**SA WG2 Meeting #153e *based on* S2-2208703r5**

**October 10th – 17th, 2022; Elbonia**

**Source: China Mobile, Tencent, Tencent Cloud, Huawei, HiSilicon**

**Title: New WID: Architecture Enhancements for XR and media services**

**Document for: Approval**

**Agenda Item: 10.3**

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: Architecture Enhancements for XR (Extended Reality) and media service

Acronym: XRM

Unique identifier:

Potential target Release: *Rel-18*

# 1 Impacts

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

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

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

## 2.2 Parent Work Item

For a brand-new topic, use “N/A” in the table below. Otherwise indicate the parent Work Item.

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

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 940068 | Study on XR (Extended Reality) and media services | Study item phase of this work item proposal, comprehensive study the key issues and make conclusions |
| 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. |
| 840019 | 5G System Enhancement for Advanced Interactive Services, | SA2 work item to enhance QoS mechanism e.g. define new standardized 5QI for cloud gaming and XR services |
| 800014 | Study on Audio-Visual Service Production (Release 17) | Multiple devices collecting data for the same task with strict KPI requirements. |
| 930020 | Supporting tactile and multi-modality communication services | SA1 requirement about tactile and multi-modality communication services |

# 3 Justification

In 5G era, mobile media services, e.g. 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 codec was 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.

Additionally, 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 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 or emotion 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.

This work item is to specify the enhancements that have been concluded in TR 23.700-60 as a result of the FS\_XRM study.

# 4 Objective

This work item will implement the following objectives as concluded in the study on XR (Extended Reality) and media services:

#1) Support of policy control enhancements to support multi-modality flows coordinated transmission for single UE;

- PCF generates policies to support coordinated transmission based on AF provisioned information.

#2) Support of policy control enhancements to support multi-modality flows coordinated transmission for multiple UEs.

- AF provides information to indicate the multiple flows belong to the same multi-modal service for multiple UEs.

- PCF generates related policies for each of the multiple UEs.

#3) Support 5GS information exposure for XR/media enhancements;

- Support ECN marking for the purpose of L4S based on NG-RAN.

- Support ECN marking for the purpose of L4S based on PSA UPF.

 - Support API based information exposure to AF including QNC for GBR QoS Flow, congestion information, data rate, delay difference, round trip delay of QoS flow, estimated bandwidth for 5QI.

#4) Support PDU set based QoS handling including PDU set integrated handling and differentiated handling;

- Support PDU set based QoS Parameters with PCF determination and provisioning, based on AF provisioned information.

- Support PDU set information identification and marking by PSA UPF.

- Support potential enhancement for UL PDU set handling based on RAN WGs conclusion.

#5) Void;

#6) Support uplink-downlink transmission coordination to meet round-trip latency requirements;

- Support RT latency split for UL and DL PDB for different QoS flows considering AF QoS requirement.

- Use of QoS monitoring to adjust the UL and DL PDB to meet RT latency.

#7) Support policy enhancements for jitter minimization;

- Support AF and 5GC interaction for jitter monitoring and exposure, jitter requirements provisioning and policy enhancements.

#8) Support enhancements to power savings for XR services;

- 5GS enhancement to provide assistant information to NG-RAN via NGAP message and GTP-U header.

#9) Support trade-off of QoE and power saving requirements;

- PCC rule generation and update based on media codec information from the AF.

NOTE : Exact conclusion contents of normative work for each Key Issue shall be based on conclusion in clause 8 of TR 23.700-60.

NOTE : Whether to define a network slice type supporting media services can be determined during normative phase.

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
| N/A |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| 23.501 | Updates to 5G System architecture to support XRM | SA#99March 2023 |  |
| 23.502 | Updates to 5G System procedures to support XRM | SA#99March 2023 |  |
| 23.503 | Updates to 5G System Policy Control to support XRM | SA#99March 2023 |  |

# 6 Work item Rapporteur(s)

Dan WANG, China Mobile wangdanyjy@chinamobile.com, responsible for objective #1, #2, #4, #5, #9

Yixue LEI, Tencent yixuelei@tencent.com , responsible for objective#3, #6, #7, #8

# 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.

RAN1/2/3 for RAN part enhancements.

SA5 for charging aspects

# 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| China Mobile |
| Tencent, Tencent Cloud |
| 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 |
| Ericsson |
| TCL |
| AT&T |
| Samsung |
| Deutsche Telekom |
| MediaTek Inc.  |
| LG Electronics |
| Allot |
| Philips International B.V.  |
| Vodafone |
| DISH Network |
| Charter Communications |
| Google |
| MATRIXX Software |
| Telefonica |
| BT |
| Microsoft |
| Rakuten |
| Meta USA |
| Sony |
| Futurewei |
| CableLabs |