3GPP TSG-RAN WG2 Meeting #113 electronic R2-21xxxxx

Online, Jan 25 – Feb 5, 2021

Agenda Item: 6.4.2

Source: vivo

Title: Summary of [AT113-e][705][V2X/SL] RLC Re-establishment (vivo)

Document for: Discussion, Decision

# Introduction

This is for the following email discussion.

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| * [AT113-e][705][V2X/SL] RLC Re-establishment (vivo)   **Scope:** Discuss the need of RLC re-establishment. Prepare agreeable CR (if needed).  **Intended outcome:** Agreeable 38.331 CR in R2-2102180 and discussion summary in R2-2102181 (if needed)  **Deadline:** Feb 04 0430 (UTC) |

# Discussion

In RAN2 #108 meeting, some left issues on NR SL RLC based on the contribution [1] and the following agreement is reached:

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| RAN2 #108 Agreements on RLC:  1: RLC re-establishment is not needed, at least in Rel-16. |

As discussed in [1], one of the main reasons for this agreement focused on:

* *Function refreshing within the lifetime of an entity: it is not very clear whether PDCP security update or ROHC reset will occur within the lifetime of a RLC entity. Even if there are such cases, RLC release/establish can also be used.*

Later in RAN2 #109bis-e meeting, the PDCP re-establishment is discussed to be an option to address the count wrap around issue when consider the re-keying procedure specified in SA3 TS 33.536 [2]. Based on the offline discussion [3] and related online discussion, PDCP re-establishment is supported.

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| RAN2 #109bis-e Agreements on PDCP:  4: PDCP re-establishment is supported in SL unicast. |

Further in RAN2 #110-e meeting, it is agreed to capture the PDCP re-establishment trigger for PC5 unicast link in TS 38.331.‎‎

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| Proposal 4: Capture the PDCP re-establishment trigger for PC5 unicast link in 38.331.‎‎  [Futurewei]: Do we need to discuss RLC reestablishment and MAC reset also?   * Agreed. |

At that time, the question of whether RLC re-establishment is needed also is actually raised by companies but not solved, as it is suggested then this can be handled by e.g. RLC/RRC specification rapporteurs if needed. However, this issue is kept open and need to be discussed how we should progress.

Therefore, the following questions are to check whether the RLC reestablishment should be specified when the corresponding PDCP entity is re-established, and to pursue an agreeable CR if needed.

## Issue-1: Need of specified RLC behaviours

**Q1-1: Do you think that specified RLC behaviours are needed when PDCP re-establishment occurs, e.g. due to re-keying procedure?**

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| Company | Yes/No | Comment |
| OPPO | No | The reason for RLC re-establishment during PDCP re-establishment for Uu interface is that otherwise the old packet (i.e., protected by old key) in RLC buffer cannot be distinguished by Rx, and thus would cause issue, e.g., wrongly deciphering.  On the other hand, with Key ID field for PC5 PDCP PDU (which does not exist in Uu PDCP PDU) helps the Rx to differentiate between the packets using old/new key, so the problem does not exist. |
| Ericsson (Tony) | No | We basically agree with the analysis explained by OPPO. Further, this is a big NBC that we are fine to have at this late stage of Rel-16. |
| Samsung | No | We share the view as OPPO and Ericsson that RLC reestablishment is not needed in case of PDCP reestablishment due to rekeying procedure. |
| Huawei, HiSilicon | No | During the WI discussion, RAN2 didn’t reach the consensus to support RLC reestablishment and MAC reset in the case of SL re-key, but only agreed to support PDCP re-establishment. It seems that we can live with only PDCP re-establishment in the re-keying case, though potential resource wastage may be forseen (to transmit out-dated RLC PDUs). Also, if we now introduce RLC reestablishment, further complication will be introduced on whether MAC reset needs to be supported as well. Considering the freeze of Rel-16 Spec and that this is to introduce a new feature (w/o which the SL unicast can still work), it is proposed not to introduce this new feature. |
| Nokia | No | There is no necessity to introduce RLC (and MAC) re-establishment at such a late point of Rel.16, where the normative specification work for Rel.16 NR SL is closed. In addition, we should not revert the agreement taken in RAN2#108 |
| MediaTek | No | Same view as other respondents that this is not needed. |
| Intel | No | We also share the view with other companies that at this stage, this change is not essential |
| Qualcomm | No | Agree with the views expressed this is not required at this time |
| CATT | No | We share the same view with other companies on this issue. |
| LG | No | Same view with other companies. |
| Spreadtrum | No | We share the same views with other companies. |
| ZTE | No | Share the same view with other companies. |

If it can be agreed to specify RLC behaviours when PDCP re-establishment occurs, basically we have two options, one is to use RLC entity release/establishment procedure, and the other one is to use RLC entity re-establishment procedure. From rapporteur’s perspective, these two options will have a similar effect but the latter one is more aligned with the legacy principle, i.e. PDCP re-establishment is always accompanied by the corresponding RLC re-establishment.

**Q1-2: If Yes to Q1-1, which option is preferable to you?**

Option 1: RLC entity re-establishment procedure to be used

Option 2: RLC release/establishment procedure to be used

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| Company | Option | Comment |
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## Issue-2: Text proposal

In this section we further discuss about the Text proposals to pursue an agreeable CR.

**Q2-1: If option 1 is chosen in Q1-2, whether the following TP can be agreed for TS 38.331?**

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| 5.8 Sidelink5.8.1 General NR sidelink communication consists of unicast, groupcast and broadcast. For unicast, the PC5-RRC connection is a logical connection between a pair of a Source Layer-2 ID and a Destination Layer-2 ID in the AS. The PC5-RRC signalling, as specified in sub-clause 5.8.9, can be initiated after its corresponding PC5 unicast link establishment (TS 23.287 [55]). The PC5-RRC connection and the corresponding sidelink SRBs and sidelink DRB(s) are released when the PC5 unicast link is released as indicated by upper layers.  For each PC5-RRC connection of unicast, one sidelink SRB (i.e. SL-SRB0) is used to transmit the PC5-S message(s) before the PC5-S security has been established. One sidelink SRB (i.e. SL-SRB1) is used to transmit the PC5-S messages to establish the PC5-S security. One sidelink SRB (i.e. SL-SRB2) is used to transmit the PC5-S messages after the PC5-S security has been established, which is protected. One sidelink SRB (i.e. SL-SRB3) is used to transmit the PC5-RRC signalling, which is protected and only sent after the PC5-S security has been established.  For unicast of NR Sidelink communication, AS security comprises of integrity protection and ciphering of PC5 signaling (SL-SRB2 and SL-SRB3) and user data (SL-DRBs). The ciphering and integrity protection algorithms and parameters for a PC5 unicast link are exchanged by PC5-S messages in the upper layers as specified in TS 33.536 [60], and apply to the corresponding PC5-RRC connection in the AS. Once AS security is activated for a PC5 unicast link in the upper layers as specified in TS 33.536 [60], all messages on SL-SRB2 and SL-SRB3 and/or user data on SL-DRBs of the corresponding PC5-RRC connection are integrity protected and/or ciphered by the PDCP.  For unicast of NR Sidelink communication, if the change of the key is indicated by the upper layers as specified in TS 33.536 [60], UE re-establishes the RLC entity and the PDCP entity of the SL-SRB1, SL-SRB2, SL-SRB3 and SL-DRBs on the corresponding PC5-RRC connection. |

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**Q2-2: If option 2 is chosen in Q1-2, whether the following TP can be agreed for TS 38.331?**

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| 5.8 Sidelink5.8.1 General NR sidelink communication consists of unicast, groupcast and broadcast. For unicast, the PC5-RRC connection is a logical connection between a pair of a Source Layer-2 ID and a Destination Layer-2 ID in the AS. The PC5-RRC signalling, as specified in sub-clause 5.8.9, can be initiated after its corresponding PC5 unicast link establishment (TS 23.287 [55]). The PC5-RRC connection and the corresponding sidelink SRBs and sidelink DRB(s) are released when the PC5 unicast link is released as indicated by upper layers.  For each PC5-RRC connection of unicast, one sidelink SRB (i.e. SL-SRB0) is used to transmit the PC5-S message(s) before the PC5-S security has been established. One sidelink SRB (i.e. SL-SRB1) is used to transmit the PC5-S messages to establish the PC5-S security. One sidelink SRB (i.e. SL-SRB2) is used to transmit the PC5-S messages after the PC5-S security has been established, which is protected. One sidelink SRB (i.e. SL-SRB3) is used to transmit the PC5-RRC signalling, which is protected and only sent after the PC5-S security has been established.  For unicast of NR Sidelink communication, AS security comprises of integrity protection and ciphering of PC5 signaling (SL-SRB2 and SL-SRB3) and user data (SL-DRBs). The ciphering and integrity protection algorithms and parameters for a PC5 unicast link are exchanged by PC5-S messages in the upper layers as specified in TS 33.536 [60], and apply to the corresponding PC5-RRC connection in the AS. Once AS security is activated for a PC5 unicast link in the upper layers as specified in TS 33.536 [60], all messages on SL-SRB2 and SL-SRB3 and/or user data on SL-DRBs of the corresponding PC5-RRC connection are integrity protected and/or ciphered by the PDCP.  For unicast of NR Sidelink communication, if the change of the key is indicated by the upper layers as specified in TS 33.536 [60], UE re-establishes the PDCP entity, while releases and establishes the RLC entity of the SL-SRB1, SL-SRB2, SL-SRB3 and SL-DRBs on the corresponding PC5-RRC connection. |

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| Company | Yes/No | Comment |
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## Summary

For specified RLC behaviour when PDCP re-establishment occurs, all companies (12 out of 12) agree that there is no need to support it at such a late stage of Rel-16, and there are no severe problems identified for not specifying this.

Rapporteur suggest to go for majority view. As the consequence of RLC re-establishment being not supported would make it different with the Uu case, it is proposed:

1. RAN2 to confirm that, for sidelink, RLC entity is not re-established when PDCP re-establishment occurs.
2. There is no specification impact if P1 is agreed.

# Conclusion

We have the following proposals

1. RAN2 to confirm that, for sidelink, RLC entity is not re-established when PDCP re-establishment occurs.
2. There is no specification impact if P1 is agreed.

# Reference

1. R2-1914922, Left issues on NR SL RLC and PDCP, vivo, 3GPP TSG-RAN2 Meeting #108, Reno, USA, 18th – 22th November, 2019
2. R2-2003774, Summary of PDCP remaining issues on NR V2X, CATT, 3GPP TSG-RAN WG2 Meeting #109bis-e, Electronic, 20 April – 30 April 2020
3. R2-2004078, Summary of offline discussion for PDCP remaining issues, CATT (rapporteur), 3GPP TSG-RAN WG2 Meeting #109bis-e, Electronic, 20 April – 30 April 2020

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