**3GPP TSG SA WG4#115-e meeting S4-211034**

**18th– 27th August 2021**

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| *CR-Form-v12.0* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
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|  | **26**.**998** | **CR** | pseudo | **rev** |  | **Current version:** | **0.8.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** | **[FS\_5GSTAR] Some Initial Conclusions** | | | | | | | | | |
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| ***Source to WG:*** | Qualcomm Incorporated | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_5GSTAR | | | | |  | ***Date:*** | | | 11/08/2021 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | 17 |
|  | *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 can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) 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)* | |
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| ***Reason for change:*** | |  | | | | | | | | |
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| ***Summary of change:*** | |  | | | | | | | | |
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| ***Consequences if not approved:*** | |  | | | | | | | | |
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| ***Clauses affected:*** | |  | | | | | | | | |
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|  | | **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:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

**===== CHANGE =====**

# 8 Potential Normative Work

## 8.1 General

This clause documents and clusters potential standardisation areas in the context of this Technical Report.

## 8.2 5G-Media Service Enablers for AR

AR applications rely on functionalities provided by devices and networks. On devices, such functionalities are typically bundled in software development kits (SDKs) in order to get access to complex hardware functionalities. SDKs typically expose APIs to simplify the communication with the underlying hardware and network functionalities.

What is clearly needed for AR and provided for example by Khronos with OpenXR, are standardized APIs to access underlying AR hardware functions. However, the standardized APIs and functions in OpenXR are restricted to local device processing. In order to enable and simplify the access to 5G network, system and media functionalities for AR, it is beneficial to provide packages and bundles for application providers. Typical assets for Media Service enablers are:

* A set of functions that may be used to develop applications on top of 5G Systems.
* A set of robust features and functionalities which reduce the complexity of developing applications
* Functions to leverage system and radio optimizations as well as features defined in 5G System and 5G NR
* Provision and documentation of APIs to enable or at least simplify access to these functionalities
* Provision of network interfaces to connect to the 5G System
* Guidelines and examples to make use of the functionalities

A specification of a 5G-Media Service enabler for AR may bundle relevant and essential functions to support AR applications on 5G networks.

A media service enabler may

* bundle functions that are exclusively defined in 3GPP
* reference technologies defined outside of 3GPP, for example in MPEG or Khronos, and may provide relevant subsets and profiles of those
* include mandatory functions
* include optional or recommended functions, for which the capability negotiation is needed
* reference other Media Service Enablers, and may provide relevant subsets and profiles of those
* be defined by stage-2 procedures and stage-3 protocols
* provide requirements for client and network functions

It is proposed to use the concept of 5G-Media Service Enablers to define relevant specifications for AR and possibly other applications.

## 8.3 5G Real-time Communication

As documented in clause 4.2.5 and further developed in the context of clause 6, there are several use cases that require a 5G Real-time communication. The use cases include

1. EDGAR-based UEs relying on rendering on the network. In this case, the downlink requires sending pre-rendered viewports with lowest latency, typically in the range below 50ms.
2. Uplink streaming of camera and sensor information for Cognitive experiences, in case the environment tracking data and sensor data is used in creating and rendering the scene.
3. Conversational AR services requires real-time communication both in the downlink and the uplink, typically independent from MTSI for app integration of the communication.

In order to provide adequate QoS as well as possible optimizations when using a 5G System for media delivery, an integration of real-time communication into the 5G System framework is essential.

As identified in clause 4.2.5 and clause 6.5, there is a need for supporting third-party application in 5G real-time communication as well as server-based real-time streaming. From an app developer perspective, an enabler is preferable, especially to support real-time streaming, for example for split-rendering.

Different options may be considered, for example re-use of parts of MTSI such as the IMS data channel and 5G Media Streaming for managed services, or re-use of the webRTC framework and protocol suite for OTT services.A 5G Real-time communication is expected to be aligned with a webRTC framework but provides additional functions to integrate with the 5G System.

It is proposed to define a general 5G Real-time communication media service enabler that includes, among others, the following functionalities:

* A protocol stack and content delivery protocol for real-time communication based on RTP
* A set of codecs for different media types
* A session and connection establishment framework, for example based on SDP and ICE
* A capability exchange mechanism
* A security framework, for example based on SRTP and DTLS
* Uplink and downlink communication
* Suitable control protocols for end-to-end adaptation
* QoS and 5G System integration framework
* Reporting and QoE framework

## 8.4 Split Rendering Media Service Enabler with AR profile

In the context of this report, it was clearly identified that AR glasses depend on cloud or edge-based pre-rendering. However, not only AR glasses benefit from such a functionality, also for VR, XR and gaming as identified in TR 26.928 and TR 26.926 benefit from split rendering approaches. Hence, a basic Media Service enabler for split rendering is tantamount, in particular in combination with 5G new radio and 5G System capabilities.

Based on this discussion it is proposed to specify a generic raster-based Split Rendering Media Service Enabler that includes, among others, the following functionalities:

* A content delivery protocol defined as a profile of 5G-RTC for downlink streaming with possible extension
* A relevant subset set of codecs for different media types
* A scene description functionality to support a scene manager end point
* Relevant edge compute capabilities, for example including rendering context and context relocation
* Relevant APIs and network communication
* Integration into 5GS and RAN, possibly with support of cross-layer optimizations
* Operational requirements and recommendations for low-latency streaming
* Guidelines and examples

In addition to the generic enabler for split rendering a specific profile for AR is recommended to be defined that includes special considerations for

* The formats to be supported on AR glasses
* The power consumption challenge for AR glasses
* The metrics and KPIs for AR glasses
* The required QoS and QoE for AR type of applications as defined in clauser 4.6
* Other AR specific considerations

## 8.5 Immersive Media Profile for 5GMS

In the context of this report, it was clearly identified streaming of immersive scenes is handled a new rendering end point referred to as scene manager in this document. For details refer to clause 4.2.4 and clause 6.2. To this extent it is suitable to define the ability to stream native 3D formats over 5GMS. For this, preferably a new specification should be generated, similar as TS 26.116 for TV Video Profile and TS 26.118 for VR Profile to support more generic immersive media than. In addition, the integration into 5G Media Streaming is essential.

Based on this discussion it is proposed to specify an Immersive Media in 3GPP addressing at the least the following considerations:

* A scene description functionality to support a scene manager end point
* A relevant subset of 2D and 3D formats, including meshes and point clouds
* A relevant subset set of codecs for different media types and formats
* An integration into CMAF encapsulation for 5G Media streaming purposes
* Guidelines and examples

In addition to the generic enabler set of tools, a profile for AR in 5G media streaming is recommended to be defined that includes special considerations for

* The formats to be supported on AR glasses
* The power consumption challenge for AR glasses
* The metrics and KPIs for AR glasses
* The required QoS and QoE for AR type of applications
* Other AR specific considerations