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XR Media
with MPEG-I
Scene Description

MPEG

3GPP™
A GLOBAL INITIATIVE

Qualcomm

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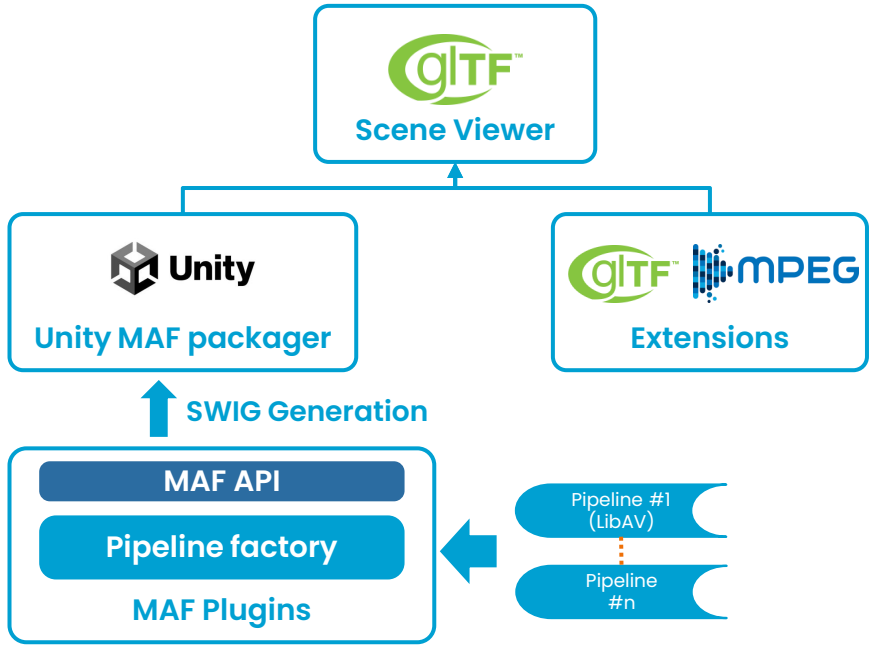
MOTION SPELL

XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

- **Unity project** to load an MPEG-I Scene Description document and render it
- Native implementation of the **Media Access Functions API** as defined in ISO/IEC 23090-14
- Fork of the **glTFast project** with modifications to parse the MPEG-I Scene Description glTF extension
- Initial set of **MPEG-I Scene Description assets**
- Initial support for **extensions to Blender** to generate 3D assets



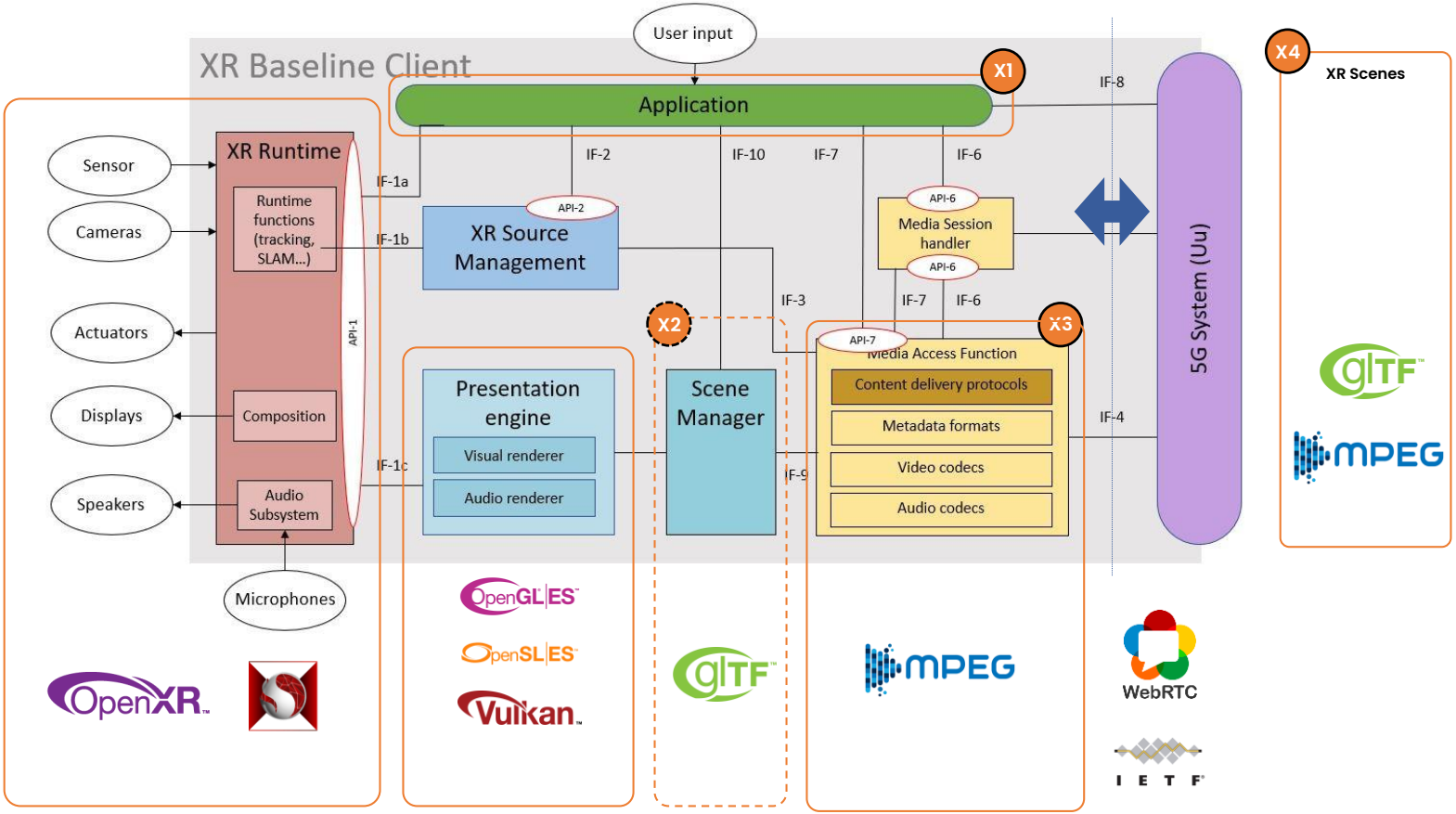
WHERE TO LOOK AT?

All the Technical Resources
Information on Standards
Reference Tools available:

- Project: XR Media with MPEG-I Scene Description

XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?



X XR Media with MPEG-I Scene Description

XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

#	Repository	Standards	License	Dependencies	Software
X1	**rt-xr-unity-player** (Unity project: XR player application)	MPEG	5G-MAG PLv1.0	Unity	
X2	**rt-xr-glTFast** (Unity plugin: MPEG-I SD glTF extensions)	glTF	Apache 2.0	KHRONOS GROUP	
X3	**rt-xr-maf-native** (C++ Media pipelines factory & plugins)	MPEG	5G-MAG PLv1.0	Unity	
X4	**rt-xr-content** (glTF test content implementing MPEG extensions)	glTF MPEG	Multiple		
X5	**rt-xr-blender-exporter** (Tools to generate glTF content)	MPEG	5G-MAG PLv1.0		

Operating System: (Linux, Windows, Android)
Packages: (APK, Docker)
Cloud Installation Support
API Tool Support
Web Interface Support

XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

Content Playback

- **Unity** and **Unreal Engine 5** are widely used for the creation of **3D experiences**
- An **open-source XR Player based on Unity Plugins** is available (an XR Web Player is expected too)
- Player is able to **load at runtime a 3D scene and render it** to create an immersive experiences
- **Open-source** will help developers to get started with standardized technologies and their integration into 5G-MAG

Content Creation

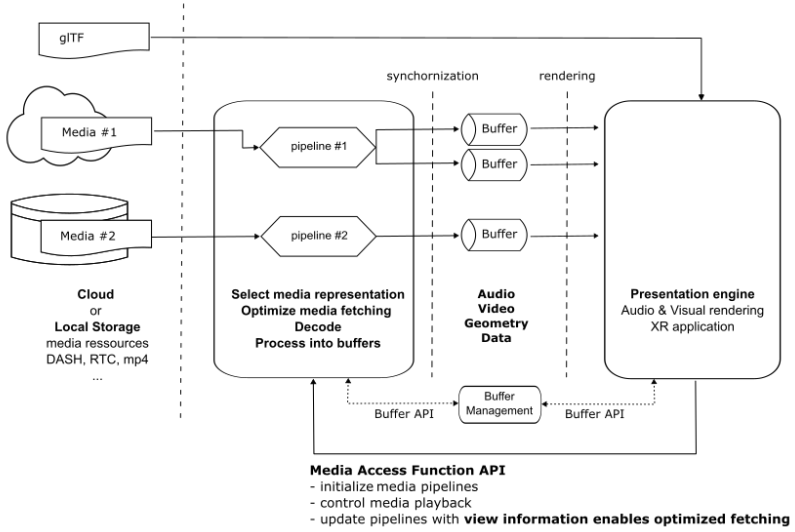
- **Blender** is an open-source and widely used **3D authoring tool with native support for glTF**
- Extended Blender for authoring **Metaverse 3D scenes**
- **Open-source** project to close the loop on content creation/consumption
- Enables developers to create content and ship players that can consume it

Slides: https://www.khronos.org/developers/linkto/gltf-2.0-extensions-in-mpeg-and-3gpp-real-time-exchange-formats-for-3d-experiences
Video: https://www.khronos.org/developers/linkto/gltf-2.0-extensions-in-mpeg-and-3gpp-real-time-exchange-formats-for-3d-experiences-vid
White paper: https://mpeg.org/wp-content/uploads/mpeg_meetings/140_Mainz/w22138.zip

XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

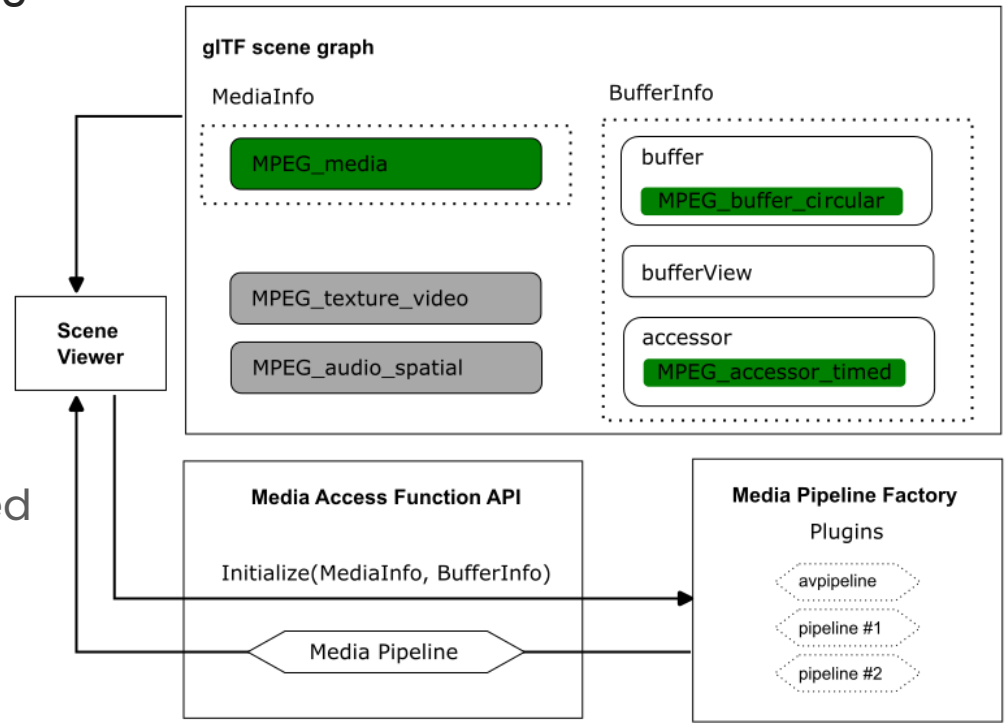
- **ISO/IEC 12113**, Runtime 3D asset delivery format
  - Interoperable & extensible format for the transmission & loading of 3D content
  - Referred to as the 'JPEG of 3D'
- **ISO/IEC 23090-14** , MPEG-I Scene Description
  - Extensions to glTF, supporting:
    - Timed media: video, audio, geometry,… XR use cases: interactivity, anchoring, haptics,…
  - Processing model for presentation engines & Media Access Function API



XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

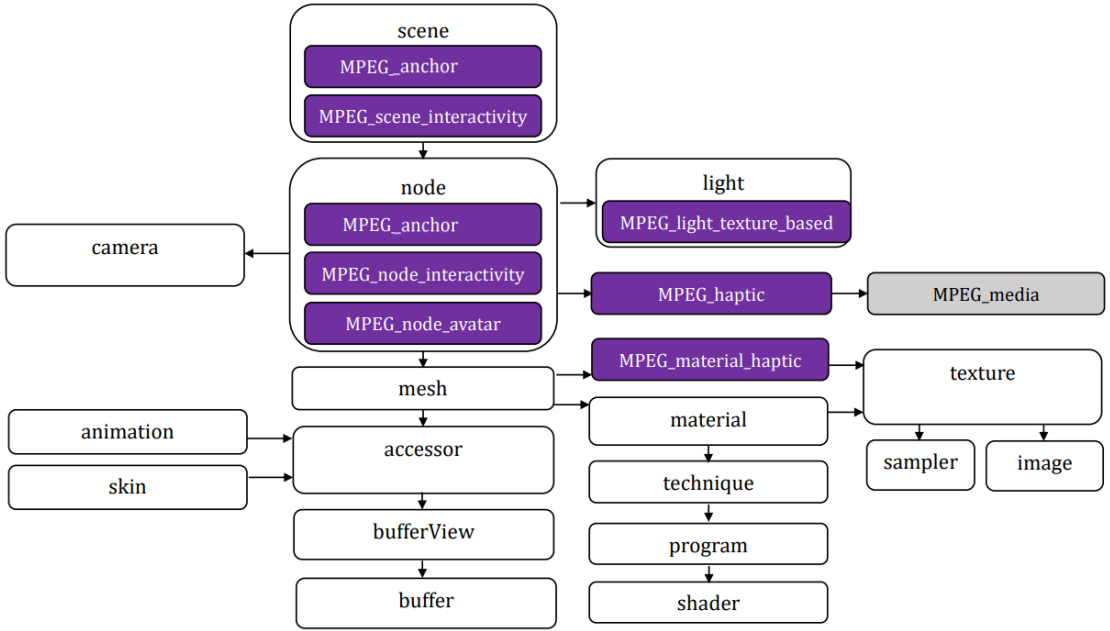
- **ISO/IEC 23090-14**, Scene Description framework
- MPEG glTF Extensions to glTF2.0
  - **MPEG_media**
  - **MPEG_buffer_circular**
  - **MPEG_accessor_timed**
  - **MPEG_texture_video**
  - **MPEG_audio_spatial**
    - Object audio
    - Ambisonic audio
    - Reverb
  - MPEG_mesh_linking
  - MPEG_viewport_recommended
  - MPEG_animation_timing



XR Media with MPEG-I Scene Description

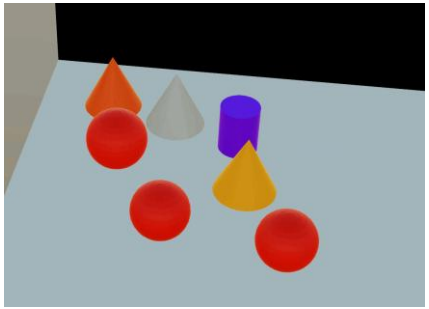
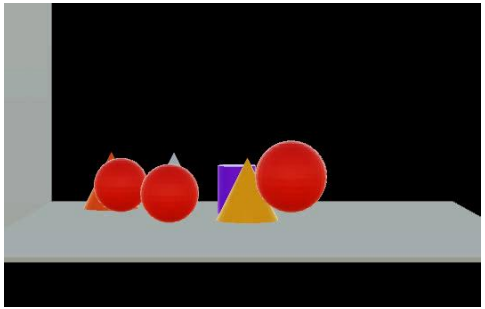
Reference Tools, what is being implemented?

- **ISO/IEC 23090-14**, Scene Description framework
- MPEG glTF Extensions to glTF2.0
  - **MPEG_scene_interactivity**
  - **MPEG_node_interactivity**
  - **MPEG_anchor**
  - MPEG_node_avatar
  - MPEG_haptic
  - MPEG_material_haptic



Initial basic Content Generation Platform for 3D Scenes and Assets

- **Example scenes** that conform to **ISO/IEC 23090-14** and can be played by the Unity Player.
  - Living Room – audio/video texture mixed in different ways

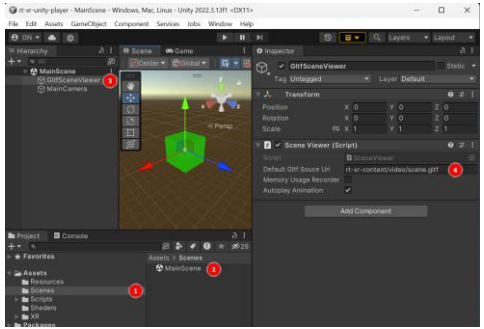
- **Blender extension** to **generate** the content from above
  - Initial support for exporting Blender audio source in glTF files
  - Initial support for exporting Blender video textures in glTF files
  - Limitations: Media files should be in MP4 format; MP4 files should contain a single audio or video track

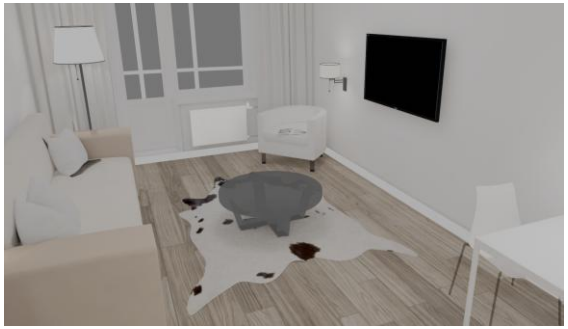
XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

Blender exporter - v1.1.0

- **Prepare scenes and export glTF** documents that conform to **ISO/IEC 23090-14**
- Content can be used with the reference tools **XR Player**
- **Features :**
  - Export audio source to glTF : **MPEG_media** and **MPEG_audio_spatial**
  - Export video textures to glTF : **MPEG_media** and **MPEG_texture_video**
  - Configure and export XR anchoring with **MPEG_anchor**





Initial basic Unity Player with MAF Accesses for 3D and XR Scenes

- **MPEG-I scene description** architecture with separation of **MAF (Media Access Functions)** and **Presentation Engine** as described in **ISO/IEC 23090-14**.
  - The implementation covers the MAF and Buffer APIs as defined by the standard.
- Support for parsing and rendering of the following **glTF extensions** (as defined in ISO/IEC 23090-14):
  - **MPEG_media**
  - **MPEG_accessor_timed**
  - **MPEG_buffer_circular**
- Implementation of **video textures** and **spatial audio** extension parsing.
  - Decoding is performed through the Libav library, and rendering is performed through Unity graphics and spatial audio rendering.
- **Interactivity behaviours** defined at scene and node level
- Implemented **support for VR rendering** through the Unity OpenXR plugin.
  - Desktop HMD support through OpenXR (eg. Meta Quest Link)

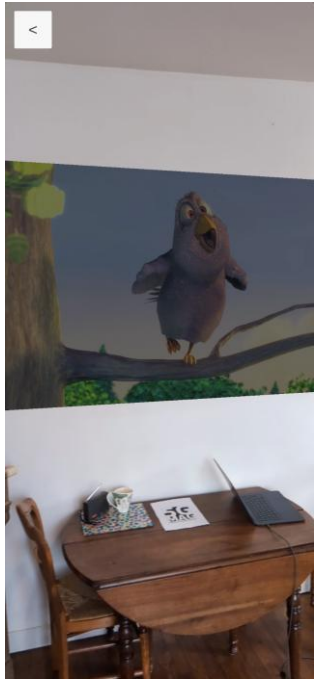
Unity glTF OpenXR MPEG

XR Player 1.0.0 (MPEG_anchor)

- Initial support for augmented reality, overlaying a scene or a node on top of a real world view, anchoring their position to objects detected :
  - support for anchoring to **2D markers**
  - support for anchoring to the **floor**
  - support for anchoring to **horizontal/vertical planes**
  - support for anchoring to the **viewer** and **controllers**
  - support for anchoring to **geospatial coordinates**
- See the rt-xr-player complete feature list and Android build & usage
- Additional test content: https://github.com/5G-MAG/rt-xr-content

XR Player 1.1.0 (MPEG_anchor and MPEG_interactivity)

- **MPEG_anchor**
  - Extension for anchoring of 3D nodes to real world features, enabling **augmented reality use cases**
    - Floor, vertical & horizontal planes
    - 2D & 3D markers
    - Open XR input controller's pose
    - Viewer's pose
    - Geospatial coordinates
    - Application specific anchors



- **MPEG_interactivity**
  - Interactivity behaviors defined as trigger / action lists
    - **Triggers:** ***OpenXR inputs, collision, proximity, visibility*** (can be combined logically, can be debounced or continuously triggered
    - **Actions:** ***activate, transform, block, animation control, media control, manipulate, haptic, set avatar*** (actions can be combined)

XR Media with MPEG-I Scene Description

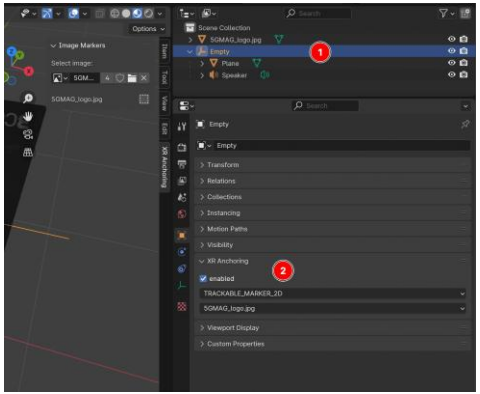
Reference Tools, what is being implemented?

XR Player 1.1.1 (Improvements to MPEG_anchor)

- Fix orientation of anchored node related to TRACKABLE_MARKER_2D
- Improve default orientation behavior of TRACKABLE_GEOMETRIC
- HORIZONTAL_PLANE : Anchored node is rotated around the up vector to look at the viewer when instantiated
- VERTICAL_PLANE : Anchored node is so that it's forward vector is aligned with the vertical plane's up vector
- Improve default orientation behavior of TRACKABLE_FLOOR
- Anchored node now relates

Blender Exporter 1.1.1

- Support for **MPEG_anchor**



XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

XR Player 1.2.0 (Under development)

- Current support for Mobile XR - Android API level >= 24
- Add Android based HMD support
  - Meta Quest 3 & OpenXR
    - On device (Android)
    - Tethered (Meta Quest link / Windows)
  - Objects manupulation
  - Interactivity actions to control media playback

XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

Under investigation

Downlink scenarios

- Integration in 5GMS architecture
  - Serving glTF content to rt-xr-unity-player applications

Downlink/Uplink (Real time communication, interactive scenarios)

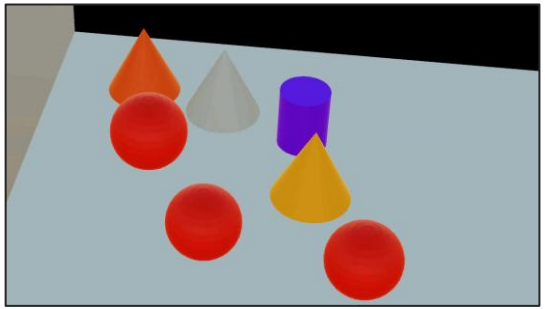
- Avatar based real time communication - TR 26.813
  - **MPEG_node_avatar** glTF extension
- Split-rendering scenarios - TS 26.249 (Immersive Audio), TS 26.565 (Split rendering enabler)
- Contribution & use case driven development
  - Spatial audio codecs

XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

Check our Tutorials and join the Developer Community

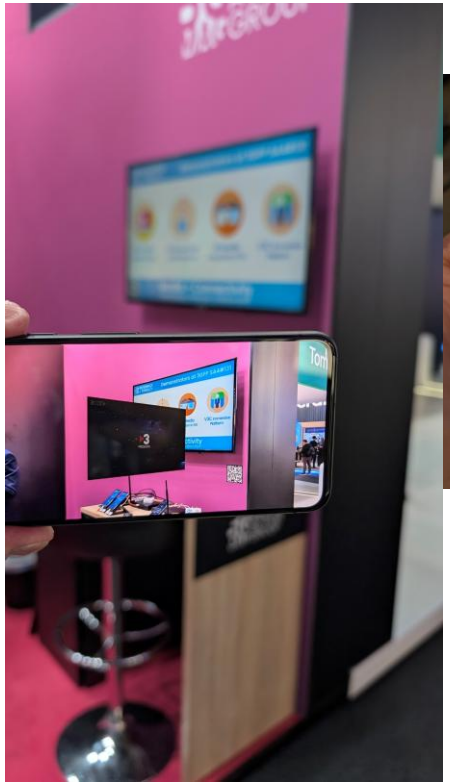
How to use the tools? Check the GitHub Tutorials

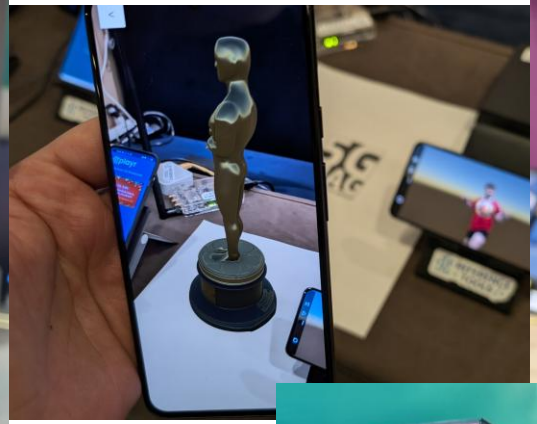


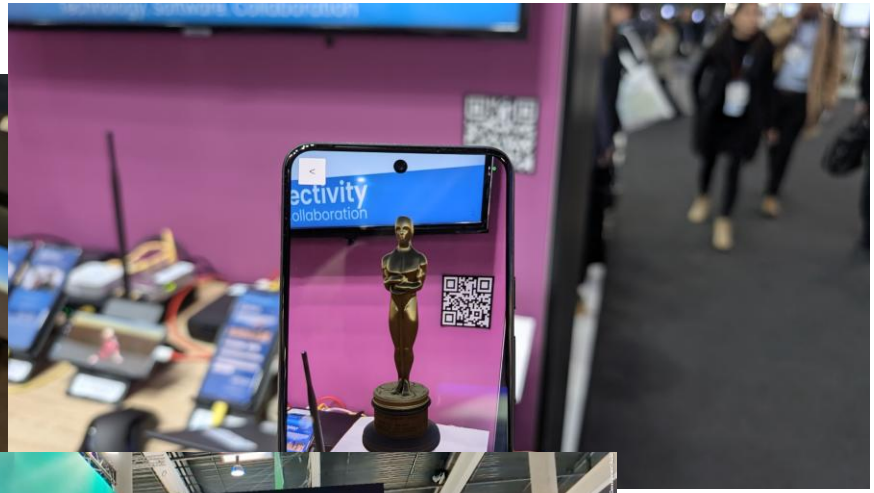
XR Media with MPEG-I Scene Description

Reference Tools, what is being implemented?

5G-MAG Reference Tools in action







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