3GPP TSG-WG SA4 Meeting #127-bis-e *S4-240639*

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**Source: Huawei, HiSilicon**

**Title: [FS\_5G\_RTP\_Ph2] QoS handingrecrements for lonely PDU**

**Document for: Discussion and approval**

**Agenda Item: 10.8**

**Work Item / Release: FS\_5G\_RTP\_Ph2 / Rel-19**

# 1. Introduction

As agreed in SP-240482, issue regarding the lonely PDU from SA2 need to be studied and discussed. This paper intends to give an analysis on the QoS handling requirements for lonely PDU and potential gaps.

# 2. Proposal

The following is proposed to capture the following changes vs. TR 26.822.

\* \* \* \* First 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".

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

[Y] 3GPP TR 23.700-70:" Study on architecture enhancement for Extended Reality and Media service (XRM); Phase 2".

\* \* \* \* Second change \* \* \* \*(all new text)

## 5.x Key Issue #x: QoS handling requirements for lonely PDU

### 5.X.1 Description

In the FS\_5G\_RTP\_Ph2, one objective is to study the 2. Issues around "lonely” PDU, as identified by SA2.

In the LS from SA2, S2-2313691/S4-240168, a question is sent to ask SA4 for the feedback as following.

*SA2 in Rel-18 has agreed that the PSA UPF marks, in the downlink, each N6-unmarked PDU (lonely PDU) with PDU Set information into a PDU Set over N3/N9. As a consequence, RAN will apply the PDU Set QoS parameters, e.g. apply the PDU Set Delay Budget (which is assumed to be larger than the PDB, if applicable) for the lonely PDU.*

*Questions: Will applying PDU Set QoS parameters to these lonely PDUs pose any issue from application perspective? If yes, what is the issue?*

*SA2 will not change the agreement to map N6-unmarked PDUs to PDU Sets over N3/N9 in Rel-18. However, since this topic may be in the scope of the FS\_XRM\_Ph2 study, SA2 would like to get feedback from SA4 on the questions above.*

For a single PDU which doesn't belong to any PDU Set, the 5GS shall handle such lonely PDU as a single PDU Set following the PDU Set QoS parameters. Furthermore, a lonely PDU does not carry the RTP header extension for PDU Set marking defined in TS 26.522 and thus cannot convey any PDU Set Information to the 5GS. It’s proposed to study:

- whether there is any issue when applying PDU Set QoS parameters to the lonely PDUs from the application layer perspective?

- how to handle the issue of missing PDU Set Information in case of lonely PDUs

Editor’s Note: Collaboration with SA2 is needed.

\* \* \* \* Third change \* \* \* \*(all new text)

6.X Solution #X: Gap analysis on the QoS requirements for lonely PDU

6.X.1 Key Issue mapping

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

6.X.2 Description

According to TS 23.501, 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, 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.

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 as following [X]:

- 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 [Y], 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 to avoid the co-existence of lonely PDUs and PDUs belonging to a PDU Set. Then the issues mentioned in the LS no longer exists.

### 6.X.3 conclusion

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

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

**- The handling of multiplexed data flows in Rel-19 FS\_XRM\_Ph2 SID can potentially avoid the lonely PDU issue.**

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 are FFS.

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