**3GPP TSG SA WG4#115-e meeting S4-211031**

**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] Improved user experience for WLAR UE** |
|  |  |
| ***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 canbe 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:*** |  |
|  |  |
| ***Summary of change:*** |  |
|  |  |
| ***Consequences if not approved:*** |  |
|  |  |
| ***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 =====**

#### 4.2.2.1 Overview

In TR 26.928, different AR and VR device types had been introduced in clause 4.8. This clause provides an update and refinement in particular for AR devices. The focus in this clause mostly on functional components and not on physical implementation of the glass/HMD. Also, in this context the device is viewed as a UE, i.e. which functions are included in the UE.

A summary of the different device types is provided in Table 4.2.2.1-1. The table also covers:

- how the devices are connected to get access to information,

- where the 5G Uu modem is expected to be placed,

- where the AR Runtime (as specified in 4.2.1) is placed,

- where the Scene Manager (as specified in 4.2.1) is placed,

- where the AR/MR application is running,

- where the power supply/battery is placed.

For all glass device types, it is assumed that sensors, cameras and microphones are on the device.

The definition for Split AR/MR in Table 4.2.2.1-1 is as follows:

- Split: the tethered device (phone/puck) or external entity (cloud/edge) does some pre-processing (e.g, a pre-rendering of the viewport based on sensor and pose information), and the AR/MR device and/or tethered device performs a rendering considering the latest sensor information (e.g. applying pose correction). Different degrees of split exist, between different devices and entities. Similarly, vision engine functionalities and other AR/MR functions (such as AR/MR media reconstruction, encoding and decoding) can be subject to split computation.

Table 4.2.2.1-1: 5G Augmented Reality device types

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Device Type Name | Reference | Tethering | 5G Uu Modem | AR Runtime | Scene Manager | AR/MR Application | Power Supply |
| **5G Standalone AR UE** | 1: STAR | N/A | Glass | Glass | Glass/Split 1) | Glass | Glass |
| **5G EDGe-Dependent AR UE** | 2: EDGAR | N/A | Glass | Glass/Split 1) | Split 1) | Split | Glass |
| **5G WireLess Tethered AR UE** | 3: WLAR | 802.11ad, 5G sidelink, etc. | Tethered device(phone/puck) | Glass | Split 2) | Tethered device | Glass |
| **5G Wired Tethered AR UE** 3) | 4: WTAR | USB-C | Tethered device | Tethered device | Split 2) | Tethered device | Tethered device |
| 1) Cloud/Edge2) Phone/Puck and/or Cloud/Edge3) Not considered in this document |

The Wired Tethered AR UE device type is for reference purposes only and not considered in this document as it is not included as part of the study item objectives.

Generally, the STAR and WLAR device according to Table 4.2.2.1-1 are expected to have similar functionalities from a 5G System perspective.

Based on this, the focus is on three main different device types in the remainder of this document following the rows 1 to 3 in Table 4.2.2.1-1.

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

#### 4.2.2.4 Type 3: 5G WireLess Tethered AR UE

This clause introduces the 5G WireLess Tethered AR UE. Two sub-types are differentiated:

* Split Rendering WLAR UE. In this case the 5G phone that includes the modem also acts to support rendering of complex scenes and provides the pre-rendered data to the glass
* Relay WLAR UE: In this case, the 5G phone acts as a relay to provide IP connectivity.

Figure 4.2.2.4-1 provides a functional structure for Type 3a: 5G Split Rendering WireLess Tethered AR UE.



Figure 4.2.2.4-1: Functional structure for Type-3a: 5G Split Rendering WireLess Tethered AR UE

Main characteristics of Type 3: 5G WireLess Tethered AR UE:

- 5G connectivity is provided through a tethered device which embeds the 5G modem. Wireless tethered connectivity is through WiFi or 5G sidelink. BLE (Bluetooth Low Energy) connectivity may be used for audio. The motion-to-render-to-photon loop runs from the glass to the phone. While the connectivity is outside of the 5G Uu domain, it is still expected that for proper performance when used for split rendering, a stable and constant delay link can be setup on the tethered connection.

- The AR Runtime is local and uses from sensors, audio inputs or video inputs, but may be assisted by functionalities on phone.

- While media processing (for 2D media) can be done on the AR glasses, heavy AR/MR media processing may be done on the AR/MR tethered device or split.

- Some devices might have limited support for immersive media decoding and rendering and may need to rely on 5G cloud/edge.

- While such devices are likely to use significantly less processing than Type 1: 5G STAR devices by making use of the processing capabilities of the tethered device, they can still support a lot of local media and AR/MR processing. Such devices are expected to provide 8-10h of battery life while keeping a significantly low weight.

- The tethered glass itself is not a regular 5G UE, but the combination of the glass and the phone results in a regular 5G UE.

- Media Access functions are provided that support the delivery of media content components over the 5G system. Examples of the media access functions are 5GMS functions, MTSI functions, web-connectivity or edge-related client functions. Detailed requirements are for study in this report.

Figure 4.2.2.4-2 provides a functional structure for Type 3b: 5G Relay WireLess Tethered AR UE.



Figure 4.2.2.4-2: Functional structure for Type-3b: 5G Relay WireLess Tethered AR UE

Main characteristics of Type 3: 5G Split Rendering WireLess Tethered AR UE:

- 5G connectivity is provided through a tethered device which embeds the 5G modem. Wireless tethered connectivity is through WiFi or 5G sidelink. BLE (Bluetooth Low Energy) connectivity may be used for audio.

- The 5G Phone acts as a relay to forward IP packets. The 5G Phone runs a Media Session Handler including EDGE functionalities to support QoS control on the 5G System. To support proper end-to-end QoS, the media session handling needs to take into account the constraints of the tethering link to provide sufficient QoS on the 5G System link to provide adequate QoE for the end user.

- Media Access functions are provided on the glass device to support the delivery of media content components over the 5G and wireless tethered link.

- The motion-to-render-to-photon loop runs from the glass to the edge and hence includes in total 4 wireless links. It is expected that for proper performance when used for split rendering, a stable and constant delay end to end link needs to be setup.

- The AR Runtime is local and uses from sensors, audio inputs or video inputs, but may be assisted by functionalities on phone.

- Media Processing is either done on the glass device or it is split with the network. In particular relevant is that many devices have limited support for immersive media decoding and rendering and may need to rely on 5G cloud/edge

- While such devices are likely to use significantly less processing than Type 1: 5G STAR devices by making use of the processing capabilities of the tethered device, they can still support a lot of local media and AR/MR processing. Such devices are expected to provide 8-10h of battery life while keeping a significantly low weight.

- The tethered glass itself is not a regular 5G UE, but the combination of the glass and the phone results in a regular 5G UE.