**3GPP TSG-SA4 Meeting #128 *S4-240969***

**Jeju, South Korea, 20th – 24th May 2024 (revision of S4-240XXX)**

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| *CR-Form-v12.2* | | | | | | | | |
| **Pesudo CHANGE REQUEST** | | | | | | | | |
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|  | **26.822** | **CR** |  | **rev** |  | **Current version:** | **0.0.1** |  |
|  | | | | | | | | |
| *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 |  | Core Network | **X** |

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| ***Title:*** | [FS\_5G\_RTP\_Ph2] update of Sol#2 on gap analysis on the QoS requirements for lonely PDU analysis on the QoS requirements for lonely PDU | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_RTP\_Ph2 | | | | |  | ***Date:*** | | | 2024-05-14 |
|  |  | | | |  | |  | | |  |
| ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Add additional information of potential occurances of lone PDU | | | | | | | | |
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| ***Summary of change:*** | | Refer to SA2 study and TS 26.522 on lonely PDU occurence | | | | | | | | |
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| ***Consequences if not approved:*** | | Less clear what the gap is about | | | | | | | | |
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| ***Clauses affected:*** | | 6.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

\* \* \* \* First change \* \* \* \*

## 6.2 Solution #2: Gap analysis on the QoS requirements for lonely PDU

### 6.2.1 Key Issue mapping

This solution intends to give gap analysis on the KI#2: QoS handling requirements for lonely PDU.

### 6.2.2 Description

According to TS 23.501 [3], in case a single PDU doesn't belong to a PDU Set based on the Protocol Description for PDU Set identification, the UPF still maps it to a PDU Set and determines the PDU Set Information accordingly. In this case, both the single PDU and the PDUs belonging to a PDU Set are in the same service data flow and the single PDU is delivered to the UE in the DL direction following the PDU Set QoS parameters.

There could be different scenarios where the application server may send the PDU Sets and single/lonely PDUs in the same service data flow which can be detected by the 5GS. For a single data flow in a service data flow, as described in Annex A.2.2.1 of TS 26.522 [2], it is generally recommended that the network function considers Non-VCL NAL units (e.g. SPS NAL unit) as part of the PDU Set of the associated VCL NALUs, e.g. identified by the same timestamp. When PDU Set marking is activated, there should be no lonely PDUs in the service data flow. There are other scenarios where lonely PDUs and PDUs belonging to a PDU Set are multiplexed in a single service data flow as following.

- **Scenario #A:** RTP streams multiplexed in a single RTP session. In this scenario, multiple RTP streams are multiplexed in a single RTP session which is carried over a single service data flow. For example, the audio and video streams are multiplexed in a single RTP session, while the PDU Set feature is needed for the video streams. Similarly, when FEC or RTP retransmission feature is enabled, the corresponding repair packets or retransmission packets may also be multiplexed with the original video stream. The 5GS cannot distinguish different RTP streams multiplexed in a single service data flow and has to take the PDUs in other RTP streams as lonely PDUs.

- **Scenario #B**: RTP data and control packets are multiplexed on a single port. In this scenario, the RTP and RTCP flows are carried over a single service data flow. When the PDU Set feature is needed for the RTP flow(s), the 5GS cannot distinguish the RTP and RTCP traffic and has to take the RTCP traffic as lonely PDUs.

As can be seen from the above, one key reason for the lonely PDU handling is that the PDUs belonging to a PDU Set and the lonely PDUs are carried over a single service data flow and the 5GS cannot differentiate the multiplexed data flows in a single service data flow.

In Sol#29 of TR 23.700-70, the scenarios for the co-existence of lonely PDUs and PDU Set are as described as following:

*"As a result, if PDU Set based QoS handling is beneficial for the RTP video streams it is applied to the QoS flow, and then RTP audio stream and all the other protocols, including lone PDUs in a video stream (e.g. SPS, PPS, etc.) and lone PDUs (e.g. STUN, RTCP, TURN) in other streams are treated using the PDU Set based QoS handling even if that was not desirable."*

The non-VCL PDUs are recommended to be treated as part of the PDU Set of associated VCL NALUs in Annex A.2.2.1 of TS 26.522 [2]. And the scenario, where lone PDUs of RTCP may exist, is still possible due to the multiplexed RTP and RTCP traffic flows are in a single QoS Flow as requested by the application layer, e.g., the QoS requirements for them are the same.

Therefore, it is clear that

- **the co-existence of lonely PDUs and PDUs belonging to a PDU Set in a single service data flow can be due to the lack of the capability to differentiate multiplexed media flows for 5GS.**

Editor’s Note: Other scenarios for the co-existence of lonely PDUs and PDU Set is FFS.

And the QoS requirements for multiplexed media streams could be different. For example, the QoS requirements for audio and video streams could be different.

For PDU Set based QoS handling, the PDU Set QoS parameters are introduced in TS 23.501 [3] as following:

- PDU Set Delay Budget, which defines an upper bound for the delay that a PDU Set may experience for the transfer between the UE and the N6 termination point at the UPF.

- PDU Set Error Rate, which defines an upper bound for the rate of PDU Sets that have been processed by the sender of a link layer protocol (e.g., RLC in RAN of a 3GPP access) but that are not successfully delivered by the corresponding receiver to the upper layer (e.g., PDCP in RAN of a 3GPP access).

- PDU Set Integrated Information, which indicates whether all PDUs of the PDU Set are needed for the usage of the PDU Set by the application layer in the receiver side.

If the NG-RAN receives PDU Set QoS Parameters, it enables the PDU Set based QoS handling and applies PDU Set QoS Parameters. When the PDU Set QoS parameters are available, they will supersede the PDU QoS parameters (i.e. PSDB/PSER supersedes the PDB/PER).

For the corresponding PDU QoS parameters, they are at a per packet granularity including the per-packet latency requirement (i.e. packet delay budget), the per-packet loss rate requirement (i.e. packet loss rate), etc. From the application perspective, the PDU Set QoS parameters and the PDU QoS parameters should reflect the same network requirements while at different granularities. Therefore, **QoS requirements for multiplexed media streams could be different** **and** **applying the PDU Set QoS parameters to a single PDU could be an issue.**

In addition, as discussed in draft TR 23.700-70 [6], how to support the traffic detection and QoS mapping for multiplexed data flows is ongoing in SA2 Rel-19 FS\_XRM\_Ph2 as shown below:

*This key issue proposes study traffic detection and QoS Flow mapping in 5GS for different media streams multiplexed within a single end-to-end transport connection.*

*- How to identify multiplexed traffic flows with different QoS requirements within a single transport connection.*

*- How to do QoS Flow mapping for traffic flows with different QoS requirements.*

*- Whether and what information needs to be provided from AF for traffic detection.*

*- Whether and how AF provides QoS requirements of different traffic flows to the 5GS.*

Via the potential R19 enhancements in 5GS, it is possible to differentiate the multiplexed RTP streams or RTP/RTCP flows, which may avoid the co-existence of lonely PDUs and PDUs belonging to a PDU Set.

### 6.2.3 Conclusion

Based on the gap analysis in the above, it is proposed to make the following conclusions.

**- QoS requirements for multiplexed media streams could be different** **and** **applying the PDU Set QoS parameters to a single PDU could be an issue.**

- **The co-existence of lonely PDUs and PDUs belonging to a PDU Set in a single service data flow may be due to the lack of the capability to differentiate multiplexed media flows for 5GS.**

Editor’s Note: Whether multiplexing is the only reason for lonely PDUs and whether the handling of multiplexed data flows in R19 SA2 FS\_XRM\_Ph2 can avoid this issue are FFS.

\* \* \* \* End of changes \* \* \* \*