offline #620. Thus no questions or proposals for those RILs.

**3.4 Comments on the RIL list or Draft CR in R2-2206077**

|  |  |  |
| --- | --- | --- |
| **Company** | **RIL number** | **Comments** |
| ZTE | Z618 | According to 38.473, PC5 RLC channel ID can be allocated in scope of remote UE or relay UE. This depends on whether CU set remote UE ID in PC5 RLC channel configuration list of UE CONTEXT MODIFICATION REQUEST as shown below.   |  |  |  |  | | --- | --- | --- | --- | | **>PC5 RLC Channel to be Modified Item IEs** |  | *1 .. <maxnoofPC5RLCChannels>* |  | | >>PC5 RLC Channel ID | M |  | 9.3.1.265 | | >>Remote UE local ID | O |  | 9.3.1.267 |   Suppose the PC5 RLC channel ID is allocated uniquely within the scope of remote UE, different remote UEs connected to one relay UE may share a same PC5 RLC channel ID. In this case, remote UE ID needs to be included in the PC5 RLC channel configuration of RRCReconfiguration message, so that relay UE can identify the PC5 RLC channel is associated with which remote UE.  In R16, UE can identify the SLRB configuration received from gNB is associated with which destination UE based on the QFI in SDAP configuration since the QFI is indexed across all destination UEs. However, PC5 RLC channel configuration does not include QFI and the QFI based approach is not applicalbe here. Therefore, we need remote UE ID to differentiate the PC5 RLC channel with same PC5 RLC channel ID.  We have submitted a Tdoc R2-2205066 for this. The potential change is as follows. Considering this issue is cross-WG and it also has ASN.1 impact, it is suggested that rapporteur treat this issue as high priority.    [Rapp] We understand RAN3 is still discussing/checking on the RLC channel configuration in F1 interface. And companies should clarify in RAN3 that RAN2’s signalling design is the relay UE is configured with a PC5 RLC channel list within which one RLC channel is associated with connected remote UE’s bearer. This is the design inherited from Rel-16 V2X. We do not see any motivation to change it from RAN2 perspective. Meantime, we also encourage other companies to check RAN3 discussion and situation, to see if RAN2 needs to extensively discuss on it. |
| OPPO | C122 | We are not a fan of this change, yet if we adopt them, it seems will prevent the UE from sending SIB/paging request, if it undergoes a RRC\_IDLE/INACTIVE => RRC\_CONNECTED => RRC\_IDLE/INACTIVE change, i.e., the request that were sent and afterwards released, yet cannot be further triggered. |
| Apple | A912 | sl-SourceIdentity-RelayUE-r17 (in the “SL-TxResourceDisc-r17” IE below) is a L2 only parameter related to path switch:    We think this should be moved to the relay-specific IE “SL-TxResourceReqCommRelay-r17”.  [Rapp] We kind of have discussed this during settling the new signalling in SUI. The purpose to sending discovery source L2 ID is because the remote UE perform measurement on discovery and will report this relay UE source L2 ID to the network. The network needs to recognize which UE it is based on the relay UE source L2 ID reported by remote UE in measurement results and the ID reported by relay in SUI.  [Apple] As Rapporteur clarified, the intention is just to notify gNB relay UE L2 ID, rather than requesting discovery or communication resource, right? Then, it is confusing to include this field within “SL-TxResourceDisc-r17” IE. To make spec clearer, we suggest to move this IE out of any of lists on discovery/communication resource request and being independently reported.  [Rapp] Sorry I misunderstood your question before. Now I update my response above and also some updates are provided in the latest CR draft in #611. Please double check if it can address your concern. Thanks. |
| Qualcomm | Q532 | We think the below Sl-SRB4 description in 5.8.1 General, as indicated in RIL#Q532 is confusing. As from the discussions of [640] that SL-SRB4 is not associated with unicast link context. Can we please clarify in 5.8.1 that SL-SRB4 is an independent SRB that is not in the context of unicast link and it is not impacted by the Sidelink RRC procedures and not by setup or release of the unicast link? Without this change, in the current spec where it is said SL-SRBs, it may point to SL-SRB4 as well and which is not correct.  [Rapp] We can consider whether spec updates are needed together with the outcome of #640. |
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# 4 Conclusion

**Higher priority issues:**

**[12/13] Proposal 1a: Keep the dedicated SL RLC and SRAP configuration in *RRCSetup* message for remote UE’s SRB1 transmission/reception at PC5 hop as the current RRC specification.**

**Proposal 1b: Remove the *sl-ServingCellInfo* from *RRCSetup* message to the first *RRCReconfiguration* message. Make the same change to *RRCReestablishment/RRCResume* message.**

**[10/13] Proposal 2a: PCI and ARFCN-DL of relay UE’s serving cell is included in the RRC container in discovery message for KgNB derivation.**

**Proposal 2b: PCI is removed from *sl-ServingCellInfo.***

**[12/13]Proposal 2c: The cell identity in *cellAccessRelatedInfo* (from either discovery message or SIB1) is used to calculate shortMAC-I at remote UE as legacy, and no extra spec impact is needed.**

**Medium priority issues:**

**[10/13] Proposal 3: It is left to remote UE implementation on how to identify relay UE’s serving cell change in case of path switch, i.e. keep the current description in spec.**

**Low priority issues:**

**[13/13] Proposal 4: Keep the concept of PCell/current cell for remote UE.**

**[13/13] Proposal 5: RAN2 to confirm that L2 relay cannot be configured with HO without DRB and/or SRB2 (Same requirement as legacy UE).**

**[10/13] Proposal 6: RAN2 to confirm that CHO cannot be configured to L2 U2N Relay UE.**

**Proposal 7: RAN2 to discuss if clarification on the term of “no suitable cell” for OoC case during AS criteria checking is needed, (e.g. no serving cell, out of coverage on the frequency used for SL communication, no acceptable cell, no cell to camp on).**

**[12/13] Proposal 8: To update the RRC specification as follows:**

**– For the procedural text only applicable to UEs acting as U2N remote UE or U2N relay UE, use “UE is acting as U2N remote/relay UE”**

**– For the procedural text common for UEs acting as U2N remote/relay UE and UEs to be acting as U2N remote/relay UE, use “UE capable of U2N remote/relay UE operation”**

**[13/13] Proposal 9: RAN2 to confirm remote UE only reports the relay UEs fulfil upper layer criteria and AS layer criteria in the measurement results in case of reporting up to N strongest candidate relay UEs,**

**[6/13:7/13] Proposal 10: RAN2 to discuss whether to specify PC5 RLC reestablishment for SRB1 transmission during RRC reestablishment. (If not, “release the old RLC PC5 channel and establish a new RLC PC5 channel” can be used to achieve RLC reestablishment-like behaviour.)**

**[10/13] Proposal 11: Agree the proposed change in V200/v201.**

# 5 Annex: Issues and proposals in R2-2206077

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| --- | --- | --- | --- | --- |
| Number | Issue | Related RILs/Company contributions | Class | Handled by other email |
|  | Clarify exceptional cases for L2 U2N Relay UE’s to trigger RRC connection establishment by AS layer. | V200, v201 | Class 1 |  |
|  | Whether the concept of PCell/current cell is applicable to L2 remote UE. | O002, E089, A806 | Class 1 |  |
|  | Discuss whether L2 relay can be configured with HO without DRB and/or SRB2. | O004 | Class 1 |  |
|  | About PC5 RLC bearer and SRAP configuration for remote UE’s SRB1 transmission at PC5 hop,  1. Clarify if the dedicated configuration can be provide via RRCSetup/RRCReestablishment which has no full security; if allowed, double check if the SetupRelease structure is needed.  2. Revisit the RAN2 agreement that the SRB1 messages other than RRCResume/RRCReestablishment/RRCReconfigurationComplete in case of path switch to IDLE/INACTIVE relay UE mush use dedicated PC5 RLC configuration. | H596, A302/A308/A906 (R2-2205634), H812(R2-2206075), O94, I012, N005, H811(R2-2206074). | Class 2 |  |
|  | Clarify the meaning and differentiation of the following term: capable of/acting as/is a L2 U2N Relay UE or Remote UE. | A304/A305/A307/A311(R2-2205635), H809(R2-2206076) | Class 1 |  |
|  | Clarify how to determine serving cell change of target relay UE before path switch. | X200, H808(R2-2206073) | Class 1/2 |  |
|  | Relay Re/selection Requirement Conflict;  Clarify UE behaviour on cell (re)selection and relay (re)selection. | M112(R2-2204587), v208 | Class 1 | #610 |
|  | For NR SL discovery transmission, the specific pools for CBR measurements are unknown and should be specified. | Z651, Z652, V353(R2-2204564). | Class 1 | #610 |
|  | Regarding measurement reporting on candidate relay, clarify if the strongest relay is among the ones met upper layer criteria. | A314 | Class 1 |  |
|  | Dedicated pool and shared pool prioritization for discovery monitoring. | V410(R2-2204675), O058(R2-2204636) | Class 1 | #610 |
|  | Clarification on the term of “no suitable cell” for OoC case during AS criteria checking, e.g. no serving cell, out of coverage on the frequency used for SL communication, no acceptable cell, no cell to camp on. | M106, O075, O076, H810(R2-2206072), B207/B208(R2-2205685) | Class 1 |  |
|  | How to configure Remote UE specific timer value, e.g. introduce a remote UE specific offset, define longer values for remote UE. | V213(R2-2204678) and B100(R2-2205695) | Class 2 | #608 |
|  | To enable Remote UE request posSIBs (or Rel-17 SIBs). | M119, H629, Xiaomi(R2- 2205319) | Class 2 | #608, Multi-WI session? |
|  | Whether to differentiate “cell change” in stop condition of the timers. | O090 | Class 1 |  |
|  | Whether to specify remote UE behaviour of re-establish PC5 RLC channel of SRB1 during RRC reestablishment. | A805 | Class 1 |  |
|  | Clarify whether CHO can be configured to relay UE | B103 | Class 1 |  |
|  | Missing information of PCI and ARFCN-DL for key derivation during RRC resume/reestablishment procedure. | I046(R2-2205826) | Class 2 |  |
|  | To enable allowlist for Event X1 | S776 (R2-2205092) | Class 2 |  |
|  | Clarify whether groupcast/uniast are supported for discovery | Q539(R2-2205962) | Class 2 | #610 |
|  | Confirm the LCIDs of SL\_RLC1, SL\_RLC0, SL SRB4 are 56, 57, 58.  Note this is not marked as ToDisc as companies have aligned proposed change but would like to confirm with others. | Z671, V216, O089, Z672, V218 | Class 1 but with impact on MAC spec |  |

**Higher priority issues (class 2)**

### Issue 4: PC5 RLC bearer and SRAP configuration for remote UE’s SRB1 transmission at PC5 hop

**Proposal 1: Regarding the configuration used for SRB1 transmission/reception at PC5 hop, RAN2 to agree:**

* **All SRB1 messages are allowed to use default SL-RLC1, i.e. remove the dedicated configuration of PC5 RLC from *RRCReestablishment* message;**
* **Discuss whether to remove the dedicated configuration of PC5 RLC from *RRCSetup* message;**
* **Define default configuration of SRAP used for reception of *RRCResume/RRCReestablishment* at PC5 hop, in order to establish SRAP entity and pass the messages to RRC layer.**

### Issue 17: Missing information of PCI and ARFCN-DL for key derivation during RRC resume/reestablishment procedure

**Proposal 2: PCI and ARFCN-DL should be provided to remote UE to derive KgNB before remote UE receiving *RRCResume/RRCReestablishment* message. FFS using PC5 RRC or the RRC container in discovery message.**

### Issue 18: To enable allowlist for Event X1

**Proposal 3: RAN2 to agree adding *useAllowedCellList* in event X1.**

### Issue 20. Confirm the LCIDs of SL\_RLC1, SL\_RLC0, SL SRB4 are 56, 57, 58.

**Proposal 4: RAN2 to confirm the LCIDs of SL\_RLC1, SL\_RLC0, SL SRB4 are 56, 57, 58.**

**Medium priority issues (may have asn.1 impact)**

### Issue 6: How to determine serving cell change of target relay UE before path switch

**Proposal 5: RAN2 to down select among the solutions for remote UE determining target relay UE’s serving cell change:**

* **Based on measurement report;**
* **Based on cell ID indicated in both of path switch command and discovery message, i.e. NCGI is to be added to path switch command.**
* **Keep the current description, i.e. left to UE implementation.**

**Lower priority issues (class 1)**

### Issue 2: Whether the concept of PCell/current cell is applicable to L2 remote UE

**Proposal 6: RAN2 to agree keeping the concept of PCell/current cell for remote UE.**

### Issue 3: Discuss whether L2 relay can be configured with HO without DRB and/or SRB2

**Proposal 7: RAN2 to confirm L2 relay cannot be configured with HO without DRB and/or SRB2 (Same requirement as legacy UE).**

### Issue 16: Clarify whether CHO can be configured to relay UE

**Proposal 8: RAN2 to confirm CHO cannot be configured to L2 U2N Relay UE.**

### Issue 11: Clarification on the term of “no suitable cell” for OoC case during AS criteria checking, e.g. no serving cell, out of coverage on the frequency used for SL communication, no acceptable cell, no cell to camp on

**Proposal 9: RAN2 to discuss to replace “no suitable cell” with which one from “no acceptable cell” or “no serving cell” or “no cell to camp on”.**

### Issue 5: Clarify the meaning and differentiation of the following term: capable of/acting as/is a L2 U2N Relay UE or Remote UE

**Proposal 10: Update the RRC specification as following:**

* **For the procedural text only applicable to UEs acting as U2N remote UE or U2N relay UE, use “UE is acting as U2N remote/relay UE”**
* **For the procedural text common for UEs acting as U2N remote/relay UE and UEs to be acting as U2N remote/relay UE, use “UE capable of U2N remote/relay UE operation”**

### Issue 9: Regarding measurement reporting on candidate relay, clarify if the strongest relay is among the ones met upper layer criteria.

**Proposal 11: RAN2 to confirm the remote UE only reports the relay UEs met both of upper layer criteria and AS layer criteria in the measurement results.**

### Issue 15: Whether to specify remote UE behaviour of re-establish PC5 RLC channel of SRB1 during RRC reestablishment

**Proposal 12: RAN2 to discuss whether to specify remote UE behaviour of re-establish PC5 RLC channel of SRB1 during RRC reestablishment.**

**No proposals for the following issues:**

Issue 1: Clarify exceptional cases for L2 U2N Relay UE’s to trigger RRC connection establishment by AS layer

Issue 14: Whether to differentiate “cell change” in stop condition of the timers

B209, B100 and B212