**3GPP TSG-RAN WG3 Meeting #115-eR3-222832**

E-Meeting, 21 Feb - 3 Mar 2022

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.425** | **CR** | **0135** | **rev** | **1** | **Current version:** | **16.3.0** |  |
|  | | | | | | | | |
| *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 |  | Radio Access Network | **X** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Correction of F1-U Delay Measurement for QoS Monitoring | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung, Verizon Wireless, Intel Corporation, Huawei, CMCC, KDDI | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Core, TEI17 | | | | |  | ***Date:*** | | | 2022-2-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | F1-U delay measurement should be supported in RAN side. According to 28.552, the corresponding measurement method is  *The time when receiving a GTP packet delivery status message from the gNB DU at the egress GTP termination, minus time when sending the same packet to gNB DU at the GTP ingress termination, minus feedback delay time in gNB DU, obtained result is divided by two.*  But the feedback delay time in gNB DU is unavailable. Therefore, a dedicated polling for F1-U delay measurement purpose should be provided for DU to report feedback delay to CU. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add F1-U Delay Measurement Report Polling in DL USER DATA. Add DU Feedback Delay Result, DU Feedback Delay Ind. in DL DATA DELIVERY STATUS.  Impact Analysis:  Impact assessment towards the previous version of the specification (same release):  This CR has isolate impact on because the change only affects Downlink User Data and DL DATA DELIVERY STATUS. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The F1-U delay measurement for QoS monitoring can not be supported. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.4.1.1, 5.4.2.1, 5.5.2.1, 5.5.2.2, 5.5.3.xx, 5.5.3.yy, 5.5.3.zz | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Rev 1:  Change the release from Rel-16 to Rel-17 and the work item code from NR\_newRAT-Core, TEI16 to NR\_newRAT-Core, TEI17. | | | | | | | | |

<<<<<<<<<<<<<<<<<<<< Start of the First Change >>>>>>>>>>>>>>>>>>>>

### 5.4.1 Transfer of Downlink User Data

#### 5.4.1.1 Successful operation

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* skip unchanged part \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

The corresponding node shall send the DL DATA DELIVERY STATUS if the Report Polling Flag is set to 1 or when the NR PDCP PDU with the indicated DL report NR PDCP PDU SN has been successfully delivered, unless a situation of overload at the corresponding node is encountered. The DL DATA DELIVERY STATUS sent as a response to a specific DL report NR PDCP PDU SN shall be sent only when all PDCP PDU SNs up to this DL report NR PDCP PDU have been successfully delivered in-sequence.

The corresponding node shall send the DL DATA DELIVERY STATUS for F1-U delay measurement purpose if the F1-U Delay Measurement Report Polling is set to 1.

If the Request OutOfSeq Report is set to 1, the corresponding node shall, if supported, include the NR PDCP PDU sequence number successfully delivered out of sequence in the DL DATA DELIVERY STATUS to the node hosting the NR PDCP entity.

NOTE: The Transfer of Downlink User Data procedure and the associated feedback of lost NR-U packets assist the node hosting the NR PDCP entity in avoiding NR PDCP HFN de-synchronisation. If a deployment decides to not use the Transfer of Downlink User Data procedure, NR PDCP HFN synchronization should be ensured by other means.

If the User data existence flag is set to 1, the corresponding node assumes that the node hosting the NR PDCP entity has some user data for the concerned data radio bearer. The corresponding node decides whether and when to use DRX for the UE (i.e. the corresponding node may indicate the UE to use DRX even if the flag is set to 1 and the received DL USER DATA frame contains no user data).



Figure 5.4.1.1-1: Successful Transfer of Downlink User Data

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### 5.4.2 Downlink Data Delivery Status

#### 5.4.2.1 Successful operation

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* skip unchanged part \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

The DL DATA DELIVERY STATUS frame may also include an indication of detected radio link outage or radio link resume for the concerned data radio bearer. When receiving an indication of radio link outage detection, the node hosting the NR PDCP entity considers that traffic delivery over the data radio bearer configured for the UE is unavailable at the corresponding node both in UL and DL. When receiving an indication of radio link resume detection, the node hosting the NR PDCP entity considers that traffic delivery over the data radio bearer configured for the UE is available at the corresponding node both in UL and in DL. When receiving an indication of UL or DL radio link outage detection, the node hosting the NR PDCP entity considers that traffic delivery over the data radio bearer configured for the UE is unavailable at the corresponding node for UL or DL, depending on the indicated outage. When receiving an indication of UL or DL radio link resume detection, the node hosting the NR PDCP entity considers that traffic delivery over the data radio bearer configured for the UE is available at the corresponding node in UL or in DL, depending on the indicated resume.

For F1-U Delay Measurement Report Polling triggered reporting, the DL DATA DELIVERY STATUS frame may also include the DU feedback delay of the frame where F1-U Delay Measurement Report Polling is in.The node hosting the NR PDCP entity, when receiving the DL DATA DELIVERY STATUS frame:

- regards the desired buffer size under b) and the data rate under c) above as the amount of data to be sent from the hosting node:

- If the value of the desired buffer size is 0, the hosting node shall stop sending any data per bearer.

- If the value of the desired buffer size in b) above is greater than 0, the hosting node may send up to this amount of data per bearer starting from the last "Highest successfully delivered NR PDCP Sequence Number" for RLC AM if received, or the hosting node may send up to this amount of data per bearer starting from the last "Highest transmitted NR PDCP Sequence Number" for RLC UM if received.

- The value of the desired data rate in c) above is the amount of data desired to be received in a specific amount of time. The amount of time is 1 sec.

- The information of the buffer size in b) above and of the data rate in c) above is valid until the next DL DATA DELIVERY STATUS frame is received.

- is allowed to remove the buffered NR PDCP PDUs of a RLC AM bearer, according to the feedback of successfully delivered NR PDCP PDUs;

- decides upon the actions necessary to take for NR PDCP PDUs reported other than transmitted and/or successfully delivered.

In case of RLC AM, after the highest NR PDCP PDU sequence number successfully delivered in sequence is reported to the node hosting the NR PDCP entity, the corresponding node removes the respective NR PDCP PDUs. For RLC UM, the corresponding node may remove the respective NR PDCP PDUs after transmitting to lower layers.



Figure 5.4.2.1-1: Successful Downlink Data Delivery Status

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<<<<<<<<<<<<<<<<<< Start of the Third Change >>>>>>>>>>>>>>>>>>>>

### 5.5.2 Frame format for the NR user plane protocol

#### 5.5.2.1 DL USER DATA (PDU Type 0)

This frame format is defined e.g. to allow the corresponding node to detect lost NR-U packets and may be associated with the transfer of a Downlink NR PDCP PDU.

The following shows the respective DL USER DATA frame.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bits | | | | | | | | | Number of Octets |
| 7 | 6 | 5 | | 4 | 3 | 2 | 1 | 0 |
| PDU Type (=0) | | | | | Spare | DL Discard Blocks | DL Flush | Report polling | 1 |
| Spare | | | F1-U Delay Measurement Report Polling | Request OutofSeq Report | Report Delivered | User data existence flag | Assistance Info. Report Polling Flag | Retransmission flag | 1 |
| NR-U Sequence Number | | | | | | | | | 3 |
| DL discard NR PDCP PDU SN | | | | | | | | | 0 or 3 |
| DL discard Number of blocks | | | | | | | | | 0 or 1 |
| DL discard NR PDCP PDU SN start (first block) | | | | | | | | | 0 or 3 |
| Discarded Block size (first block) | | | | | | | | | 0 or 1 |
| … | | | | | | | | |  |
| DL discard NR PDCP PDU SN start (last block) | | | | | | | | | 0 or 3 |
| Discarded Block size (last block) | | | | | | | | | 0 or 1 |
| DL report NR PDCP PDU SN | | | | | | | | | 0 or 3 |
| Padding | | | | | | | | | 0-3 |

Figure 5.5.2.1-1: DL USER DATA (PDU Type 0) Format

<<<<<<<<<<<<<<<<<<<< End of the Third Change >>>>>>>>>>>>>>>>>>>>

<<<<<<<<<<<<<<<<<< Start of the Forth Change >>>>>>>>>>>>>>>>>>>>

#### 5.5.2.2 DL DATA DELIVERY STATUS (PDU Type 1)

This frame format is defined to transfer feedback to allow the receiving node (i.e. the node that hosts the NR PDCP entity) to control the downlink user data flow via the sending node (i.e. the corresponding node).

The following shows the respective DL DATA DELIVERY STATUS frame. The Figure shows an example of how a frame is structured when all optional IEs (i.e. those whose presence is indicated by an associated flag) are present.

Absence of such an IE changes the position of all subsequent IEs on octet level.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bits | | | | | | | | | | Number of Octets |
| 7 | 6 | | 5 | | 4 | 3 | 2 | 1 | 0 |
| PDU Type (=1) | | | | | | Highest Transmitted NR PDCP SN Ind | Highest Delivered NR PDCP SN Ind | Final Frame Ind. | Lost Packet Report | 1 |
| Spare | | DU Feedback Delay Ind. | | Delivered NR PDCP SN Range Ind | | Data rate Ind. | Retransmitted NR PDCP SN Ind | Delivered Retransmitted NR PDCP SN Ind | Cause Report | 1 |
| Desired buffer size for the data radio bearer | | | | | | | | | | 4 |
| Desired Data Rate | | | | | | | | | | 0 or 4 |
| Number of lost NR-U Sequence Number ranges reported | | | | | | | | | | 0 or 1 |
| Start of lost NR-U Sequence Number range | | | | | | | | | | 0 or (6\* Number of reported lost NR-U SN ranges) |
| End of lost NR-U Sequence Number range | | | | | | | | | |
| Highest successfully delivered NR PDCP Sequence Number | | | | | | | | | | 0 or 3 |
| Highest transmitted NR PDCP Sequence Number | | | | | | | | | | 0 or 3 |
| Cause Value | | | | | | | | | | 0 or 1 |
| Successfully delivered retransmitted NR PDCP Sequence Number | | | | | | | | | | 0 or 3 |
| Retransmitted NR PDCP Sequence Number | | | | | | | | | | 0 or 3 |
| Number of successfully delivered out of sequence PDCP Sequence Number range | | | | | | | | | | 0 or 1 |
| Start of successfully delivered out of sequence PDCP Sequence Number range | | | | | | | | | | 0 or (6\* Number of successfully delivered out of sequence PDCP Sequence Number range) |
| End of successfully delivered out of sequence PDCP Sequence Number range | | | | | | | | | |
| DU Feedback Delay Result | | | | | | | | | | 0 or 4 |
| Padding | | | | | | | | | | 0-3 |

Figure 5.5.2.2-1: DL DATA DELIVERY STATUS (PDU Type 1) Format

<<<<<<<<<<<<<<<<<<<< End of the Forth Change >>>>>>>>>>>>>>>>>>>>

<<<<<<<<<<<<<<<<<< Start of the Fifth Change >>>>>>>>>>>>>>>>>>>>

#### 5.5.3.xx F1-U Delay Measurement Report Polling

**Description:** This parameter indicates that the node hosting the NR PDCP entity requests providing the downlink delivery status report for F1-U delay measurement.

**Value range:** {0=Downlink Data Delivery Status report not requested, 1= Downlink Data Delivery Status report requested}.

**Field length:** 1 bit.

<<<<<<<<<<<<<<<<<< End of the Fifth Change >>>>>>>>>>>>>>>>>>>>

<<<<<<<<<<<<<<<<<< Start of the Sixth Change >>>>>>>>>>>>>>>>>>>>

#### 5.5.3.yy DU Feedback Delay Ind.

**Description:** This parameter indicates the presence of DU Feedback Delay Result.

**Value range:** {0= DU Feedback Delay Result not present, 1= DU Feedback Delay Result present}.

**Field length:** 1 bit.

<<<<<<<<<<<<<<<<<< End of the Sixth Change >>>>>>>>>>>>>>>>>>>>

<<<<<<<<<<<<<<<<<< Start of the Seventh Change >>>>>>>>>>>>>>>>>>>>

#### 5.5.3.zz DU Feedback Delay Result

**Description:** This parameter indicates the feedback delay result measured at the corresponding node in milliseconds for the frame where F1-U Delay Measurement Report Polling is in. It is encoded as an Unsigned32 binary integer value. The node hosting PDCP entity shall, if supported, use this information to calculate the F1-U delay for the concerned DRB and report to the UPF for the purpose of QoS monitoring as specified in [8].

**Value range:** {0..232-1}.

**Field length:** 4 octets.<<<<<<<<<<<<<<<<<< End of the Seventh Change >>>>>>>>>>>>>>>>>>>>