3GPP TSG-RAN WG2 #131 R2-2506337

**Bengaluru, India, August 25 – August 29, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.323** | **CR** | **0149** | **rev** | **2** | **Current version:** | **18.5.0** |  |
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| *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:*** | Introduction of R19 XR enhancements for PDCP spec. | | | | | | | | | |
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| ***Source to WG:*** | LG Electronics Inc. | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_XR\_Ph3-Core | | | | |  | | ***Date:*** | | 2025-08-25 |
|  |  | | | |  | | |  | |  |
| ***Category:*** | **B** |  | | | | | | ***Release:*** | | Rel-19 |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19) Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | New mechanisms have been agreed to enhance support for XR services in Rel-19. | | | | | | | | |
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| ***Summary of change:*** | | 1. To support multiple entry DSR in MAC, data volume is calculated for each i'th dsr-ReportingThreshold. 2. To support RLC autonomous retransmission and polling, the transmitting PDCP entity provides indication to RLC when the remaining time of the discardTimer becomes lower than respective thresholds. | | | | | | | | |
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| ***Consequences if not approved:*** | | Enhancements for XR services would not be supported in Rel-19. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.1, 3.2, 5.15, 5.X | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | |  | | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | TS 38.300 CR 1007  TS 38.306 CR 1321  TS 38.321 CR 2102  TS 38.322 CR 0065  TS 38.331 CR 5395, 5403 | | | |
| ***affected:*** | |  | **X** | Test specifications | | |  | | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | |  | | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

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| ***This CR's revision history:*** |  |

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**AM DRB**:a data radio bearer which utilizes RLC AM.

**AM MRB:** an MRB associated with at least one AM RLC bearer for PTP transmission.

**Broadcast MRB**: a radio bearer configured for MBS broadcast delivery.

**DAPS bearer**:a bearer whose radio protocols are located in both the source gNB and the target gNB during DAPS handover to use both source gNB and target gNB resources.

**Delay-critical PDCP SDU**: if *pdu-SetDiscard* is not configured, a PDCP SDU for which the remaining time till *discardTimer* expiry is less than the *remainingTimeThreshold*. If *pdu-SetDiscard* is configured, a PDCP SDU belonging to a PDU Set of which at least one PDCP SDU has the remaining time till *discardTimer* expiry less than the *remainingTimeThreshold*.

**Delay-reporting PDCP SDU**: if *pdu-SetDiscard* is not configured, a delay-reporting PDCP SDU associated with the i:th *DSR-ReportingThreshold* is a PDCP SDU for which the remaining time till *discardTimer* expiry is less than the i:th *DSR-ReportingThreshold* and larger than or equal to the i-1:th *DSR-ReportingThreshold* (if i>1) or larger than zero (if i=1). If *pdu-SetDiscard* is configured, a delay-reporting PDCP SDU associated with the i:th *DSR-ReportingThreshold* is a PDCP SDU belonging to a PDU Set of which the PDU Set remaining time is less than the i:th *DSR-ReportingThreshold* and larger than or equal to the i-1:th *DSR-ReportingThreshold* (if i>1) or larger than zero (if i=1).

**MBS Radio Bearer:** a radio bearer that is configured for MBS delivery.

**Multicast MRB:** a radio bearer configured for MBS multicast delivery.

**Multi-path:** Mode of operation of a remote UE in RRC\_CONNECTED configured with one direct path on which the UE connects to the gNB using NR Uu and one indirect path on which the UE connects to the same gNB via another UE using PC5 unicast link or Non-3GPP Connection.

**Multi-path Primary Path**: In multi-path for a split DRB, the primary path is configured by RRC to be either the direct path or the indirect path. In multi-path for a split SRB, the primary path is always the direct path.

**Multi-path Secondary Path**: In multi-path for a split DRB, the path (either direct or indirect) which is not configured by RRC as the primary path. In multi-path for a split SRB, the secondary path is always the indirect path (SL or N3C).

**Multi-path split bearer:** In multi-path, a bearer in which one PDCP entity is mapped to one or more (direct) Uu RLC entities and either one SRAP entity of a SL indirect path or a non-3GPP connection.

**N3C indirect path:** In multi-path, the indirect path using Non-3GPP Connection between remote UE and relay UE.

**Non-delay-reporting PDCP SDU**: a non-delay-reporting PDCP SDU associated with the *DSR-ReportingThreshold* is a PDCP SDU that will be transmitted prior to any of the delay-reporting PDCP SDUs associated with the i:th *DSR-ReportingThreshold* and that is not a delay-reporting PDCP SDU associated with the i:th *DSR-ReportingThreshold*.

**Non-split bearer**: a bearer whose radio protocols are located in either the MgNB or the SgNB to use MgNB or SgNB resource, respectively.

**NR sidelink communication**: AS functionality enabling at least V2X communication as defined in TS 23.287 [13] and ProSe communication (including ProSe non-Relay, UE-to-Network Relay, and UE-to-UE Relay communication) as defined in TS 23.304 [18], between two or more nearby UEs, using NR technology but not traversing any network node.

**NR sidelink discovery**: AS functionality enabling ProSe non-Relay Discovery, ProSe UE-to-Network Relay discovery, and ProSe UE-to-UE Relay discovery for Proximity based Services as defined in TS 23.304 [18] between two or more nearby UEs, using NR technology but not traversing any network node.

**NR sidelink transmission**: any NR Sidelink-based transmission, including both transmission for NR sidelink discovery and transmission for NR sidelink communication.

**PDCP data volume**: the amount of data available for transmission in a PDCP entity.

**PDU Set**: one or more PDUs carrying the payload of one unit of information generated at the application level (e.g. frame(s) or video slice(s) etc. for XR services), as defined in TS 23.501 [23]. A PDU in the PDU Set corresponds to a PDCP SDU.

**PDU Set remaining time**: the shortest remaining time till *discardTimer* expiry among the remaining time of the PDCP SDUs belonging to the PDU Set.

**SL indirect path**: In multi-path, the indirect path on which the L2 U2N Remote UE connects to the network via a L2 U2N Relay UE.

**Split bearer**: in dual connectivity, a bearer whose radio protocols are located in both the MgNB and the SgNB to use both MgNB and SgNB resources.

**Split secondary RLC entity**: in dual connectivity, the RLC entity other than the primary RLC entity which is responsible for split bearer operation. If the PDCP entity is associated with two RLC entities, the split secondary RLC entity is the RLC entity other than the primary RLC entity. If the PDCP entity is associated with more than two RLC entities, the split secondary RLC entity is configured by upper layers. In multi-path, the split secondary RLC entity is the RLC entity on the direct path which is responsible for split bearer operation when the MP primary path is the indirect path. When the PDCP entity on the direct path is associated with one RLC entity, the split secondary RLC entity is that RLC entity. When the PDCP entity is associated with more than one RLC entity, the split secondary RLC entity is configured by upper layers.

**UM DRB**:a data radio bearer which utilizes RLC UM.

**UM MRB:** an MRB associated with only RLC UM.

**U2N Relay UE**: A UE that provides functionality to support connectivity to the network for U2N Remote UE(s).

**U2N Remote UE**: A UE that communicates with the network via a U2N Relay UE.

**U2U Relay UE**: A UE that provides functionality to support connectivity between two U2U Remote UEs

**U2U Remote UE**: A UE that communicates with another UE via a U2U Relay UE

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

AM Acknowledged Mode

ARP Address Resolution Protocol

CID Context Identifier

DAPS Dual Active Protocol Stack

DRB Data Radio Bearer carrying user plane data

DSR Delay Status Reporting

EHC Ethernet Header Compression

FIFO First In First Out

gNB NR Node B

HFN Hyper Frame Number

IETF Internet Engineering Task Force

IP Internet Protocol

MAC Medium Access Control

MAC-I Message Authentication Code for Integrity

MBS Multicast/Broadcast Services

MP Multi-path

MRB MBS Radio Bearer

MTCH MBS Traffic Channel

N3C Non-3GPP Connection

PDCP Packet Data Convergence Protocol

PDU Protocol Data Unit

PSI PDU Set Importance

RB Radio Bearer

RFC Request For Comments

RLC Radio Link Control

ROHC RObust Header Compression

RRC Radio Resource Control

RTP Real Time Protocol

SAP Service Access Point

SCCH Sidelink Control Channel

SDU Service Data Unit

SLRB Sidelink Radio Bearer carrying NR sidelink communication or NR sidelink discovery

SN Sequence Number

SRAP Sidelink Relay Adaptation Protocol

SRB Signalling Radio Bearer carrying control plane data

STCH Sidelink Traffic Channel

TCP Transmission Control Protocol

UDC Uplink Data Compression

UDP User Datagram Protocol

UE User Equipment

UM Unacknowledged Mode

U2N UE-to-Network

X-MAC Computed MAC-I

## 5.15 Data volume calculation for delay status reporting

For the purpose of MAC single entry delay status reporting, the transmitting PDCP entity shall consider the following as delay-critical PDCP data volume:

- the delay-critical PDCP SDUs for which no PDCP Data PDUs have been constructed;

- the PDCP Data PDUs that contain the delay-critical PDCP SDUs and have not been submitted to lower layers;

- the PDCP Control PDUs;

- for AM DRBs, the PDCP SDUs to be retransmitted according to clause 5.1.2 and clause 5.13;

- for AM DRBs, the PDCP Data PDUs to be retransmitted according to clause 5.5.

The transmitting PDCP entity provides a delay-critical indication for the PDCP Data PDU to lower layers when:

- the PDCP Data PDU has already been submitted to lower layers and the corresponding PDCP SDU becomes a delay-critical PDCP SDU; or

- the PDCP Data PDU is submitted to lower layers and the corresponding PDCP SDU is already a delay-critical PDCP SDU.

For the purpose of MAC multiple entry delay status reporting, the transmitting PDCP entity shall evaluate the delay-reporting PDCP data volume in ascending order of *DSR-ReportingThreshold*, and consider the following as delay-reporting PDCP data volume associated with the i:th *DSR-ReportingThreshold*:

- the delay-reporting PDCP SDUs associated with the i:th *DSR-ReportingThreshold* for which no PDCP Data PDUs have been constructed, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *DSR-ReportingThreshold* where k < i;

- the PDCP Data PDUs that contain the delay-reporting PDCP SDUs associated with the i:th *DSR-ReportingThreshold* and have not been submitted to lower layers, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *DSR-ReportingThreshold* where k < i;

- if *dsr-ReportNonDelayCriticalData* is configured:

- the non-delay-reporting PDCP SDUs associated with the i:th *DSR-ReportingThreshold* for which no PDCP Data PDUs have been constructed, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *DSR-ReportingThreshold* where k < i;

- the PDCP Data PDUs that contain the non-delay-reporting PDCP SDUs associated with the i:th *DSR-ReportingThreshold* and have not been submitted to lower layers, and are not considered as delay-reporting PDCP data volume associated with any of the k:th *DSR-ReportingThreshold* where k < i;

- if i = 1, the PDCP Control PDUs;

- if i = 1, for AM DRBs, the PDCP SDUs to be retransmitted according to clause 5.1.2 and clause 5.13;

- if i = 1, for AM DRBs, the PDCP Data PDUs to be retransmitted according to clause 5.5.

The transmitting PDCP entity provides a DSR data indication associated with the i:th *DSR-ReportingThreshold* for the PDCP Data PDU to lower layers when:

- the PDCP Data PDU has already been submitted to lower layers and the corresponding PDCP SDU becomes a delay-reporting PDCP SDU or non-delay-reporting PDCP SDU (if *dsr-ReportNonDelayCriticalData* is configured) associated with the i:th *DSR-ReportingThreshold*; or

- the PDCP Data PDU is submitted to lower layers and the corresponding PDCP SDU is already a delay-reporting PDCP SDU or non-delay-reporting PDCP SDU (if *dsr-ReportNonDelayCriticalData* is configured) associated with the i:th *DSR-ReportingThreshold*.

If the transmitting PDCP entity is associated with at least two RLC entities, when indicating the delay-critical PDCP data volume or delay-reporting PDCP data volume to a MAC entity for DSR triggering and Buffer Size calculation (as specified in TS 38.321 [4]), the transmitting PDCP entity shall:

- if the PDCP duplication is activated for the RB:

- indicate the delay-critical PDCP data volume or delay-reporting PDCP data volume to the MAC entity associated with the primary RLC entity;

- indicate the delay-critical PDCP data volume or delay-reporting PDCP data volume excluding the PDCP Control PDU to the MAC entity associated with the RLC entity other than the primary RLC entity activated for PDCP duplication;

- indicate the delay-critical PDCP data volume or delay-reporting PDCP data volume as 0 to the MAC entity associated with RLC entity deactivated for PDCP duplication;

- else (i.e. the PDCP duplication is deactivated for the RB):

- if the split secondary RLC entity is configured; and

- if the total amount of PDCP data volume and RLC data volume pending for initial transmission (as specified in TS 38.322 [5]) in the primary RLC entity and the split secondary RLC entity is equal to or larger than *ul-DataSplitThreshold*:

- indicate the delay-critical PDCP data volume or delay-reporting PDCP data volume to both the MAC entity associated with the primary RLC entity and the MAC entity associated with the split secondary RLC entity;

- indicate the delay-critical PDCP data volume or delay-reporting PDCP data volume as 0 to the MAC entity associated with RLC entity other than the primary RLC entity and the split secondary RLC entity;

- else:

- indicate the delay-critical PDCP data volume or delay-reporting PDCP data volume to the MAC entity associated with the primary RLC entity;

- indicate the delay-critical PDCP data volume or delay-reporting PDCP data volume as 0 to the MAC entity associated with the RLC entity other than the primary RLC entity.

## 5.x Triggering of RLC functions

For the purpose of remaining-time-based RLC retransmission, if the remaining time till *discardTimer* expiry becomes less than the *remainingTimeThresholdRLC-ReTx* for the PDCP SDU for which the corresponding PDCP Data PDU has already been submitted to lower layers but for which successful delivery has not been confirmed by lower layers, the transmitting PDCP entity shall:

- indicate to lower layers that the condition for remaining-time-based RLC retransmission is met for the corresponding PDCP Data PDU.

For the purpose of remaining-time-based RLC polling, if the remaining time till *discardTimer* expiry becomes less than the *remainingTimeThresholdRLC-Polling* for the PDCP SDU for which the corresponding PDCP Data PDU has already been submitted to lower layers but for which successful delivery has not been confirmed by lower layers, the transmitting PDCP entity shall:

- indicate to lower layers that the condition for remaining-time-based RLC polling is met for the corresponding PDCP Data PDU.