3GPP TSG-RAN WG2 #114-e R2-210xxxx

Electronic meeting, 19th May – 27th May 2021

Agenda Item: x.x.x.x

Source: Ericsson, Mediatek Inc.

Title: [Post113bis-e][060][NR15] RLC bearer handling with Full Configuration

Document for: Discussion, Decision

# 1 Introduction

This document is to handle the following email discussion:

* [Post113bis-e][060][NR15] RLC bearer handling with Full Configuration (Ericsson, Mediatek)

 Scope: Based on R2-2104127 and related parts, determine consolidated view what is the problem and the solution / potential solution(s).

 Intended outcome: Report

 Deadline: Monday May 10 23.59 PDT

Regarding the deadlines, we would like to set the deadline for providing comments on **Friday May 7 1800 UTC**.

# 2 Contact information

|  |  |
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# 3 Discussion

## 3.1 Release of the RLC entity during full configuration

This topic was addressed in the last meeting in [7], but it was decided to postpone the discussion to the next meeting so to give more time to companies to check internally their implementations and decide a way forward to a solution able to accommodate UE and NW implementations already in the field.

Going into the problem, the full configuration (*fullConfig* Flag) is basically used to release **all** configuration with some exception. In LTE, according to the TS 36.331, section 5.3.5.8, the UE **does NOT** release PDCP and RLC configuration (of all RB) when initiating full configuration. For DRB, the configurations (including PDCP and RLC entities) will be released later. For the SRB, instead, it does not release the PDCP and RLC entities but it can re-apply the default configuration if the SRB ID is still present in *srb-ToAddModList*.

This procedure applies equally on whether the UE is connected to the EPC or whether is connected to the 5GC.

-------------------------------------------------------- LTE ------------------------------------------------------

1. if the UE is connected to EPC:

2> release/ clear all current dedicated radio configurations except for the following:

- the MCG C-RNTI,

- the MCG security configuration,

- the PDCP, RLC, logical channel configurations for the RBs,

- the logged measurement configuration;

1> else if the UE is connected to 5GC:

2> release/ clear all current dedicated radio configurations except for the following:

- the MCG C-RNTI,

- the MCG security configuration,

- the configurations (SDAP if configured, PDCP, RLC and logical channel) for the RBs;

NOTE 1: Radio configuration is not just the resource configuration but includes other configurations like *MeasConfig* and *OtherConfig*. In case (NG)EN-DC is configured, this also includes the entire NR SCG configuration. Such NR SCG configuration does not include the DRB configuration as configured by *nr-RadioBearerConfig1* and nr-*RadioBearerConfig2*).

For what concerns full configuration in NR, instead, the procedural text in TS 38.331, section 5.3.5.11, implies that during full configuration the UE will release **all** radio configurations except for configuration in *radioBearerConfig* and *radioBearerConfig2*. The field *radioBearerConfig* or *radioBearerConfig2* contains the configurations of IE *RadioBearerConfig*, which includes both PDCP and SDAP configuration but **NOT** RLC configuration. This is because the RLC bearer configuration is included within the *CellGroupConfig* IE.

Therefore, this seems to imply that all RLC bearers are released (including RLC entities of SRB1) as the result the first level 1> clause in TS 38.331, section 5.3.5.11. Of course, releasing the RLC entities it also implies that the RLC variable should be initiated again and thus the RLC SN is reset to 0.

-------------------------------------------------------- NR ----------------------------------------------------------

1> release/ clear all current dedicated radio configurations except for the following:

- the MCG C-RNTI;

- the AS security configurations associated with the master key;

NOTE 1: Radio configuration is not just the resource configuration but includes other configurations like *MeasConfig*. In case NR-DC or NE-DC is configured, this also includes the entire NR or E-UTRA SCG configuration which are released according to the MR-DC release procedure as specified in 5.3.5.10. The radio configuration does not include SRB1/SRB2 configurations and DRB configurations as configured by *radioBearerConfig* or *radioBearerConfig2*.

According to the following analysis, the first question we would like to ask to companies is to confirm that, upon initiating the NR full configuration, the UE should release the RLC entities of SRB and DRB and reset the RLC SN to 0 (i.e., differently from what is the UE ehaviour in LTE)

**Question 1**: Do companies agree that the UE shall release the RLC entities of SRB and DRB and reset the RLC SN to 0 when initiating the full config procedure according to NR specification (i.e., and that this is different from LTE)?

|  |  |  |
| --- | --- | --- |
| Company  | Agree (y/n) | Comments |
| Qcom | Agree |  |
| MediaTek | Agree | The ehaviour is different from LTE, which we are not sure whether this was original intention. However, UE implementation has no choose but follow the procedure text. As our analysis in [7], it is clear that the RLC bearers are released from our point of view. The question is whether we need a CR to clarify this and that could be discussed once we have consensus on UE ehaviour. |
| Nokia | Agree | Agree with MediatTek’s explanation. If one reads the text literally this seems to be implied that RLC bearers are released. |
| OPPO | Agree |  |
| Huawei, HiSilicon | Agree |  |
| vivo | Agree | According to the current NR specification, the RLC bearers are released. |
| Ericsson | Agree |  |
| Apple | Agree |  |
| ZTE | Agree |  |
| Sequans | Agree |  |
| Intel |  | Agree that the current specification text implies that the RLC entities are released. Though this may not have been the intention.We have to be sure that this is the only UE implementation in the field before we making any agreements. |

## 3.2 How the UE add back the RLC entity during full configuration

Once clarified how the UE should handle the RLC entities during the NR full configuration procedure, another point to be discussed is how the UE should add back the RLC entity of SRB(s). According to the current procedural text in TS 38.331, section 5.3.5.11, the UE will apply the SRB configuration according to the default values only if *srb-identity* is included in *srb-ToAddModList.*

1> for each *srb-Identity* value included in the *srb-ToAddModList* (SRB reconfiguration):

2> apply the default SRB configuration defined in 9.2.1 for the corresponding SRB;

However, according to what has been agreed in RAN2#112-e, RAN2 confirmed that SRB1 configuration is not required in the first *RRCReconfiguration* message after re-establishment in the case of *fullConfig*.

*From RAN2#112-e*

* **RAN2 confirm that SRB1 configuration is not required in the first RRCReconfiguration message after re-establishment in the case of fullConfig.**
* **RAN2 confirm that SRB1 configuration is not required in the first RRCReconfiguration message after re-establishment in the case of delta ignaling.**
* **If SRB1 is included in the first RRCReconfiguration after re-establishment, the reestablishPDCP field *is not set to true* for SRB1**
* **If SRB1 is included in the first RRCReconfiguration after re-establishment, the reestablishRLC field is not set to *true* for SRB1**

Our understanding is that there are basically two options on how the UE should add back the RLC entity:

1. By NW configured *srb-ToAddModList* (default configuration)
	* When triggering full configuration, the network always includes the *srb-identity* within *srb-ToAddModList*
2. By NW configured *rlc-BearerToAddModList* within *CellGroupConfig* IE
	* When triggering full configuration, the network uses *rlc-BearerToAddModList* to add RLC entities of SRB(s) back explicitly

Therefore, we would like to ask to the companies:

**Question 2**: During full configuration, if the UE releases the RLC entity, how this one is added back?

1. By NW configured *srb-ToAddModList* (default configuration)
	* When triggering full configuration, the network always includes the *srb-identity* within *srb-ToAddModList*
2. By NW configured *rlc-BearerToAddModList* within *CellGroupConfig* IE
	* When triggering full configuration, the network uses *rlc-BearerToAddModList* to add RLC entities of SRB(s) back explicitly
3. *Others (please specify in the comments column)*

|  |  |  |
| --- | --- | --- |
| Company  | Option  | Comments |
| Qcom | Option-1 and Option-2 | We don’t see why we have to select either options, when both options are spec compliant behaviour.  |
| MediaTek | Option-1 and Option-2 | We understand the question is intended to clarify how NW configures the RLC bearer back (if it is released). Both option 1 and 2 are allowed in current SPEC. Although option 1 (and option 2?) seems violate previous agreement on “SRB1 configuration is not required”, we see no other way to do it. Therefore, we would suggest to confirm the NW could use both options to add SRB1 RLC bearer back. |
| Nokia | Option-1 and Option-2 | Yes, both options seem to be possible as per the spec. |
| OPPO | Option-1 and Option-2 | Option-2 can always work. Option-1 is subject to the IE condition “*HO-Conn*” i.e. “or when the *fullConfig* is included in the *RRCReconfiguration* message and NE-DC/NR-DC is not configured”. |
| Huawei, HiSilicon | Option-1 and Option-2 | It seems that we should not agree on observations/understandings (sometimes wrong) when there is no clear intention. |
| Vivo | Option-1 and Option-2 |  |
| Ericsson | Option-1 and Option-2 | Since both options are optional for the network but one them needs to be necessarly used for let the UE setting back the RLC entity, problaly a clarification is needed. No normative text as such but at least a note it would be helpful to clarify this situation.  |
| Apple | Option 1 and Option 2 | Both options are specified in current spec.  |
| ZTE | Option 1 and Option 2 | Both options are feasible per current spec. |
| Sequans | Option-1 and Option-2 |  |
| Intel | Option-2 | Option-2 is a possible implementation option if the agreement is that RLC bearer is released by the UE. This is also captured in § 5.3.5.5.4 the procedural text for RLC bearer add/modelse (a logical channel with the given *logicalChannelIdentity* is not configured within the same cell group, including the case when full configuration option is used):[..]3> establish an RLC entity in accordance with the received *rlc-Config*;Regarding option-1:If the network includes the *srb-ToAddModList*, then as per current specifications, UE apply the default SRB configuration defined in 9.2.1 for the corresponding SRB;so this only talks about applying and doesn’t say “establish the RLC entity” (probably because the original intention was not to release the RLC entity). In summary, the UE behaviour on receiving *srb-ToAddModList* is a ambiguous in specification and whether it works will depend on UE implementation. |

## 3.3 How the reestablishRLC and reestablishPDCP are set

The last issue to be addressed is how the network should set the *reestablishRLC* and *reestablishPDCP* during full configuration assuming that the UE releases the RLC entity and add it back according to the option 1 or option 2 described in section 3.2. Since the RLC entity is initialized from scratch there should not be any need to set the *reestablishRLC* flag to *true*. At least it is not clear what entity is re-established since this is released at the beginning of the full configuration procedure.

**Question 3**: Do companies agree that, for full configuration, once the UE releases the RLC entity and add it back according to the network configuration*,* the network **does not** set the *reestablishRLC* to *true*?

|  |  |  |
| --- | --- | --- |
| Company  | Agree (y/n) | Comments |
| Qcom | Agree |  |
| MediaTek | Agree, but | We prefer to say that the network is **not required** to set *reestablishRLC* to true in this case. If there is other UE implementation that follows LTE behavior, always setting *reestablishRLC* to true could be a configuration that works for different implementations.  |
| Nokia | Agree, but | The behavior is different if UE follows LTE or NR assumption. But for the NR specific case, the flag has no context in the procedural description and if set by the network we understand it has no action on the UE, i.e. the field is ignored? But for LTE based handling it seems it is required to get to the same behavior as in NR case i.e. start afresh. |
| OPPO | Agree |  |
| Huawei, HiSilicon | Agree, but | Agree with MTK and also prefer saying that the network is **not required** to set *reestablishRLC* to true. |
| Vivo | Agree for adding back by Option 2 | If the RLC entity is added back by Option 2 rather than Option 1, as the rapporteur explained “At least it is not clear what entity is re-established since this is released at the beginning of the full configuration procedure”. So no need to set *reestablishRLC* flagto true.However, if the RLC entity is added back by Option 1&2, according to TS38.331 5.3.5.3,5.3.13.4 and 5.3.5.11 sections, before performing *RadioBearerConfig* and *CellGroupConfig* to apply SRB configuration, UE has added back the RLC entity according to the default SRB configuration. Besides, the network may want to update the security-related parameters by the RRC messages(e.g., RRCReconfiguration or RRCResume) including the *FullConfig*. So in this case, network may set *reestablishRLC* flag *to true*. |
| Ericsson | Agree |  |
| Apple | Agree |  |
| ZTE | Agree |  |
| Sequans | Agree |  |
| Intel | Agree | Regarding other company comments:We are not sure that just allowing setting *reestablishRLC* alone allows the LTE behaviour. The UE behaviour on receipt *RLC-BearerConfig* depends on whether UE takes the add or modify branch. In the add branch, there is no procedural text defined for *reestablishRLC* (as mentioned by Nokia).If all UE implementations do release the RLC bearer, it will be better to make that the only possible network behaviour rather than allowing both and have a mixed implementation possibility that can potentially lead to different implementations. |

Regarding the *reestablishPDCP*, instead, the PDCP entity is not released during full configuration but the network it may include anyway the *srb-identity* within *srb-ToAddModList* in order to indicate to the UE to add back the RLC entity, it may be necessary to set this flag to *true*. However, this was already addressed during RAN2#112-e and RAN2#113-e meeting and the final decision was that if the SRB1 is included in the first *RRCReconfiguration* after re-establishment or in the *RRCResume*, the *reestablishPDCP* field **is not** set to *true* for SRB1. Therefore, we believe that this agreement can be confirmed.fullConfig

**Question 4**: Do companies confirm that if the SRB1 is included in the first *RRCReconfiguration* after re-establishment or in the *RRCResume*, the *reestablishPDCP* field **is not** set to *true* for SRB1?

|  |  |  |
| --- | --- | --- |
| Company  | Agree (y/n) | Comments |
| Qcom | Agree |  |
| MediaTek | Agree |  |
| Nokia | Agree |  |
| OPPO | Agree |  |
| Huawei, HiSilicon | Agree, but | But we don’t agree to have a CR to clarify this, when the specification is clear; otherwise, it will only cause problems for future maintaince and bring unnecessary discussion (this discussion itself is an example). |
| Vivo | Agree for the first *RRCReconfiguration* after re-establishment | Considering that the previous RAN2 agreement is only discussed in the first *RRCReconfiguration* after re-establishment case( the main reason is “UE is requested to refresh the security already when receiving an RRCReestablishment by the network”), so for RRCResume case, maybe we need a separate discussion. For example, *reestablishPDCP* field is set to true for SRB1 when network wants to update the security-related parameters. |
| Ericsson | Agree | The agreements for the first reconfiguration after reestablishment and for the resume case still hold in this case. |
| Apple | Agree |  |
| ZTE | Agree |  |
| Sequans | Agree | Agree that previous agreements are still ok. |
| Intel  | Agree |  |

## 3.4 Other comments

**Question x**: Do companies have any other comments?

|  |  |
| --- | --- |
| Company  | Comments |
| Intel | The behaviour where UE releases the RLC bearer of SRB on full config flag can have other impacts on implementations. Currently, it is generally allowed to send another RRC message without waiting for the response message from the UE. If the network sends another RRC message immediately after the RRC message containing the full configuration, the message can be lost during the RLC bearer release of the SRB. Hence network implementations have to take care not to send the second RRC message until receipt of the first response message (response to the message containing the full config flag). |

# 4 Conclusion

Based on the discussion in the previous sections we propose the following:

# 5 References

1. [R2-2103655](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs//R2-2103655.zip), Clarification on SRB1 configuration for RRC resume and reestablishment, Ericsson, Intel Corporation, ZTE Corporation, RAN2#113bis-e, April 2021

1. [R2-2103656](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs//R2-2103656.zip), Clarification on SRB1 configuration for RRC resume and reestablishment, Ericsson, Intel Corporation, ZTE Corporation, RAN2#113bis-e, April 2021

1. [R2-2103657](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs//R2-2103657.zip), Clarification on the RLC entity release during full configuration, Ericsson, RAN2#113bis-e, April 2021
2. [R2-2103658](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs//R2-2103658.zip), Clarification on the RLC entity release during full configuration, Ericsson, RAN2#113bis,

1. [R2-2104127](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs//R2-2104127.zip), Clarification on RLC bearer handling in Full Configuration, MediaTek Inc., Qualcomm Incorporated, RAN2#113bis-e, April 2021

1. [R2-2104140](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs//R2-2104140.zip), Clarification on RLC bearer handling in full configuration, MediaTek Inc., Qualcomm Incorporated, RAN2#113bis-e, April 2021
2. [R2-2104143](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs//R2-2104143.zip), Clarification on RLC bearer handling in full Configuration, MediaTek Inc., Qualcomm Incorporated, RAN2#113bis-e, April 2021