**3GPP TSG-RAN WG2 Meeting #110 electronic R2-200xxxx**

1 June – 12 June 2020

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.322** | **CR** | **0036** | **rev** | **1** | **Current version:** | **16.0.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Correction on RLC spec to support the BAP as upper layer | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_IAB-Core | | | | |  | ***Date:*** | | | 2020-06-01 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In the IAB architecture, the BH RLC is below BAP sub-layer and the access RLC is below PDCP sub-layer. Therefore, there are two alternative upper layers for RLC spec, i.e. either PDCP or BAP.  The maximium size of RLC SDU is either the maximium size of PDCP PDU or that of BAP PDU. This should be clarified in the RLC spec that the current description “The maximum Data field size is the maximum size of a PDCP PDU” only applies to the case of access RLC. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | In section 6.2.3.2, add NOTE “NOTE: In case the upper layer is BAP, the maximum Data field size can be larger than the maximum size of a PDCP PDU.” | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The maximum Data field size of RLC is not correctly, in case the BAP sub-layer is above this RLC entity, rather than PDCP. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.2.3.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

--------------------- [Start ofchange] ---------------------------------

6.2 Formats and parameters

6.2.1 General

The formats of RLC PDUs are described in sub clause 6.2.2 and their parameters are described in sub clause 6.2.3.

6.2.2 Formats

6.2.2.1 General

RLC PDU is a bit string. In the figures in sub clause 6.2.2.2 to 6.2.2.5, bit strings are represented by tables in which the first and most significant bit is the left most bit of the first line of the table, the last and least significant bit is the rightmost bit of the last line of the table, and more generally the bit string is to be read from left to right and then in the reading order of the lines.

RLC SDUs are bit strings that are byte aligned (i.e. multiple of 8 bits) in length. An RLC SDU is included into an RLC PDU from first bit onward.

6.2.2.2 TMD PDU

TMD PDU consists only of a Data field and does not consist of any RLC headers.

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**Figure 6.2.2.2-1: TMD PDU**

6.2.2.3 UMD PDU

UMD PDU consists of a Data field and an UMD PDU header. The UMD PDU header is byte aligned.

When an UMD PDU contains a complete RLC SDU, the UMD PDU header only contains the SI and R fields.

An UM RLC entity is configured by RRC to use either a 6 bit SN or a 12 bit SN. For groupcast and broadcast of NR sidelink communication, only 6 bit SN length is configured. An UMD PDU header contains the SN field only when the corresponding RLC SDU is segmented. An UMD PDU carrying the first segment of an RLC SDU does not carry the SO field in its header. The length of the SO field is 16 bits.

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**Figure 6.2.2.3-1: UMD PDU containing a complete RLC SDU**

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**Figure 6.2.2.3-2: UMD PDU with 6 bit SN (No SO)**

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**Figure 6.2.2.3-3: UMD PDU with 12 bit SN (No SO)**

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**Figure 6.2.2.3-4: UMD PDU with 6 bit SN and with SO**

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**Figure 6.2.2.3-5: UMD PDU with 12 bit SN and with SO**

6.2.2.4 AMD PDU

AMD PDU consists of a Data field and an AMD PDU header. The AMD PDU header is byte aligned.

An AM RLC entity is configured by RRC to use either a 12 bit SN or a 18 bit SN. The length of the AMD PDU header is two and three bytes respectively.

An AMD PDU header contains a D/C, a P, a SI, and a SN. An AMD PDU header contains the SO field only when the Data field consists of an RLC SDU segment which is not the first segment, in which case a 16 bit SO is present.

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**Figure 6.2.2.4-1: AMD PDU with 12 bit SN (No SO)**

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**Figure 6.2.2.4-2: AMD PDU with 18 bit SN (No SO)**

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**Figure 6.2.2.4-3: AMD PDU with 12 bit SN with SO**

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**Figure 6.2.2.4-4: AMD PDU with 18 bit SN with SO**

6.2.2.5 STATUS PDU

STATUS PDU consists of a STATUS PDU payload and an RLC control PDU header.

RLC control PDU header consists of a D/C and a CPT field.

The STATUS PDU payload starts from the first bit following the RLC control PDU header, and it consists of one ACK\_SN and one E1, zero or more sets of a NACK\_SN, an E1, an E2 and an E3, and possibly a pair of a SOstart and a SOend or a NACK range field for each NACK\_SN.

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**Figure 6.2.2.5-1: STATUS PDU with 12 bit SN**

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**Figure 6.2.2.5-2: STATUS PDU with 18 bit SN**

6.2.3 Parameters

6.2.3.1 General

In the definition of each field in sub clauses 6.2.3.2 to 6.2.3.5, the bits in the parameters are represented in which the first and most significant bit is the left most bit and the last and least significant bit is the rightmost bit. Unless mentioned otherwise, integers are encoded in standard binary encoding for unsigned integers.

#### 6.2.3.2 Data field

Data field elements are mapped to the Data field in the order which they arrive to the RLC entity at the transmitter.

For TMD PDU, UMD PDU and AMD PDU:

- The granularity of the Data field size is one byte;

- The maximum Data field size is the maximum size of a PDCP PDU.

NOTE: In case the upper layer is BAP, the maximum Data field size can be larger than the maximum size of a PDCP PDU.

For TMD PDU:

- Only one RLC SDU can be mapped to the Data field of one TMD PDU.

For UMD PDU, and AMD PDU:

- Either of the following can be mapped to the Data field of one UMD PDU, or AMD PDU:

- One RLC SDU;

- One RLC SDU segment.

#### 6.2.3.3 Sequence Number (SN) field

Length: 12 bits or 18 bits (configurable) for AMD PDU. 6 bits or 12 bits (configurable) for UMD PDU.

The SN field indicates the sequence number of the corresponding RLC SDU. For RLC AM, the sequence number is incremented by one for every RLC SDU. For RLC UM, the sequence number is incremented by one for every segmented RLC SDU.

6.2.3.4 Segmentation Info (SI) field

Length: 2 bits.

The SI field indicates whether an RLC PDU contains a complete RLC SDU or the first, middle, last segment of an RLC SDU.

**Table 6.2.3.4-1: SI field interpretation**

|  |  |
| --- | --- |
| **Value** | **Description** |
| 00 | Data field contains all bytes of an RLC SDU |
| 01 | Data field contains the first segment of an RLC SDU |
| 10 | Data field contains the last segment of an RLC SDU |
| 11 | Data field contains neither the first nor last segment of an RLC SDU |

6.2.3.5 Segment Offset (SO) field

Length: 16 bits

The SO field indicates the position of the RLC SDU segment in bytes within the original RLC SDU. Specifically, the SO field indicates the position within the original RLC SDU to which the first byte of the RLC SDU segment in the Data field corresponds. The first byte of the original RLC SDU is referred by the SO field value "0000000000000000", i.e., numbering starts at zero.

6.2.3.6 Data/Control (D/C) field

Length: 1 bit.

The D/C field indicates whether the RLC PDU is an RLC data PDU or RLC control PDU. The interpretation of the D/C field is provided in Table 6.2.3.6-1.

**Table 6.2.3.6-1: D/C field interpretation**

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | Control PDU |
| 1 | Data PDU |

6.2.3.7 Polling bit (P) field

Length: 1 bit.

The P field indicates whether or not the transmitting side of an AM RLC entity requests a STATUS report from its peer AM RLC entity. The interpretation of the P field is provided in Table 6.2.3.7-1.

**Table 6.2.3.7-1: P field interpretation**

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | Status report not requested |
| 1 | Status report is requested |

6.2.3.8 Reserved (R) field

Length: 1 bit.

The R field is a reserved field for this release of the protocol. The transmitting entity shall set the R field to "0". The receiving entity shall ignore this field.

6.2.3.9 Control PDU Type (CPT) field

Length: 3 bits.

The CPT field indicates the type of the RLC control PDU. The interpretation of the CPT field is provided in Table 6.2.3.9-1.

**Table 6.2.3.9-1: CPT field interpretation**

|  |  |
| --- | --- |
| **Value** | **Description** |
| 000 | STATUS PDU |
| 001- | Reserved  (PDUs with this coding will be discarded by the receiving entity for this release of the protocol) |

6.2.3.10 Acknowledgement SN (ACK\_SN) field

Length: 12 bits or 18 bits (configurable).

The ACK\_SN field indicates the SN of the next not received RLC SDU which is not reported as missing in the STATUS PDU. When the transmitting side of an AM RLC entity receives a STATUS PDU, it interprets that all RLC SDUs up to but not including the RLC SDU with SN = ACK\_SN have been received by its peer AM RLC entity, excluding those RLC SDUs indicated in the STATUS PDU with NACK\_SN, portions of RLC SDUs indicated in the STATUS PDU with NACK\_SN, SOstart and SOend, RLC SDUs indicated in the STATUS PDU with NACK\_SN and NACK\_range, and portions of RLC SDUs indicated in the STATUS PDU with NACK\_SN, NACK range, SOstart and SOend.

6.2.3.11 Extension bit 1 (E1) field

Length: 1 bit.

The E1 field indicates whether or not a set of NACK\_SN, E1, E2 and E3 follows. The interpretation of the E1 field is provided in Table 6.2.3.11-1.

**Table 6.2.3.11-1: E1 field interpretation**

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | A set of NACK\_SN, E1, E2 and E3 does not follow. |
| 1 | A set of NACK\_SN, E1, E2 and E3 follows. |

6.2.3.12 Negative Acknowledgement SN (NACK\_SN) field

Length: 12 bits or 18 bits (configurable).

The NACK\_SN field indicates the SN of the RLC SDU (or RLC SDU segment) that has been detected as lost at the receiving side of the AM RLC entity.

6.2.3.13 Extension bit 2 (E2) field

Length: 1 bit.

The E2 field indicates whether or not a set of SOstart and SOend follows. The interpretation of the E2 field is provided in Table 6.2.3.13-1.

**Table 6.2.3.13-1: E2 field interpretation**

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | A set of SOstart and SOend does not follow for this NACK\_SN. |
| 1 | A set of SOstart and SOend follows for this NACK\_SN. |

6.2.3.14 SO start (SOstart) field

Length: 16 bits.

The SOstart field (together with the SOend field) indicates the portion of the RLC SDU with SN = NACK\_SN (the NACK\_SN for which the SOstart is related to) that has been detected as lost at the receiving side of the AM RLC entity. Specifically, the SOstart field indicates the position of the first byte of the portion of the RLC SDU in bytes within the original RLC SDU. The first byte of the original RLC SDU is referred by the SOstart field value "0000000000000000", i.e., numbering starts at zero.

6.2.3.15 SO end (SOend) field

Length: 16 bits.

When E3 is 0, the SOend field (together with the SOstart field) indicates the portion of the RLC SDU with SN = NACK\_SN (the NACK\_SN for which the SOend is related to) that has been detected as lost at the receiving side of the AM RLC entity. Specifically, the SOend field indicates the position of the last byte of the portion of the RLC SDU in bytes within the original RLC SDU. The first byte of the original RLC SDU is referred by the SOend field value "0000000000000000", i.e., numbering starts at zero. The special SOend value "1111111111111111" is used to indicate that the missing portion of the RLC SDU includes all bytes to the last byte of the RLC SDU.

When E3 is 1, the SOend field indicates the portion of the RLC SDU with SN = NACK\_SN + NACK range - 1 that has been detected as lost at the receiving side of the AM RLC entity. Specifically, the SOend field indicates the position of the last byte of the portion of the RLC SDU in bytes within the original RLC SDU. The first byte of the original RLC SDU is referred by the SOend field value "0000000000000000", i.e., numbering starts at zero. The special SOend value "1111111111111111" is used to indicate that the missing portion of the RLC SDU includes all bytes to the last byte of the RLC SDU.

6.2.3.16 Extension bit 3 (E3) field

Length: 1 bit.

The E3 field indicates whether or not information about a continous sequence of RLC SDUs that have not been received follows.

**Table 6.2.3.16-1: E3 field interpretation**

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | NACK range field does not follow for this NACK\_SN. |
| 1 | NACK range field follows for this NACK\_SN. |

6.2.3.17 NACK range field

Length: 8 bits

This NACK range field is the number of consecutively lost RLC SDUs starting from and including NACK\_SN.

--------------------------[End of change] ------------------------------