3GPP TSG-RAN WG2 #109-e TDoc R2-20XXXXX

**Electronic Meeting, 24th February – 6th March 2020**

Agenda Item: 6.4.3.2

Source: Ericsson

Title: Report for offline discussion on RLC left issues

Document for: Discussion, Decision

# Introduction

In this paper, companies are invited to discuss the RLC remaining issues.

R2-2002019 Summary for NR V2X RLC left issues Ericsson discussion Rel-16 5G\_V2X\_NRSL-Core

* [Offline#706]: To discuss and decide proposal 1, 2 and 3 (Ericsson, R2-2001972) (Comeback next Wed.)

# Discussion

In the RAN2#107bis meeting the following agreement was made:

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| **RAN2#107:****Agreements on SL RLC:** 6: One bi-directional SLRB based RLC AM is taken as the baseline for SL RLC design. FFS possible enhancements.8: For unicast NR SL RLC UM, 6-bit and 12-bit RLC SN length are supported.11: For NR SL RLC AM, 12-bit and 18-bit RLC SN length are supported.**RAN2#107bis****Agreements on RLC UM:** 1: For SL groupcast/broadcast, only uni-directional RLC UM SLRB is supported (i.e. no support of bi-directional RLC UM SLRB). FFS on SL unicast. |

For NR Uu, UL and DL side of the same bi-directional AM/UM RLC entity are configured separately as shown below, and the SN lengths can be different.

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| **From TS 38.331:***RLC-Config* information element-- ASN1START-- TAG-RLC-CONFIG-STARTRLC-Config ::= CHOICE { am SEQUENCE { ul-AM-RLC UL-AM-RLC, dl-AM-RLC DL-AM-RLC }, um-Bi-Directional SEQUENCE { ul-UM-RLC UL-UM-RLC, dl-UM-RLC DL-UM-RLC }, um-Uni-Directional-UL SEQUENCE { ul-UM-RLC UL-UM-RLC }, um-Uni-Directional-DL SEQUENCE { dl-UM-RLC DL-UM-RLC }, ...}UL-AM-RLC ::= SEQUENCE { sn-FieldLength SN-FieldLengthAM OPTIONAL, -- Cond Reestab t-PollRetransmit T-PollRetransmit, pollPDU PollPDU, pollByte PollByte, maxRetxThreshold ENUMERATED { t1, t2, t3, t4, t6, t8, t16, t32 }}DL-AM-RLC ::= SEQUENCE { sn-FieldLength SN-FieldLengthAM OPTIONAL, -- Cond Reestab t-Reassembly T-Reassembly, t-StatusProhibit T-StatusProhibit}UL-UM-RLC ::= SEQUENCE { sn-FieldLength SN-FieldLengthUM OPTIONAL -- Cond Reestab}DL-UM-RLC ::= SEQUENCE { sn-FieldLength SN-FieldLengthUM OPTIONAL, -- Cond Reestab t-Reassembly T-Reassembly} |

Therefore, one issue to clarify is about bi-directional SL RLC AM entity configuration. In the first question, companies are asked if RAN2 follow the Uu principle that the TX side and RX side of the same SL RLC AM entity can be configured with different SN lengths.

**Question 1: Do companies agree that the TX side and RX side of the same SL RLC AM entity can be configured with different SL lengths? Please describe you reason in the comment if No is selected.**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| OPPO | Yes | Just to clarify the SN length of TX side and RX side of the same SL RLC AM entity is not configured by one UE. Instead of that RX side is configured by counterpart UE. |
| Samsung | Yes | We are fine to apply NR Uu principle to SL unicast bidirectional. Different SN lengths for each direction can be configured in TX UE of the corresponding direction. |
| Huawei | Yes | We assume the questions discussed throughout this discussion are all for the SL-**D**RB, since SL-SRBs are specified with fixed parameters and thus do not face these issues. For a UE, the SN length for TX is configured by the gNB, and is to be further sent to the peer UE, in order for the peer UE to receive correctly; the SN length for RX is configured by the peer UE, and is received from the peer UE via PC5 RRC, in order to receive the peer UE correctly. This is with the same logic as in Uu UL(TX) and DL(RX), and we think this is already captured in the TS 38.331 running CR.  |
| MediaTek | Yes |  |
| ZTE | Yes | Similar to Uu, the SL PDCP/RLC SN length could be different in the two directions of the bi-directional SL RLC AM SLRB.  |
| LG | Yes |  |
| vivo | Yes | We are ok to follow NR Uu principle to SL RLC AM configuration. Different SN lengths can be configured by each peer of TX UEs, which will reduce the configuration collision probability and increase flexibility.  |
| Nokia | Yes |  |
| CATT | Yes | For NR Uu, for bi-directional RB, different SN lengths can be used for UL and DL, hence, the similar principle can be reused in NR SL.  |
| Ericsson | Yes |  |
| Futurewei | Yes | We are fine to follow Uu practice. |
| Apple | Yes | The question is not very clear, because RX side is not able to cotrol the SN size chosen by the transmitter indepdently. I assume the question is about the two peer TX side of the same SL RLC bi-diretional bearer. |

In the second question, to address the left FFS point, do companies agree that both uni-directional and bi-directional SL RLC UM entities are supported for SL unicast? Note that uni-directional RLC entity means that only TX side or RX side is configured within the same RLC entity, while bi-directional RLC entity means that bot TX side and RX side are configured within the same RLC entity.

**Question 2: Do companies agree that both uni-directional and bi-directional RLC UM SLRB are supported for SL unicast? Please describe you reason in the comment if No is selected.**

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| **Company** | **Yes/No** | **Comment** |
| OPPO | Yes | Just to clarify that “bi-directional RLC entity means that both TX side and RX side are configured within the same RLC entity”, it dies not necessary mean the configuration is done from initiating UE within one RRCReconfigurationSidelink message. Instead of that the RX side is configured by counterpart UE via another RRC reconfiguration procedure for the same SLRB. So the IE SL-RLC-ConfigPC5-r16 in current running CR should be modified as following:SL-RLC-ConfigPC5-r16 ::= CHOICE { sl-AM-RLC-r16 SEQUENCE { sl-SN-FieldLengthAM-r16 SN-FieldLengthAM OPTIONAL, -- Need M ... },  sl-UM-RLC-r16 SEQUENCE { sl-SN-FieldLengthUM-r16 SN-FieldLengthUM OPTIONAL, -- Need M ... }} |
| Samsung | Yes | Same view as OPPO |
| Huawei | Yes | As in Q1, we assume the question is for SL-DRBs. We think this is already supported in the TS 38.331 running CR. |
| MediaTek | Yes |  |
| LG | Yes |  |
| vivo | Yes | If a logical channel is an UM uni-directional, RLC UM parameters will be only configured by TX UE, e.g. only one SN is needed.If a logical channel is an UM bi-directional, RLC UM parameters will be configured by two TX UEs for each direction, e.g. maybe different SN lengths, which is similar with RLC AM. |
| Nokia | Yes | Nokia |
| CATT | Yes | Agree with OPPO. |
| Ericsson | Yes | Same view as OPPO.  |
| Futurewei | Yes | Some procedural change would also be need together with Oppo’s change on SL-RLC-ConfigPC5-r16 to make it work both for bi-directional and uni-directional SLRB. |
| Apple | Yes | Agree with OPPO |
| Qualcomm | Yes |  |

If bi-directional RLC UM SLRB is supported, one following question, similar as Q1, is that if TX side and RX side of the same SL RLC UM entity can be configured with different lengths?

**Question 3: If bi-directional RLC UM SLRB is supported, do companies agree that the TX side and RX side of the same bi-directional SL RLC UM entity can be configured with different SL lengths? Please describe you reason in the comment if No is selected.**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| OPPO | Yes | Similar comments as answer to Q1 |
| Samsung | Yes | Same as Q1 |
| Huawei | Yes | Similar comments as to Q1. |
| MediaTek | Yes | The question is a bit vague, we assume that same direction traffic should use same SL length. However, in reverse direction, it is possible to use different SN length.I.e., UE1 -> UE2, TX side entity in UE1 and RX side entity in UE2 should use the same SL length. If it is UE2 -> UE1, it is possible that TX side entity in UE2 can use different SN length compared to that used in RX side entity in UE2. |
| ZTE | Yes | Since bi-directional RLC AM SLRB is supported, there is no additional issues to support bi-directional RLC UM SLRB on top of bi-directional RLC AM SLRB.  |
| LG | Yes |  |
| vivo | Yes | As Q1 |
| Nokia | Yes |  |
| CATT | Yes | Similar comments as answer to Q1 |
| Ericsson | Yes  |  |
| Futurewei | Yes | We are fine to follow Uu practice. |
| Apple | Yes | As same as Q1 |

If uni-directional RLC UM SLRB is supported, another following issue (related to the comment from Futurewei during online discussion) is that if the SL QoS flow is a bi-directional SL QoS flow, how to ensure that it is not mapped to a uni-directional RLC UM SLRB?

In rapporteur’s understanding, one alternative is to leave it to implementation, if a bi-directional SL QoS flow is mapped to a uni-directional RLC UM SLRB (by the initiating UE or by the gNB of the initiating UE), in the worst case, the peer UE might have to initiate a new SL QoS flow to support the traffic in the other direction.

As another alternative, without knowing whether the QoS flow is uni-directional or bi-directional, a UE/gNB only configures the TX side of an RLC UM entity, while the RX side configuration relies on the triggering/parameters from peer UE/gNB. For example:

* To support a SL QoS flow, UE#1 initiates/configures an RLC UM SLRB#1 to transmit packet to UE#2. Only UE#1->UE#2 direction of SLRB#1 is configured. SLRB#1 is a uni-directional RLC UM SLRB at this moment.
* When UE#2 receives the configuration of SLRB#1 and decides to use SLRB#1 to transmit packet to UE#1 in the other direction, UE#2 can configure the UE#2->UE#1 direction of SLRB#1. SLRB#1 becomes a bi-directional RLC UM SLRB.

**Question 4: If uni-directional RLC UM SLRB is supported, how to ensure a bi-directional SL QoS flow is not mapped to a uni-directional RLC UM SLRB?**

1. **UE/gNB only configures the TX side of an RLC UM entity, while the RX side configuration relies on the triggering/parameters from peer UE/gNB. Basically, the peer UE/gNB is allowed to turn a uni-directional RLC UM SLRB into a bi-directional RLC UM SLRB.**
2. **Up to implementation**
3. **Others**
4. **No restriction as in the question is needed and the question does not need to be discussed.**

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| --- | --- | --- |
| **Company** | **Option** | **Comment** |
| OPPO | A with comment | Peer UE/gNB is also allowed to configure another SLRB for the same QoS flow. |
| Samsung | Same as RLC configuration alignment | We are somewhat confused with the issue itself. UE should be configured with one RLC mode (RLC AM, RLC UM bidirectional or RLC UM unidirectional) based on QoS characteristics of the flow. Then the same RLC mode should be applied for peer UE. Can we solve this issue with the same resolution of RLC configuration alignment? |
| Huawei | d | In Uu, asymmetric QoS flow to DRB mapping is already allowed between the gNB and the UE. This means that for a bi-directional QoS flow in Uu, such DRB configuration is already possible that a UE uses one uni-directional DRB for the data transmission to the gNB (one direction), but uses another uni-directional DRB for the data reception from the gNB (the other direction), i.e. using two uni-directional DRBs to perform the transmission and reception of a QoS flow respectively. Such a mechanism should also be feasible to PC5, so no restriction is needed to require a PC5 QoS flow (even if bi-directional) to have to be mapped to a bi-directional SL-DRB. |
| MediaTek | b | We think this is an error case that NW configure uni-directional RLC UM SLRB for a bi-directional SL QoS flow. NW should ensure that will not happen. Thus, we prefer NW to solve this for in coverage case, In OOC case, there is no NW help, so it is up to “UE” implementation to avoid the error case, i.e. UE should not build uni-directional RLC UM SLRB for a bi-directional SL QoS flow. |
| ZTE | b | It is not appropriate to say a SL QoS flow is bi-directional. The SL QoS flow shall be uni-directional, i.e. from initiating UE(UE1) to the peer UE(UE2). If UE2 has a similar QoS flow need to transmit to UE1, then the UE2 becomes the initiating UE and it is up to UE2 implementation to initiate a new SLRB to transmit the QoS flow or re-configure an existing uni-directional RLC UM SLRB to be a bi-directional SLRB to transmit the QoS flow. |
| LG | b | We think that NW should insure SL QoS flow mapping corresponding to each RLC mode. That is, it is NW implementation not to occure such a error case.  |
| Nokia | D | Similar view as Huawei |
| CATT | b | Firstly, it should clarify how AS knows whether a SL QoS flow is a bi-directional SL QoS flow or not. Secondly, UE/gNB only configures the Tx side of an RLC UM entity, the Rx side configuration relies on the QoS flow from the Rx UE, how to configures it in the Rx side depends on Rx UE implementation. |
| Ericsson | A | In our view, if we take what suggested by OPPO in Q2 that a UE only configures the TX side of the SLRB (regardless of uni-directional or bi-directional) while the RX side (if needed, in case of bi-directional) configuration is provided by the peer UE, then it is natural to support option a) that it is up to peer UE to decides whether to configure a bi-directional for the given PC5 QoS flow. Option b) can work but less efficient.  |
| Futurewei | A | We’re fine with Option A, which would be aligned with Oppo’s change on SL-RLC-ConfigPC5-r16 in Q2.The difference from Uu is that the node initiating the RB configuration - gNB in Uu case – decides the mapping of QoS flow on the RB, while option A would give it to the Rx node. |
| Apple | A or D | This depends on whether the QoS flow is in need of bi-directionoal RLC UM bearer or not.If yes, then option A can be used to configure such bearer and ensure the same LCID is used in both sides.If no, then there is no such a requirement that both TX side and RX side must be configured within the same RLC UM entity to support a bi-directional QoS flow. Then, there is no need to specify any new UE behavior for this case.  |
| Qualcomm | a |  |

# Conclusion

For the proposals listed in the section 2, we believe all of them can be easily agreed in this e-meeting: