**3GPP TSG-SA4 Meeting #131 *S4-250132***

**Geneva, , 17th Feb 2025 - 21st Feb 2025 In revision of S4aR250067**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **26.522** | **CR** | **0009** | **rev** | **4** | **Current version:** | **18.1.0** |  |
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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 |  | Core Network | **x** |

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| ***Title:*** | Guideline for PDU Handling marked and unmarked PDU | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_RTP\_Ph2 | | | | |  | ***Date:*** | | | 2025-01-13 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | TR 26.822 conclusions`in 7.2 state the following: Consider guidelines for handling lone PDU in TS 26.522 [2]. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add a guideline on how to deal with lone PDU (i.e. marked and unmarked PDUs) in a network element such as UPF. | | | | | | | | |
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| ***Consequences if not approved:*** | | Goals for study item not complete, confusion on the “lone PDU” case | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.X (new sub clause) , clause 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:*** | | * Address comments and editorial improvements * Clarify the situation around RTCP PT vs RTP PT and the absence of RTP HE * Address comments from february 5 telco * Revision add | | | | | | | | |

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| \*\*\* CHANGE\*\*\* |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] ITU-T Rec H.264 (08/2021): "Advanced video coding for generic audiovisual services" | ISO/IEC 14496-10:2022: "Information technology – Coding of audio-visual objects – Part 10: Advanced Video Coding".

[3] ITU-T Rec H.265 (08/2021): "High efficiency video coding" | ISO/IEC 23008-2:2023: "High Efficiency Coding and Media Delivery in Heterogeneous Environments – Part 2: High Efficiency Video Coding".

[4] IETF RFC 3550 (2003): "RTP: A Transport Protocol for Real-Time Applications", H. Schulzrinne, S. Casner, R. Frederick and V. Jacobson.

[5] IETF RFC 6184 (2011): "RTP Payload Format for H.264 Video", Y.-K. Wang, R. Even, T. Kristensen, R. Jesup.

[6] IETF RFC 7798 (2016): "RTP Payload Format for High Efficiency Video Coding (HEVC)", Y.-K. Wang, Y. Sanchez, T. Schierl, S. Wenger, M. M. Hannuksela.

[7] 3GPP TR 26.928: "Extended Reality (XR) in 5G".

[8] 3GPP TR 26.998: "Support of 5G glass-type Augmented Reality / Mixed Reality (AR/MR) devices".

[9] IETF RFC 768 (1980): "User Datagram Protocol", J. Postel.

[10] IETF RFC 5761 (2010): "Multiplexing RTP Data and Control Packets on a Single Port", C. Perkins, M. Westerlund.

[11] IETF RFC 8285 (2017): "A General Mechanism for RTP Header Extensions", D. Singer, H. Desineni, R. Even.

[12] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

[13] IETF RFC 5905 (2010): "Network Time Protocol Version 4: Protocol and Algorithms Specification”, D. Mills, J. Martin, J. Burbank, W. Kasch.

[14] IEEE 1588-2019 – IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems, June 2020.

[15] IETF RFC 4574 (2006): "The Session Description Protocol (SDP) Label Attribute", O. Levin, G. Camarillo.

[16] IETF RFC 3611 (2003): "RTP Control Protocol Extended Reports (RTCP XR)", T. Friedman, R. Caceres, A. Clark.

[17] 3GPP TS 26.119: "Media Capabilities for Augmented Reality".

[18] IETF RFC 7656 (2015): "A Taxonomy of Semantics and Mechanisms for Real-Time Transport Protocol (RTP) Sources ", J. Lennox, K. Gross, S. Nandakumar, G. Salgueiro, B. Burman.

[19] IETF RFC 5888 “The Session Description Protocol (SDP) Grouping Framework”, G. Camarillo et al.

[20] ISO/IEC 60559:2020: “Floating-point arithmetic”.

[XX] 3GPP TS 38.415 "NG-RAN; PDU Session User Plane Protocol".

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| \*\*\* CHANGE (new clause all new text)\*\*\* |

# A.X Obtaining PDU Set information from marked and unmarked (lone) PDUs

A guideline is provided to support the case where both marked and unmarked packets exist in a stream to which RTP HE for PDU Set marking is applied. Packets from some streams contain an RTP Header Extension while some packets do not contain an RTP Header extension for PDU Set marking. An example could be a stream of multiplexed audio and video packets with only video packets marked. In this case the video stream RTP packets include RTP HE for PDU Set marking for each RTP packet but the audio stream RTP Packets might not contain the RTP Header Extension. Another example could be RTCP packets multiplexed in a stream, since it is not possible add an RTP HE to RTCP packets to signal PDU Set information.

NOTE: Guidelines for PDU Set handling of unmarked video packets at the UPF is handled in annexes A.2.2.2 and A.2.2.3, this clause consider the case of marked and unmarked packets.

In this case the network element in the 5G System (e.g. UPF) needs to map both marked and unmarked packets to PDU Sets including the PDU Set information, as PDU Set QoS handling, when enabled, is applied to all packets in a flow. An example guideline for determining PDU Set information at the UPF from either RTP HE or unmarked PDU is given in Table A.X-1.

The middle column indicates how the UPF can derive PDU Set information for packets that include RTP HE for PDU Set marking. The right column indicates how the UPF can derive PDU Set information for unmarked packets (lone PDUs). The left column lists the PDU Set information parameters e.g. set in the GTP-U header by the PDU Session User Plane protocol [XX].

Table A.X-1: Determining PDU Set information at UPF from RTP HE and unmarked PDU

|  |  |  |
| --- | --- | --- |
| PDU Set information (PDU Session User Plane Protocol) [XX] | RTP HE for PDU Set marking | Lone/unmarked PDU |
| PDU Set Importance | Set by interpreting PSI field RTP HE | Set by 5G System to a preconfigured value based on the payload/packet type (RTP Payload or RTCP packet type) |
| PDU Set Size | Optionally transmitted in additional PSSize field and derived from this field, otherwise this could be calculated. | PDU Size |
| End of Data Burst | Can be set by EoDB flag | N/A for lone PDU |
| PDU Sequence Number (within a PDU Set) | From PDU Sequence Number (PSN) in RTP HE | Set to 0 |
| PDU Set Sequence Number | Separate number space, e.g. PSSN field from RTP HE with most significant bit is set to 0 (another partition is also possible) | Separate number space e.g. set by UPF with most significant bit set to 1 (another partition is also possible) |
| End of PDU Set | End of the PDU Set (E) in RTP HE | Always 1 |

PDU Set Importance can be set based on a preconfigured value in the 5G System for unmarked/lone PDUs and from the RTP HE for PDU Set marking for marked PDUs.

PDU Set Size can be derived from the RTP HE if set, otherwise it can be calculated if needed, for unmarked packets it equals the PDU Size (assuming single packet per PDU Set in these cases).

PDU Sequence Number (within a PDU Set) could be retrieved from the PSN in RTP HE, or when no RTP HE is present (unmarked PDU), it can be set to 0 as only a single PDU is present in the PDU Set.

Deriving the PDU Set Sequence Number includes some additional steps to enable using a different number space for marked and unmarked PDUs. As an example, the UPF can only use the 9 least significant bits of the RTP HE to number the marked PDUs. In addition, for unmarked PDUs it can set the most significant bit of PSSN in PDU Set information to 1. Other separations of the number space are also possible.

End of Data Burst is not applicable for unmarked PDUs. End of PDU Set for unmarked PDUs is always equal to 1 since there is only one PDU in the PDU Set.

NOTE 1: The RTP HE PSSN cannot map directly to PSSN for PDU Set information when unmarked/lone PDUs are present as the UPF needs to assign numbers to both.

NOTE 2: This solution shows how a possible mapping of PSSN from RTP HE and non RTP HE packets can be done at the UPF. Other solutions can be equally valid and applicable by the UPF. This example was included to illustrate this issue as in practice both marked and unmarked packets can coexist.

NOTE 3: This guideline example will be coordinated with SA2 to confirm that this is aspect is left to implementation and that this example is feasible.

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