**Source: Samsung Electronics Co., Ltd.**

**Title: [FS\_5GSTAR] Updates to Procedures for 5G Downlink Streaming using a STAR UE**

**Agenda Item: 10.9**

**Document for: Discussion and Agreement**

1. **Introduction**

This contribution discusses the procedures and call flows for the 5G Downlink Streaming use case in 5GSTAR, using a STAR-based UE. The updates focus on the entry point as referenced by the Media Player Entry, and the addition of relevant procedures identified by S4aV210678, for the non-edge assisted STAR-based UE scenario.

1. **Motivation and gap analysis**

The current TR 26.998 v0.7.0 includes a typical procedure diagram for 5G immersive media downlink streaming using a STAR-based UE (without assistance by an edge). The procedures described are based on the 5GMS procedures for video streaming, as specified in TS 26.501, namely where a manifest in the form of a DASH MPD is referenced by the Media Player Entry and used as the entry point.

Entry point referenced by Media Player Entry

For AR/MR services which need to support the streaming of media data beyond video, such as volumetric media (as should be described and discussed in the media formats section of TR 26.998), there may be multiple options for the entry point referenced by the Media Player Entry, namely: a scene description, a DASH MPD (supporting AR/MR media data), or a manifest specific to an AR/MR service. Depending on the entry point format used, extra procedures for obtaining further delivery manifests for streaming AR content (e.g. media data streaming adaptation) may also be necessary.

As stage 2 work, we propose to update figure 6.2.4.1-1, and its related text, in TR 26.998 in order to support such different options for the Media Player Entry entry point, and to align the procedures with the call flows discussed in S4aV210678, as shown in section 3 below.

1. **Typical Procedures and Call Flows for 5G Downlink Streaming using a STAR-based UE**

Figure 6.2.4.1-1 illustrates the procedure diagram for 5G immersive media downlink streaming using a STAR-based UE when all essential AR/MR functions in an UE are available without an assist by an edge.



**Figure 6.2.4.1-1: STAR-based High Level Procedure for 5G Downlink Streaming**

Prerequisites and assumptions:

- The AR/MR Scene Manager includes immersive media rendering and scene graph handling functionalities.

- The Media Player includes immersive content delivery and immersive media decoding functionalities.

- The AR/MR Application in the STAR UE is run by the user.

- The STAR UE initialises AR registration (starts analysing the surroundings where a user/UE is located), it namely:

1. captures its surroundings via camera(s)
2. analyses where the device is located
3. registers the device into the analysed surroundings.

- AR/MR Application and AR/MR Application Provider have exchanged some information, such as device capability or content configuration, for content rendering.

 Editor’s Note: The exchange procedures for device capability and content configuration are FFS.

- AR/MR Application Provider has established a Provisioning Session and its detailed configurations has been exchanged.

- AR/MR Application Provider has completed to set up ingesting immersive contents.

Procedures:

1. Service Announcement is triggered by AR/MR Application. Service Access Information including Media Player Entry or a reference to the Service Access Information is provided through M8d interface.
2. Desired media content is selected.
3. The AR/MR Application triggers the Media Player to start media playback. The Media Player Entry is provided to the Media Player
4. When the AR/MR Application has received only a reference to the Service Access Information (see step 1), the Media Session Handler interacts with the 5GMSd AF to acquire the whole Service Access Information.
5. In parallel, the Media Player is invoked to start media access and playback.
6. The Media Player establishes the transport session to acquire entry point information. Entry point information may or may not correspond to a delivery manifest for streaming AR content, and may be a scene description, DASH MPD, or a document specific to AR/MR services.

NOTE: Depending on the entry point used, extra procedures for obtaining further delivery manifests for streaming AR content (step 12) may also be necessary.

1. The Media Player requests the entry point.
2. 5GMSd AS provides the entry point.
3. The Media Player and/or AR/MR Scene Manager processes the entry point to acquire the necessary information for accessing media content.
4. The Media Player and/or AR/MR Scene Manager notifies the necessary information acquired from the entry point to the Media Session Handler.
5. The Media Session Handler shares the information with the 5GMSd AF, in some cases including desired QoS information. Based on existing provisioning by the AR/MR Application Provider, the 5GMSd AF may request QoS modifications to the PDU sessions.
6. Media content delivery manifest fetching procedure for each AR object. For static AR objects, a simple URL may be provided in the entry point information for downloading the AR object media data.
7. For the required media content, the Media Player establishes the transport session(s) to acquire delivery manifest(s) information.
8. The Media Player requests the delivery manifest(s).
9. 5GMSd AS provides the delivery manifest(s).
10. The Media Player processes the delivery manifest(s). It determines for example the number of needed transport sessions for media acquisition. The Media Player should be able to use the delivery manifest(s) information to initialize the media pipelines for each media stream.
11. The Media Player notifies the Media Session Handler about the delivery manifest(s).
12. The Media Player configures the media playback pipelines.
13. The Media Player establishes the transport session(s) to acquire the media content.
14. The Media Player notifies to the Media Session Handler that the playback is ready.
15. The Media Player requests the immersive media data according to the delivery manifest processed, possibly taking into account pose information for further processing (e.g., viewport dependent streaming)
16. The Media Player receives the immersive media data and triggers the media rendering pipeline(s), including the registration of AR content into the real world accordingly.
17. The Media Player decodes and processes the media data.
18. The Media Player passes the media data to the AR/MR Scene Manager.
19. The AR/MR Scene Manager renders the media, which includes the registration of the AR content into the real world accordingly.

Editor’s Note: Edge-assisted STAR UE procedures may differ from those above, and may have similarities to EDGAR UE procedures. STAR UEs may have the possibility to select, and change between non-assisted and edge-assisted modes depending on processing resources, UE power consumption and/or heat dissipation.

1. **Proposal**

We propose to include the updated figure and text in section 3 of this document as a pCR to TR 26.998.