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

**Title: [FS\_5GSTAR] 6.3.4 updates**

**Agenda Item: 10.9**

**Document for: Discussion and Agreement**

1. **Introduction**

This contribution includes merged updates from S4-211401 and S4-211408 to clause 6.3.4.

1. **Typical Procedures and Call Flows for 5G Interactive Immersive Services using a STAR-based UE**

### 6.3.4 Procedures and call flows

#### 6.3.4.1 STAR-based interactive immersive service

Figure 6.3.4.1-1 illustrates the procedure diagram for interactive immersive services using a STAR-based UE when all essential AR/MR functions in a UE are available without an assist by an edge.



Figure 6.3.4.1-1: STAR-based procedure for interactive immersive service

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 UE is run by the user.

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

a. captures its surroundings via camera(s)

b. analyses where the device is located

c. 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. 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. The Scene Server context is established, and scene content is ingested by the Media AS.

2. Service Announcement is triggered by AR/MR Application. Service Access Information including Media Client entry or a reference to the Service Access Information is provided through the M8d interface.

3. Desired media content is selected.

4. Optionally, the Service Access information is acquired or updated.

5. The AR/MR Application initializes the Scene Manager with the entry point (full scene description) URL.

6. The Media Client establishes the transport session for the scene session between the Scene Manager in the UE and the Scene Server.

7. The Media Client requests and receives the full scene description. The entry point (scene description) is processed by the AR/MR Scene Manager.

8. The AR/MR Scene Manager requests the creation of a new AR/MR session from the AR Runtime.

9. The AR Runtime creates a new AR/MR session.

Scene session loop, steps 10~24, send the interaction and pose information and receives and renders the updated scenes accordingly:

10. The latest interaction and pose information is acquired by the AR/MR Scene Manager and shared to the Media Client. The Media Client sends this information to the Media AS and Scene Server.

11. The Scene Server processes the scene according to the interaction and pose information from the UE. Depending on the level of processing, the current scene may be updated or replaced.

12. One of the following steps:

12a. The Scene Server sends a new scene entry point to the AR/MR Scene Manager through the Media AS and Media Client (go to step 7), or

12b. The Scene Server sends a scene update (updating streams/objects) to the AR/MR Scene Manager through the Media AS and Media Client.

13. The Media Client and/or AR/MR Scene Manager notifies the necessary (updated) QoS information required to the Media Session Handler.

14. The Media Session Handler shares the information with the Media AF, in some cases including desired QoS information. Based on existing provisioning by the AR/MR Application Provider, the Media AF may request QoS modifications to the PDU sessions.

Streaming session, steps 15~18 establish the transport sessions for media objects and configure the media pipelines:

15. For the required media content, the Media Client establishes the transport session(s) to acquire delivery manifest(s) information.

16. The Media Client requests and receives the delivery manifest(s) from the Media AS.

17. The Media Client processes the delivery manifest(s). It determines for example the number of needed transport sessions for media acquisition. The Media Client should be able to use the delivery manifest(s) information to initialize the media pipelines for each media stream.

18. The AR/MR Scene Manager and Media Client configures the rendering and delivery media pipelines.

19. The Media Client establishes the transport session(s) to acquire the media content.

Media session loop includes steps 20~24 which are for streaming, decoding and rendering media components:

20. The Media Client requests the immersive media data according to the delivery manifest processed, possibly taking into account pose information (e.g., viewport dependent streaming).

21. The Media Client receives the immersive media data and triggers the media rendering pipeline(s), including the registration of AR content into the real world accordingly.

22. The Media Client decodes and processes the media data. For encrypted media data, the Media Client may also perform decryption.

23. The Media Client passes the media data to the AR/MR Scene Manager.

24. The AR/MR Scene Manager renders the media, and passes the rendered media to the AR Runtime, which performs further processing such as registration of the AR content into the real world, and pose correction.

#### 6.3.4.2 EDGAR-based interactive immersive service

Figure 6.3.4.2-1 illustrates the procedure diagram for interactive immersive services using an EDGAR-based UE.



Figure 6.3.4.2-1: EDGAR-based procedure for interactive immersive service

Prerequisites and assumptions:

- Identical to those from the STAR UE case.

Procedures:

1~7. Identical to steps 1~7 from the STAR UE case (figure 6.3.4.1-1).

8. Based on the processed scene description and the device capabilities, the Media AS/EAS is selected, and edge processes are instantiated using the processes defined in EDGE:

a. The AR/MR Scene Manager sends the scene description and the device capabilities to Media AS. The Media AS derives the EAS KPIs and if needed selects a new AS/EAS (through AF) based on the new KPI. Then the edge processes are started, and a new entry point URL is provided to the AR/MR Scene Manager.

b. The AR/MR Scene Manager derives the EAS KPIs from the scene description and device capabilities, requests the AF to provide the list of suitable EAS. Then the AR/MR Scene Manager selects the AS/EAS and requests to start the edge processes in the AS. The edge processes are started, and a new entry point URL is provided to the AR/MR Scene Manager.

9. The AR/MR Scene Manager requests the simplified scene description. The edge processes derive the simplified scene description from the full scene description and provide it to AR/MR Scene Manager.

10. The simplified entry point (simplified scene description) is processed.

11~21. Identical to steps 8~18 from the STAR UE case (figure 6.3.4.1-1).

 Note: After step 15a (12a in 6.3.4.1-1): go to step 10.

22. The Media Client establishes the transport session(s) to acquire the media content.

23. The Media AS initiates and starts a media session. This media session forms a stateful session loop specific to the UE, containing steps 25~28:

Stateful media session loop (steps 24~30):

24. The latest pose information is acquired by the AR/MR Scene Manager and shared to the Media Client.

25. The Media Client sends the latest pose information to the Media AS.

26. The 5GMSd AS performs pre-rendering of the media based on the latest received pose information. Pre-rendering may typically consist of decoding and rendering immersive media, and encoding the rendered (2D) media.

27. The pre-rendered media is sent by the Media AS to the Media Client.

28. The Media Client decodes and processes the media data. For encrypted media data, the Media Client may also perform decryption.

29. The Media Client passes the media data to the AR/MR Scene Manager.

30. The AR/MR Scene Manager renders the media, and passes the rendered media to the AR Runtime, which performs further processing such as registration of the AR content into the real world, composition, and pose correction.

1. **Proposal**

We propose to include the updated figures and text in section 2 of this document as a pCR to section 6.3 of TR 26.998.