**3GPP TSG SA WG4#127-bis S4-240638**

**Online, 8th – 12nd April 2024**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **26**.**804** | **CR** | **0007** | **rev** | **-** | **Current version:** | **18.1.0** |  |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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|  |
| ***Title:***  | **[FS\_AMD] Key Issue #X: Improved QoS support for Media Streaming services** |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | FS\_AMD |  | ***Date:*** | 2024-04-03 |
|  |  |  |  |  |
| ***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 canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* *Rel-17 (Release 17)* *Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | As agreed in SP-240514, how to improve the QoS support for Media Streaming services based on the QoS enhancements and the network information exposure is to be studied. Therefore, this paper proposes the Key Issue of "Improved QoS support for Media Streaming services". |
|  |  |
| ***Summary of change:*** | Proposal of KI#X: Improved QoS support for Media Streaming services. |
|  |  |
| ***Consequences if not approved:*** | SI cannot be completed. |
|  |  |
| ***Clauses affected:*** |  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**===== 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*.

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**===== CHANGE =====（all new text）**

##

## 5.X Key Issue #X: Improved QoS support for Media Streaming services

### 5.X.1 Description

#### 5.X.1.1 General

Since Rel-16, QoS support for Media Streaming services has been introduced. For example, the dynamic policy feature is introduced to request specific QoS handling and the network assistance feature is introduced to get aware of the network status. Besides, lots of new features are introduced in 5GS for QoS enhancements and the network information exposure, which could be useful for Media Streaming services.

This Key Issue proposes to study whether and how to integrate the new features of 5GS to improve the QoS support for Media Streaming services.

#### 5.X.1.2 QoS enhancements and network information exposure in 5GS

Editor’s Note: Other candidate QoS features are FFS.

##### 5.X.1.2.1 Support of ECN marking for L4S

The purpose of ECN marking for L4S (Low Latency, Low Loss and Scalable Throughput) as described in IETF RFC 9330 [X1], IETF RFC 9331 [X2] and IETF RFC 9332 [X3] is to expose the network congestion information that packets are affected. It exposes congestion information by marking ECN bits in the IP header of the user IP packets between the UE and the application server to trigger application layer rate adaptation. To support this functionality, the receiver needs to support L4S feedback as described in IETF RFC 9330 [X1], e.g. the receiver can use QUIC ACK or TCP ACK to report the status of ECN marking. Then the sender can, based on the L4S feedback, behave adaptively.

The Application Function may provide an explicit indication that the UL and/or DL of the service data flow supports ECN marking for L4S via the *Nnef\_AFsessionWithQoS* in N33 interface or *Npcf\_PolicyAuthorization* in N5 interface. Based on AF input and/or local configuration, the PCF indicate to the SMF to enable for ECN marking for L4S. ECN marking for L4S is enabled on a per service data flow (i.e. QoS Flow) basis in the uplink and/or downlink direction. ECN marking for the L4S in the IP header is supported in either the NG-RAN (see clause 5.37.3.2 and TS 38.300 [X4]), or in the PSA UPF (see clause 5.37.3.3 of TS 23.501[23]).

In the case of ECN marking for L4S by PDU Session Anchor (PSA) UPF, the NG-RAN is instructed to perform congestion information monitoring and report to the PSA UPF the congestion information of the QoS Flow on UL and/or DL directions via GTP-U header extension to PSA UPF and accordingly, the PSA UPF may mark the UL and/or DL direction packets.

##### 5.X.1.2.2 Support of PDU Set handling

A PDU Set is comprised of one or more PDUs carrying an application layer payload such as a video frame or video slice.

AF may provide PDU Set QoS Parameters and the Protocol Description to the 5GC (i.e. PCF) via the *Nnef\_AFsessionWithQoS* API in N33 interface or *Npcf\_PolicyAuthorization* in N5 interface. The PDU Set QoS parameters, including a PDU Set Integrated Handling Information (PSIHI), PDU Set Delay Budget (PSDB) and PDU Set Error Rate (PSER), are used to instruct the PDU Set based hanlding in NG-RAN. And the Protocol Description is used to assist UPF/UE for the PDU Set identification.

To support PDU Set based QoS handling, for the downlink direction, the PSA UPF identifies PDUs that belong to PDU Sets based on the protocol description (e.g. the RTP Header Extension defined in TS 26.522 [X5]) if available or its implementation way, and determines the below PDU Set Information which it sends to the NG-RAN in the GTP-U header. The PDU Set information is used by the NG-RAN for PDU Set based QoS handling as described above.

The PDU Set Information comprises:

- PDU Set Sequence Number.

- Indication of End PDU of the PDU Set.

- PDU Sequence Number within a PDU Set.

- PDU Set Size in bytes.

- PDU Set Importance, which identifies the relative importance of a PDU Set compared to other PDU Sets within a QoS Flow.

Based on the PDU Set QoS parameters provided by the 5GC and the PDU Set Information carried over the GTP-U header of DL packets, the NG-RAN performs the PDU Set based QoS handling accordingly.

##### 5.X.1.2.3 Support of QoS monitoring

QoS monitoring comprises of measurements of QoS monitoring parameters and reports of the measurement result for a service data flow (i.e., QoS Flow) and can be enabled based on 3rd party application requests and/or operator policies configured in the 5GC (i.e. PCF).

The AF may request measurements and subscribe to the event for one or more of the following QoS monitoring parameters via the *Nnef\_AFsessionWithQoS* API in N33 interface or *Npcf\_PolicyAuthorization* in N5 interface, which may trigger QoS monitoring for service data flow(s):

- UL packet delay, DL packet delay, round trip packet delay for a service data flow (see clause 5.45.2 of TS 23.501 [23]).

- Congestion (see clause 5.45.3 of TS 23.501 [23]).

- Data Rate (see clause 5.45.4 of TS 23.501 [23]).

- Packet Delay Variation (see clause 5.37.7 of TS 23.501 [23]).

- Round trip packet delay considering UL on a service data flow and DL of another service data flow (see clause 5.37.4 of TS 23.501 [23]).

Via the QoS monitoring mechansims, the above parameters can be derived and further exposed to the AF via the PCF or the UPF (directly or further via NEF) as requested.

### 5.X.2 Collaboration Scenario

Editor’s Note: Collaboration scenarios between the 5G System and Application Provider are FFS.

### 5.X.3 Architecture Mapping

Editor’s Note: Based on existing architectures, one or more deployment architectures that address the key topics and the collaboration models are FFS.

### 5.X.4 High-level Call Flow

Editor’s Note: The high-level call flows are FFS.

### 5.X.5 Gap Analysis and Requirements

Editor’s Note: Other issues that need to be solved are FFS.

Regarding the features (i.e., QoS enhancements and network information exposure) described in clause 5.X.1.2, it is proposed to study

- whether these features in 5GS can be beneficial and valid for Media Delivery services?

- whether the ECN marking for L4S can be beneficial and valid for Media Delivery?

- whether the PDU Set handling can be beneficial and valid for Media Delivery?

- whether the QoS monitoring can be beneficial and valid for Media Delivery?

- How to apply these features to Media Delivery services?

- how to integrate feature of the ECN marking for L4S into the Media Delivery system?

- how to integrate feature of PDU Set handling into the Media Delivery system?

- how to integrate feature of the QoS monitoring into the Media Delivery system?

### 5.X.6 Candidate Solutions

Editor’s Note: Candidate solutions including call flows, protocols and APIs for identified issues are FFS.

### 5.X.7 Summary and Conclusions