3GPP TSG SA WG-4 Meeting #133-e S4-2507xxx

Online, Japan, July 19 – 23 2025 In revision of S4-250776

**Source: Huawei, HiSilicon**

**Title: New SID on Characterization and Identification of Dynamically Changing Traffic Characteristics and enhanced QoS support in Media Applications and Services**

**Document for: Agreement**

**Agenda Item: 17.1**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Study on Characterization and Identification of Dynamically Changing Traffic Characteristics and enhanced QoS support in Media Applications and Services

Acronym: FS\_DTC\_eQOS\_MED

Unique identifier: xxxx

{A number to be provided by MCC at the plenary}

Potential target Release: Rel-20

# 1 Impacts

{For Normative work, identify the anticipated impacts. For a Study, identify the scope of the study}

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  | x |  |  |  |
| No |  |  | x | x | x |
| Don't know |  |  |  |  |  |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a study

|  |  |
| --- | --- |
| x | Study  |
|  | Normative – Stage 1 |
|  | Normative – Stage 2 |
|  | Normative – Stage 3 |
|  | Normative – Other\* |

**\* Other = e.g. testing**

## 2.2 Parent Work Item

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| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| N/A |  |  |  |

### 2.3 Other related Work Items and dependencies

FS\_XRTraffic defined traffic models and quality evaluation methods for media and XR Services in the 5G Network (see TR 26.926). FS\_TyTrac studied Typical Traffic Characteristics of Media Services and defined the generic traffic characteristics such as bitrate, file format and provides a summary of the work in 3GPP on QoS (see TR 26.925). Neither document presents a study on dynamically changing traffic characteristics in common media applications and services with a link to exploiting them using the features available in the 5GS.

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| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 870013 | FS\_XRTraffic | Modelling and evaluation of end-to-end XR services in 5G network |
| 810005 | FS\_TyTrac | Defines the basic (aggregate) traffic characteristics such as bit-rate media format etc. for XR services |
| 1030000 | FS\_5G\_RTP\_PH2 | Studied some of the dynamically changing traffic characteristics for the case of RTP |
| 960046 | 5G\_RTP | Defined some of the user plane signaling for dynamic traffic characteristics in RTP |

# 3 Justification

Additional support for transmission of content with dynamically changing traffic characteristics was added to the 5G System, see Table 1 for an overview of these features from TS 23.501. In addition, improved usage of the QoS framework in 23.501 can benefit media applications and services.

Table 1 5GS features defined in TS 23.501 (originally targeting XR applications)

|  |  |  |
| --- | --- | --- |
| **Feature** | **Reference** | **Benefit** |
| a) Data Burst Size | TS 23.501 clause 5.37.10.1 | Exploit data burst for improved scheduling of the transmission |
| b) Time to Next Burst | TS 23.501 clause 5.37.10.2 | Exploit time to next burst for improved transmission and resource saving |
| c) Expedited data transfer with reflective QoS | TS 23.501 clause 5.37.10.3  | Improve data transmission by using alternative QoS enabling expedited data transfer |
| d) End of Data Burst indication | TS 23.501 clause 5.37.8.2 | Improved power saving and potentially improved transmission |
| e) policy for multi-modal service | TS 23.501 clause 5.37.2 | Policy for multi-modal services |

Both XR and non-XR Media applications and services can benefit from these features, but support and understanding of their usage in media workflows is currently limited. The detection and identification of such dynamically changing traffic characteristics, both on the uplink and downlink, is not well understood and documented for media applications and services.

Therefore, 3GPP SA4 should provide additional support for enabling these features in different media applications and services and study how and if these features can provide benefits.

NOTE: Work on PDU Set Based Handling and End of Data Burst indication was already done in Release 18, the aim of this study is providing additional guidelines for using these features in media applications and services based on the type of dynamically changing traffic characteristics that originate from these applications and services beyond PDU Set based QoS handling.

The use cases of how the UE or Network features related to dynamically changing traffic characteristics from Table 1 and enhanced QoS can benefit media services and applications include at least the following use cases:

1. Variable bit-rate support in encoders using expedited data transfer, i.e. (c) from Table 1, by using data boost feature a video producing variable bit-rate encoding for real time service can still send their video in time.
2. Exploiting time to next burst, (b) from Table 1, in live and video on demand or live streaming scenarios. This can enable power saving in the device and more effective transmission.
3. Exploiting data burst size indication in real-time communication services,(a) and (d) from Table 1. This can also results in power savings and resource optimization.
4. Supporting a-periodic media streams with high burst frequency and low burst data volume by exploiting the data burst feature, (a) from Table 1. In this case more effective resource allocation can be achieved.
5. Supporting aspects related to multi-modality and relationships between streams can be studied, as well as how to support these streams in the 3GPP network to improve QoS and QoE for multi-modal applications, including (e) from Table 1.
6. Support bursty uplink transmission of captured media for rapid AI inference in the (edge-cloud). The captured media can include video, audio and/or text.

In addition, dynamically changing traffic characteristics occurring in relevant scenarios will be documented. Further characterization and identification can be useful for subsequent normative work. Such normative work could result in:

* Specification of the dynamically changing traffic characteristics and their link to features from 23.501 in Table 1, where possible.
* Updates to related 3GPP SA 4 specifications in the context of media applications and services, either in the architecture or in the delivery carriage (if needed).

NOTE: Common media applications and services are considered, if not defined by an SA4 specification, it need to be checked if the example service or application is representative

* Signaling to support dynamically changing traffic characteristics for uplink and downlink.
* Additional improvements to QoE and QoS frameworks [and potential additional quality metrics].

Current SA4 reports on dynamic traffic characteristics focus on stationary characteristics such as aggregate bitrate, protocol format, resolution. For meaningful usage of features from Table 1 and possibly new features, non-stationary dynamically changing traffic characteristics also need to be taken into account.

These aspects are relevant for both low-bitrate and high bitrate applications. For example, in the Study of haptic media, traffic characteristic evaluation has highlighted that the bit-stream includes larger bursts but overall, it has a very low bandwidth. In AR/VR services animation and/or pose streams sent uplink may have irregular trafficpattern with low bitrate and burst characteristics. In high bitrate conversations and XR streams, patterns of data bursts and aperiodicity have also been identified in 5G RTP Ph2 and FS\_XR\_Traffic.

[ To date, Video and Audio have been considered rather independently from a QoE/QoS perspective. As new types of streams are becoming mainstream in emerging services, assessing the desired QoS granularity for these new streams is increasingly relevant, particularly in multimodal services, where prioritization should be carefully considered. The current QoE/QoS framework does not specify PSI for audio streams due to the overhead introduced by PDU Set marking relative to the audio bitstream bitrate. This overhead could similarly impact other low-bitrate media streams]

An emerging use-case of transmitting media to be leveraged by an AI enhanced application can impact traffic characteristics in new ways. On the uplink, media and is transmitted that may include, chunks of video, audio, video and text generating a periodic or aperiodic burst pattern.

The study should identify meaningful usage of features specified in Table 1 and/or possibly new features for providing better QoS and QoE to the uplink media with dynamic traffic characteristics. [The overall QoE and QoS granularity needs to also consider the dependency between the uplink and downlink streams to meet the latency sensitive service requirements. ]The test setup and framework can also be used to extend previous studies with additional behavior of these media applications and services.

# 4 Objective

The objectives are:

1. Identify common media application and service scenarios that may exhibit dynamically changing traffic characteristics, such as:
	1. Real-Time Communication for conversational, XR and/or gaming applications and services, both on the uplink and downlink.
	2. Video on demand streaming and progressive download
	3. Live Streaming
	4. Short form video download
	5. Media transmission for upstream AI inference.
2. Develop tests to evaluate these scenarios (based on 3GPP specifications or configuration or industry best practices). Tests will collect network traffic traces in real network and emulated network conditions with loss/delay impairments, possibly corresponding to 3GPP 5QI configurations. Also, the tests will give some quality indications in some of these cases. [These quality indications may lead to the identification of additional quality metrics]. The tests will be documented to enable reproducing similar experiments. The tests will be based on real and existing implementations and possible network emulation.
3. Characterize and document dynamically changing traffic characteristics observed in these scenarios [for single stream or dependent multi-modal streams], and:
	1. Identify how they relate to features in the 3GPP system (e.g., see Table 1), if applicable.
	2. Evaluate existing mechanisms and identify gaps [with respect to:
		1. PDU Set marking overhead for each media stream and for a set of multi-modal streams.
		2. PSI signaling of one or more media streams, taking into account the desired QoS granularity.]
	3. Study improved QoS and QoE mechanisms for uplink media with bursty dynamic traffic characteristics.
4. Develop call flows for the different scenarios exploiting features available in the 5G System including from Table 1.
5. Develop potential solutions to address dynamically changing traffic characteristics and enhanced QoS support:
	1. Define the characteristics of dynamically changing traffic for the selected media applications and services, both on uplink and downlink, where relevant, and potentially link them to features in the 5G system (e.g., as defined Table 1).
	2. Explore other relevant cases of signaling such characteristics in media-related workflows, for example in the 3GPP file format or ISO BMFF file format, in addition to real-time protocols, to assist intended use cases if needed.
	3. Document possible QoE and QoS framework improvements for single, and multi-modal streams [as well as dependent UL/DL streams]. For example, the mapping of QoS to dynamic traffic pattern characteristics may be different from the currently supported QoS features, both on the uplink and the downlink.
	4. Identify whether enhancements to the QoE metrics reporting feature is needed, potentially including additional metrics.
6. Identify normative work based on the potential solutions documented by this study. The potential aspects for normative work identified are:
	1. Normative characterization of dynamically changing traffic characteristics in different media applications and services
	2. Enhanced adoption of enhanced QoS and traffic characteristics features in SA4 streaming and delivery architectures (if needed)
	3. Enhanced carriage of metadata related to enhanced QoS and dynamically changing traffic characteristics in delivery and storage specifications (if needed).

# 5 Expected Output and Time scale

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| New specifications  |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
| TR 26.xxx |  | Study on usage of dynamically changing traffic characteristics and enhanced QoS support in 5GS for media applications and services | SA#111 (Mar ´26) | *SA#112*(June ´26) | TBD |

|  |
| --- |
| Impacted existing TS/TR  |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| TR 26.926 | Additional information on dynamically changing traffic characteristics | SA#112 (June ’26) | Add additional updates and finding of this study to report 26.926 |
| TR 26.925 | Additional information about dynamically changing traffic characteristics | SA#112(June ’26) | Add additional updates and finding of this study to report 26.925 |
| *TR 26.822* | *Study on 5G Real-time Transport Protocol Configurations, Phase 2* | *SA#112 (June ’26)* | *Optional in case there are updates relating to 5G RTP* |
| *TR 26.812* | *Additional QoE metric handling* | SA#112(June ’26) | *Optional in case there are updates related to XR use cases* |

# 6 Work item Rapporteur(s)

*Rufael Mekuria Rufael.mekuria@huawei.com*

# 7 Work item leadership

SA4

# 8 Aspects that involve other WGs

*SA2 on possible architectural aspects and signaling*

*RAN 2 on potential clarification of* RAN 2 related features

*MPEG/IETF* for potential format related issues

# 9 Supporting Individual Members

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| Supporting IM name |
| Huawei |
| HiSilicon |
| Interdigital Communications |
| Peng Cheng Laboratory |
| Meta |
| CMCC |
| CATT |