

HOLOMIT

A key technology for photorealistic holoportation

HOLOMIT is a novel solution to provide a complete holoportation service where users, remotely connected, are represented as volumetric video, processed and transmitted in real time. The architecture has been designed to allow easy adaptation to different use cases and bandwidth availability.

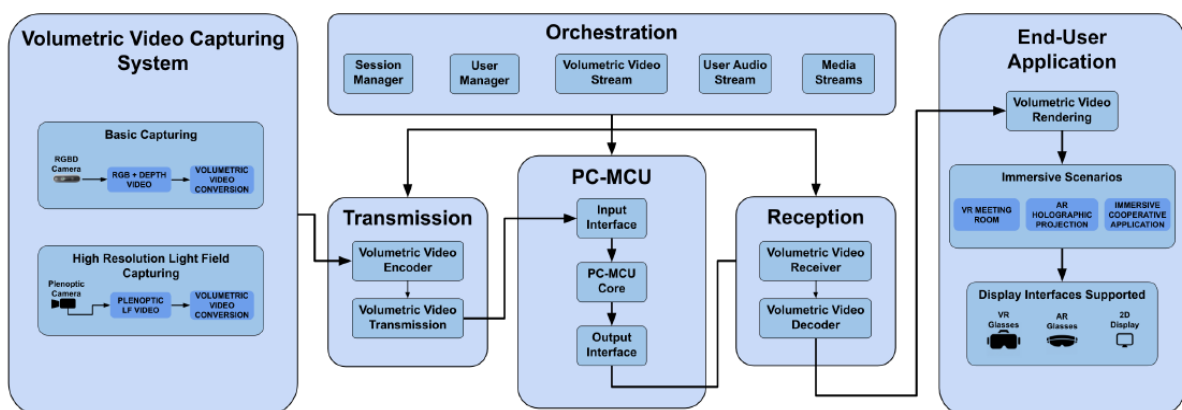
Framework architecture

The HOLOMIT framework is composed by the following functional elements:

- **Holoconferencing client:** The rendering of users' volumetric video in custom VR/AR environments is based on Unity. It also integrates a decoding method compatible with MPEG Anchor codec.
- **Orchestrator:** Handle sessions and user's creation and guarantees synchronization of events.
- **PC-MCU:** Virtually instantiated in the cloud, it receives multiple MPEG DASH streams with Point Cloud human representations and performs key novel features.
- **Volumetric capturing system:** Supports RGB-D cameras, which create a depth map in 8 bits grayscale. Then, data is converted to Point Cloud.
- **Volumetric Compression system:** Based on two compression systems, one for the geometry component and one for the colors.

Main features

1. Capture process is done by the combination of one or more volumetric cameras that provide RGB+Depth images. After a calibration procedure, it combines the different images with world coordinates allowing the fusing of the pointclouds.
2. Point cloud streams are compressed. Tiling enables viewers to save bandwidth downloading only the relevant parts of a pointcloud, omitting invisible tiles (POV aware). Then each tile is downsampled into 3 different resolutions.
3. A cloud application able to receive multiple Point Cloud streams and, considering the needs of a multi-user 3D holoconferencing system creates specific streams, optimized for every user depending on their position and viewpoint, reducing resources usage (RAM, CPU, GPU, and bandwidth).
4. The per-tile compressed data is fed to the decompressor for converting them back to pointclouds.
5. The synchronization module is responsible for synchronizing the tile streams and the audio.
6. The renderer receives the self-view pointcloud from the capturer and a number of tiles per other participant and renders these in 3D space based on viewpoint and position of the participants.





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Problem solved

VR/AR industry has started focusing on the development of novel systems to represent, compress and transmit 3D, or volumetric video, giving a strong importance to natural content (point-cloud format) but the needs of such paradigms in terms of data handling and scalability as well as the limited resources at the client side, have delayed its wide adoption.

HOLOMIT contains a virtualized cloud-based component, which aims at reducing the end-user client computational resources and bandwidth usage, providing fusion of volumetric videos, Level of Detail (LoD) adjustment and non-visible data removal. The results obtained show how it provides significant benefits in terms of computational resources and bandwidth savings, thus alleviating the requirements at the client side in holoconferencing services.



About i2CAT

i2CAT is a nonprofit research and technology center that promotes R&D activities in advanced digital technologies. The center has pioneered a new model of innovation based on collaboration between companies, public administrations, academia and users. Our activities are focused on three objectives:

- **Research:** playing a key role in EU Framework Programme for Research and Innovation, participating in 23 H2020 projects.
- **Strategic projects:** leading local initiatives and projects to deploy digital strategies and policies of the public administrations.
- **Technology:** Fostering R&D collaboration with companies to develop innovative market-oriented solutions.

Key Benefits

- Level of Detail adjustment to provide an appropriate resolution depending on the positions of each representation in the 3D virtual scenario.
- Removal of non visible parts of the volumetric video, so never transmitted.
- Fusion of volumetric videos providing a single stream to the client devices.
- Optimized stream reducing the requirements in terms of bandwidth and computational resources.

Applications & uses cases

The COVID lockdown has significantly raised the demand for virtual meets, conferences, etc... and is spurring the demand for immersive solutions. HOLOMIT provides you with the possibility of unleashing new applications with the use of immersive scenarios. From business meetings to social games and live events with a photo-realistic look-alike representation. This technology will be key for communication applications in the VR/AR market.

