**3GPP TSG SA WG4#117-e meeting S4-220219**

**14th – 23rd February 2022 revision of S4-220050**

**Source: Qualcomm Incorporated, Facebook, Dolby Laboratories Inc., Xiaomi, Samsung Electronics Co., Ltd**

**Title: Feasibility Study on Smartly Tethering AR Glasses (FS\_SmarTAR)**

**Document for: Agreement**

**Agenda Item: 10.10**

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: Feasibility Study on Smartly Tethering AR Glasses

Acronym: FS\_SmarTAR

Unique identifier:

Potential target Release: Rel-18

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Affects:** | **UICC apps** | **ME** | **AN** | **CN** | **Others (specify)** |
| **Yes** |  | X |  | 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 …

|  |  |
| --- | --- |
|  | **Feature** |
|  | **Building Block** |
|  | *Work Task* |
| X | **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.

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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

|  |
| --- |
| **Other related Work /Study Items (if any)** |
| **Unique ID** | **Title** | **Nature of relationship** |
| 810006 | Extended Reality (XR) in 5G (FS\_5GXR) | Initial study on AR/MR and key use cases. |
| 880011 | Study on 5G Glass-type AR/MR Devices (FS\_5GSTAR) | Study on the support of AR/MR with 5G glass-type devices. TR 26.998 concludes 5G Real-time Communication as an area for potential standardisation. |
| 830033 | Study on System enhancement for Proximity based Services in 5GS (FS\_5G\_ProSe) | Addresses potential tethering use cases |
| 900007 | Stage 2 for Proximity based Services in 5GS (5G\_ProSe) | Addresses stage-2 for tethering case we use 5G sidelink |
| 880041 | Study on Personal IoT Networks (FS\_PIN) | AR Glasses can be considered a category of PIN (Personal IoT Network) Element. This study aimed at new use cases and service requirements to enhance 5GS support of Personal IoT (PIoT) networks. |
| 930029 | Personal IoT and Residential networks (PIRates) | AR Glasses can be considered a category of PIN (Personal IoT Network) Element. This work item shall specify requirements for using the 5G system for Customer Premises and Personal IoT Networks as derived from TR 22.858 and TR 22.859.  |

**Dependency on non-3GPP (draft) specification:**

N/A

# 3 Justification

In clause 4.2.2.4 of TR 26.998, the important aspect of wireless tethering of AR glasses was introduced. The tethering technology between a UE and an AR glass may use different connectivity. Wireless tethered connectivity is provided through WiFi or 5G sidelink. BLE (Bluetooth Low Energy) connectivity may be used for audio.

Two main types are identified:

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

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



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

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

In the first case, the motion-to-render-to-photon loop runs from the glass to the phone, whereas in the second case the 5G Phone acts as a relay to forward IP packets. The architectures result in different QoS requirements, session handling properties, and also media handling aspects. For enhanced end-to-end QoS and/or QoE, AR glasses may need to provide functions beyond the basic tethering connectivity function, and the resulting AR glasses may be referred to as Smartly Tethering AR Glasses (SmarTAR). Generally, smartly tethering AR glasses is an important aspect.

A key challenge for WLAR and WTAR UEs is to properly estimate the required QoS allocations for the AR sessions. The QoS allocation must take into account the wireless/wired tethering link from the glass to the UE. This applies to all QoS parameters, namely bitrate, packet loss, delay, and jitter. The following diagram depicts a breakdown of the components contributing to the end-to-end delay as an example:



Figure 4.2.2.4-3: End-to-end delay breakdown to components

For a smooth operation of the AR session, the UE must estimate the impact of the tethering link on the overal QoS requirements.

# 4 Objective

The objectives of the study item is the definition of the study item is as follows

* Defining different tethering architectures for AR Glasses including 5G sidelink and non-5G access based on existing 5G System functionalities
* Study the relationship between AR Glasses tethering and AR glasses considered as PIN (Personal IoT Network) elements according to TR 22.859 and the derived service requirements in TS 22.261.
* Documenting end-to-end call flows for session setup and handling
* Identify media handling aspects of different tethering architectures
* Identify end-to-end QoS-handling for different tethering architectures and define supporting mechanisms to compensate for the non-5G link between the UE and the AR glasses
* Provide recommendations for suitable architectures to meet typical AR requirements such as low power consumption, low latency, high bitrates, security and reliability.
* Collaborate with relevant other 3GPP groups on this matter
* Identify potential normative work for stage-2 and stage-3

# 5 Expected Output and Time scale

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| --- |
| **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** |
| *TR* | *26.8xx* | *Study on Tethering AR Glasses – Architectures, QoS and Media Aspects*  | *SA#98 (Dec. 2022)* | *SA#99 (Mar. 2023)* | *Thomas Stockhammer (tsto@qti.qualcomm.com)* |
|  |  |  |  |  |  |

|  |
| --- |
| **Impacted existing TS/TR {One line per specification. Create/delete lines as needed}** |
| **TS/TR No.** | **Description of change**  | **Target completion plenary#** | **Remarks** |
| *TR26.998* | *Smartly Tethering AR Glasses* | *SA#99 (Mar. 2023)* |  |
|  |  |  |  |

# 6 Work item Rapporteur(s)

*Thomas Stockhammer, Qualcomm Incorporated, tsto@qti.qualcomm.com*

# 7 Work item leadership

SA4

# 8 Aspects that involve other WGs

*SA2 on architectural aspects related to tethering*

# 9 Supporting Individual Members

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| **Supporting IM name** |
| Qualcomm Incorporated |
| Facebook |
| Dolby Laboratories Inc. |
| Xiaomi |
| Samsung Electronics Co., Ltd |
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