**SA WG2 Meeting #S2-146E S2-2106284r08-Qualcomm**

**Aug 16 – 27, 2021, Electronic meeting**

**Source: China Mobile, Huawei, Hisilicon, Xiaomi**

**Title: New SID: Study on architecture enhancement for XR and media services**

**Document for: Approval**

**Agenda Item: 9.1.3**

3GPP™ Work Item Description

For guidance, see [3GPP Working Procedures](http://www.3gpp.org/About/WP.htm), article 39; and [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm).
Comprehensive instructions can be found at <http://www.3gpp.org/Work-Items>

# Title: Study on architecture enhancement for XR and media services

## Acronym: FS\_XRM

## Unique identifier:

## 1 Impacts

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

## 2 Classification of the Work Item and linked work items

### 2.1 Primary classification

This work item is a …

|  |  |
| --- | --- |
|  | Feature |
|  | Building Block |
|  | Work Task |
| X | Study Item |

### 2.2 Parent and child Work Items

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| --- |
| Parent and child Work Items  |
| Unique ID | Title | Nature of relationship |
|  |  |  |

### 2.3 Other related Work Items and dependencies

{List here other Work Items which relate to the proposed one but are not part of the hierarchical structure.}

|  |
| --- |
| Other related Work Items (if any) |
| Unique ID | Title | Nature of relationship |
| 900027 | Study on supporting tactile and multi-modality communication services (Release 18) | Study of requirement about tactile and multi-modality communication services  |
| 890009 | Operation Points for 8K VR 360 Video over 5G | SA4 study to specify operation points as well as new media decoding capabilities to enable support for up to 8K video. |
| 870013 | Feasibility Study on Typical Traffic Characteristics for XR Services and other Media | SA4 study to collect traffic, codecs and protocol characteristics to identify and document additional relevant XR and other media services and related requirements. |
| 800014 | Study on Audio-Visual Service Production (Release 17) | Multiple devices collecting data for the same task with strict KPI requirements. |

## 3 Justification

In 5G era, mobile media services, cloud AR/VR, cloud gaming, video-based tele-control for machines or drones, are expected to contribute more and more traffics to 5G network. All media traffics, in spite of which codecs were used, have some common characteristics. These characteristics can be very useful for better transmission control and efficiency. However, currently 5GS uses common QoS mechanisms to handle media services together with other data services without taking full advantage of these information. For examples:

- Packets within a frame have dependency with each other since the application needs all of these packets for decoding the frame. Hence one packet loss will make other correlative packets useless even they are successfully transmitted. For example, XR applications impose requirements in terms of Media Units (Application Data Units), rather than in terms of single packets/PDUs.

- Packets of same video stream but different frame types (I/P frame) or even different positions in the GoP (Group of Picture) are of different contributions to user experience, so a layered QoS handling within the video stream can potentially relax the requirement thus lead to higher efficiency.

This study will investigate enhancements of QoS mechanisms considering the characteristics of XR and other media services.

Secondly, in order to help application adapt to network status and provide better QoE, the network information exposure to applications is needed, especially for the media service which has large traffic burst.

What’s more, the XR/media traffics have the characteristics of high throughput, low latency, and high reliability requirement, and the UE battery level may impact the user’s experience since the high throughput require the high power consumption in terminal side. So considering the limited radio resource and end-to-end QoS policy control from system perspective, the 5GS should be enhanced to support trade-off among throughput, latency and reliability and device battery life.

Furthermore, considering the XR/media traffics have natural interval between periodic video/audio frames, it would be possible to enhance the mobility management (e.g. Handover) and power saving mechanisms (e.g. CDRX) considering the XR/media traffic pattern.

Some advanced XR or media services may include more modalities besides video and audio stream, such as information from different sensors and tactile data for more immersing experience e.g. haptic data or sensor data. To support such tactile and multi-modality communication services (identified by SA WG1 TACMM), the 5G system may need to address service requirement of different types of traffic steams with coordinated QoS selection and packet processing, guaranteed latency and reliability, time synchronization of these parallel information, in order to ensure best service experience.NOTE 1: This study is mainly focusing on the enhancements to 5G system for better support of transmission of media services. Media service layer is not in the scope of this study. SA4 has responsibility for XR-based services and traffic characteristics, which means close coordination between the WGs are needed.

NOTE 2: Some cooperation with RAN WG may be needed to provide end-to-end solution.

## 4 Objective

The study item aims at identify the system architecture aspects related to better support advanced media services, e.g., High Data Rate Low Latency (HDRLL) services, AR/VR/XR services, and tactile/multi-modality communication services.

Objective1: Enhancements for supporting multi-modality service:

- Study whether and how to enable delivery of related tactile and multi-modal data (e.g., audio, video and haptic data related to a specific time) to the user at a similar time.

Objective 2: Enhancements of network exposure to support interaction between 5GS and application：

- Study whether and how interaction between AF and 5GS is needed for application synchronization and QoS control coordination between multiple QoS flows per UE or among multiple UEs.

NOTE: The above objectives related with tactile and multi-modality service may be updated based on SA1 outputs on TACMM.

- Study exposure of 5GS QoS information, e.g., QoS capabilities and network conditions to the Application to enable quick codec/rate adaptation.

- Study whether and how QoS Notification enhancements are needed to help the 5GS to quickly recover to normal state from congestion state for the HDRLL service, e.g., via network information provided to AF.

- Study whether and how to enable DL traffic redistribution within the PDB time frame to improve RAN resource scheduling.

NOTE: Parameters for exposure may coordinate with RAN and SA4.

Objective 3: Study whether and how the following Enhancements for XR service and media service transmission are needed:

- Study the traffic characteristics of media service enabling improved network resources usage and QoE.

- Enhance QoS framework to take media units (e.g., video/audio frame, Application Data Unit, control information), where media units consist of PDUs that have the same QoS requirements and that may, e.g. , belong to the same frame in the HDRLL application.

- Support QoS control based on media unit granularity (e.g. video frame/tile granularity)

- Support differentiated QoS handling considering importance of packet of media units.

- Study architecture enhancement/QoS adjustment to support trade-off among throughput and latency, with reliability and device battery life.

NOTE: Coordination with RAN WGs may be needed.

- Support uplink-downlink transmission coordination to meet RTT (Round-Trip Time) requirements.

- Enhance the 5GS to minimize the media packet drop and its impact, e.g., eligible drop packet, reduce the resource wasting, reduce the useless packets.

- Potential policy enhancements needed to support the above and to minimize the jitter.

- Enhance the QoS to support the low round trip time for the HDRLL traffic.

Objective 4: Study potential enhancements of Mobility and power management considering traffic pattern of media services:

- Support handover enhancement considering the traffic pattern of media services to minimizing service disruption.

- Power saving enhancement e.g. whether and how to enhance CDRX , considering XR/media traffic pattern.

Objective 5: Whether and how to support network slice for mobile media:

- Potentially define a network slice type supporting mobile media transmission.

The time for this study item is about 18TUs.

## 5 Expected Output and Time scale

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| --- |
| **New specifications** {One line per specification. Create/delete lines as needed} |
| Proposed Spec no. or series | Type (see note 1)  | Rapporteur(s)(see note 2) | For info at TSG#  | For approval at TSG# | Remarks |
| New TR 23.7xy | Internal TR | TBD |  |  |  |

Note 1: Only TSs may contain normative provisions. Study Items shall create or impact only TRs.
“Internal TR” is intended for 3GPP internal use only whereas “External TR” may be transposed by Ops.

Note 2: The first listed Rapporteur is the specification primary Rapporteur. Secondary Rapporteur(s) are possible for particular aspect(s) of the TS/TR. In this case, their responsibility has to be provided as “Remarks”.

|  |
| --- |
| **Impacted existing TS/TR** {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## 6 Work item Rapporteur(s)

TBD

## 7 Work item leadership

SA2

## 8 Aspects that involve other WGs

SA3 for security aspects.

SA4 for media types of emerging and XR-based services and traffic characteristics aspects.

SA5 for management and charging aspects.

RAN1/2/3 for RAN part enhancements.

## 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| China Mobile |
| CATT |
| China Telecom |
| China Unicom |
| CAICT |
| Huawei |
| HiSilicon |
| Spreadtrum Communications |
| vivo |
| ZTE |
| Qualcomm |
| Xiaomi |
| OPPO |
| Intel |
| Oracle |
| Broadcom |
| CBN |
| ABS |
| Toyota |
| Interdigital |
| Alibaba |
| Futurewei |
| Nokia |
| Nokia Shanghai Bell |
| Apple |
| Telecom Italia |
| NTT DOCOMO |
| KDDI |
| SK Telecom |
| Verizon UK Ltd |
| Lenovo |
| Motorola Mobility |
| KPN |
| Bosch |