Demo: 6G-Powered Immersive Technologies for Metaverse-Like Virtual Broadcasting

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***Abstract*—This demonstration presents how 6G-enabled immersive communication can transform the broadcasting industry through real-time holographic telepresence. Traditional 2D videoconferencing is increasingly being complemented by Social VR and Metaverse platforms, which enhance interaction and co-presence in shared virtual environments. Leveraging these trends, the presented system integrates volumetric capture, extended reality (XR), and low-latency 6G connectivity to enable remote participants to appear as realistic 3D holograms within a virtual broadcast studio. The demonstration uses Brainstorm's InfinitySet, a state-of-the-art XR and virtual production platform, to seamlessly merge holographic guests with real-time broadcast graphics and green-screen footage of the host. By combining high-throughput communication, edge processing, and synchronised rendering, the system achieves lifelike, interactive telepresence between remote and in-studio participants. This proof of concept showcases the potential of 6G networks and immersive media technologies to enable the next generation of broadcasting, which is more interactive, flexible, and engaging for both producers and audiences.**

***Index Terms*—6G, holographic communication, extended reality (XR), telepresence, Metaverse**

I. Introduction

Traditional 2D audio and video conferencing tools are increasingly being complemented by Social XR and Metaverse platforms, which allow multiuser meetings in shared environments [1]. Studies have shown that such immersive systems can significantly enhance collaboration, learning outcomes, and engagement [2], [3]. Similarly, research highlights the limitations of 2D videoconferencing, such as fatigue, reduced interaction quality, and lack of presence, and the ability of Metaverse-like experiences to overcome them by providing higher immersion, co-presence, and realism [1], [4]. These benefits are particularly pronounced when volumetric or holographic representations of users are employed instead of synthetic avatars.

However, metaverse services supported by holographic communications are inherently demanding in terms of bandwidth, latency, reliability, and processing resources, particularly when deployed at scale in distributed environments. Within this context, the progressive development and adoption of 6G technologies will contribute to fulfilling the demands required to deliver seamless, highly interactive, and high-quality immersive experiences [5].

This paper demonstrates how 6G-enabled immersive technologies can result in enhanced quality of interaction, co-presence and engagement in Metaverse experiences, revolving around virtual TV scenarios for broadcast. The proposed system and use case integrate cutting-edge immersive technologies, such as multi-user holographic communications (with remote users represented as 3D holograms captured in real-time) [6], virtual production tools for broadcast [7], and remote rendering capabilities to deliver the resulting experience to a mass audience via lightweight devices [8]. In addition, it demonstrates how 6G cell-free links become a promising alternative to meet the high-bandwidth, low-latency and reliability demands for holographic content delivery, both for connecting individual holographic clients and for one-to-many delivery via an audience distribution engine.

II. Concept of the Demonstration

During this demonstration, visitors will have the opportunity to experience the holoconferencing scenario in two complementary ways. First, they can join as fully interactive participants, being teleported into the shared virtual environment to interact in real time with a holographic remote guest and the studio presenter. Second, visitors can participate as immersive spectators, observing the ongoing session through a real-time 360-degree video stream delivered to lightweight display devices, offering an engaging view of the holographic interaction from within the virtual studio.

A. Equipment and software

The demonstration integrates three core immersive technologies (see Figure 1), interconnected through a 6G-enabled network infrastructure:

1) Multiuser holographic communication platform [6]: This requires an Edge communication server with diverse components (no GPU required) and several holographic client stations, each equipped with a VR-ready laptop,

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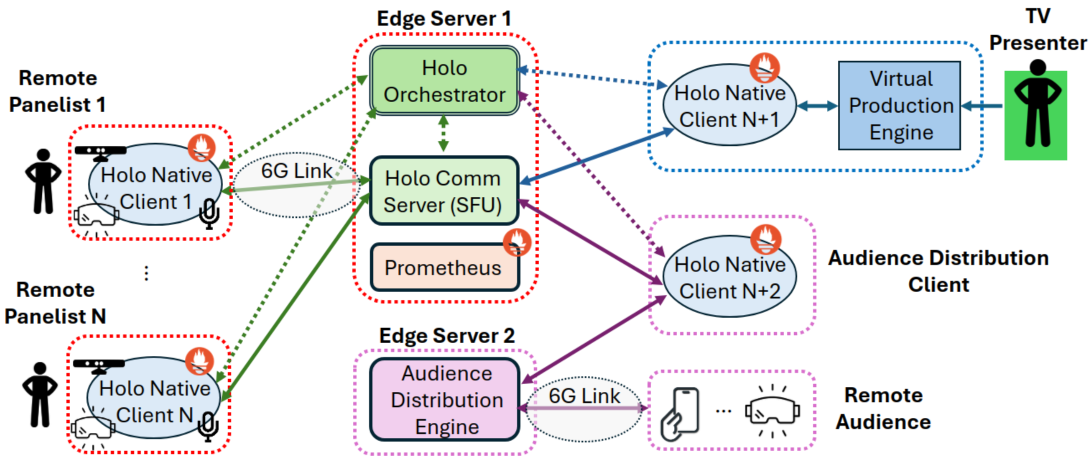

Fig. 1. High-level deployment diagram of the Metaverse demonstration

one VR headset (e.g., *Meta Quest 3*), and an RGB-D camera (e.g., *Orbbec Femto Bolt*).

2) Professional virtual production engine (InfinitySet): InfinitySet is interfaced with a reference holographic client station running on a GPU-equipped desktop (RTX 4080 onwards). The client station will also receive the audio-visual streams from both a TV presenter via a tracking-enabled camera and from a Chroma Key room.
3) Mass audience distribution components: A secondary holographic client station, running on a GPU-equipped desktop PC (RTX 4080 onwards), produces a high-quality 360º render of the session. This stream is sent to an Edge transcoding and distribution server with GPU (also RTX 4080 onwards), and is later consumed by the audience via lightweight devices, such as untethered VR headsets and smartphones.

The 6G communication link plays a central role in the demonstration. It is used to connect one full-fledged holographic client to the metaverse experience and to stream real-time content from the audience distribution engine to lightweight devices.

This entire setup will be deployed on the KU Leuven testbed for 6G research [9], established within the EU 6G-BRICKS project [10], which provides the required 6G connectivity, edge computing, and media processing infrastructure.

III. Conclusion

This demonstration showcases how 6G technologies can enable next-generation immersive communication experiences (Metaverse), where multiple cutting-edge immersive technologies coexist, presenting stringent bandwidth, latency, processing, and reliability requirements.

The demonstration will be deployed on the KU Leuven 6G research testbed, within the framework of the EU SNS 6G-BRICKS project, validating 6G's role as a critical enabler of future holographic and XR applications.

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