

# See What We See - Sharing Mixed Reality Experiences with WebRTC

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# Introduction

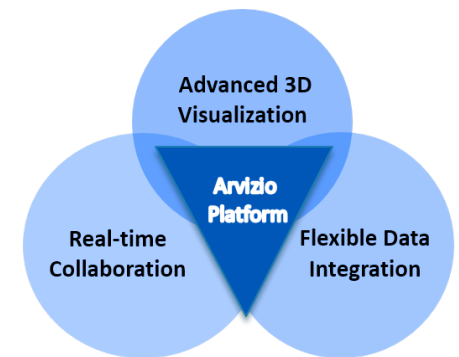
Mixed Reality is a game changing technology for enterprises including AEC, education, energy, engineering & healthcare

Key requirements for enterprise adoption:

- Mixed reality platforms must scale to handle complex 3D models
- Experiences should be shared both locally and remotely
- Integration with existing IT systems essential for seamless workflow

Arvizio's MR Studio platform goal:

- Dynamic serving of large 3D models with rich LOD (level of detail)
- Sharing of experiences and collaboration across locations
- Flexible data integration with existing IT systems and IoT data



# The MR Studio Platform

## *MR Studio Immerse*

Large 3D model visualization with LOD  
 Sharing & collaboration across locations  
 Support for multiple AR/MR device types



IoT Data & IT Systems



WebRTC



4G / 5G  
 or WiFi



## *MR Studio Director*

ASPEN scalable 3D model LOD processing  
 Real-time session & sharing services  
 On Prem, edge or cloud deployment

## *MR Studio Remote*

View mixed reality scenes remotely  
 2 Way video, audio & annotation

# MR Studio Director

## Advanced 3D Visualization

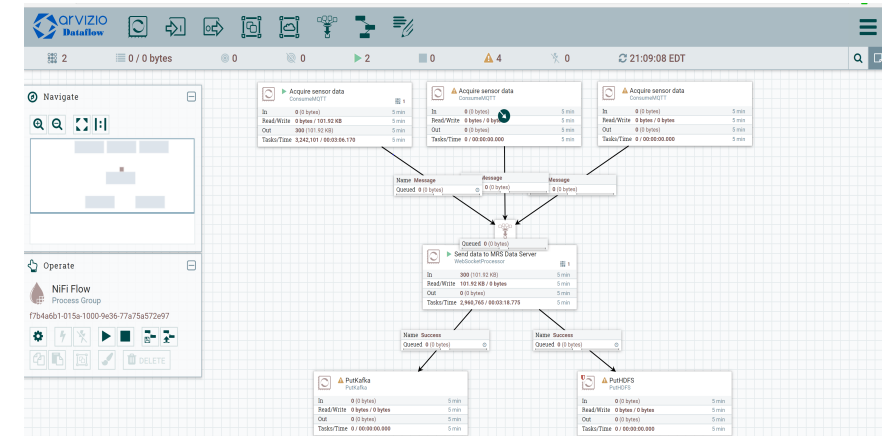
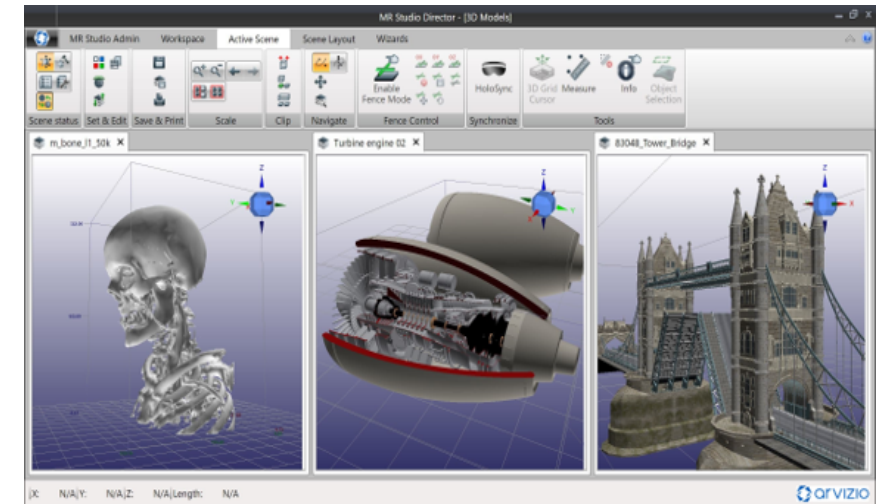
- Optimizes large 3D models with LOD (Level of Detail)
- Mesh, CAD, Point cloud, BIM, GIS & DICOM
- Workflow wizards for many spatial data formats

## Real-time Sharing Services

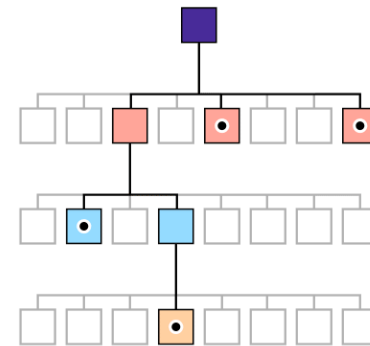
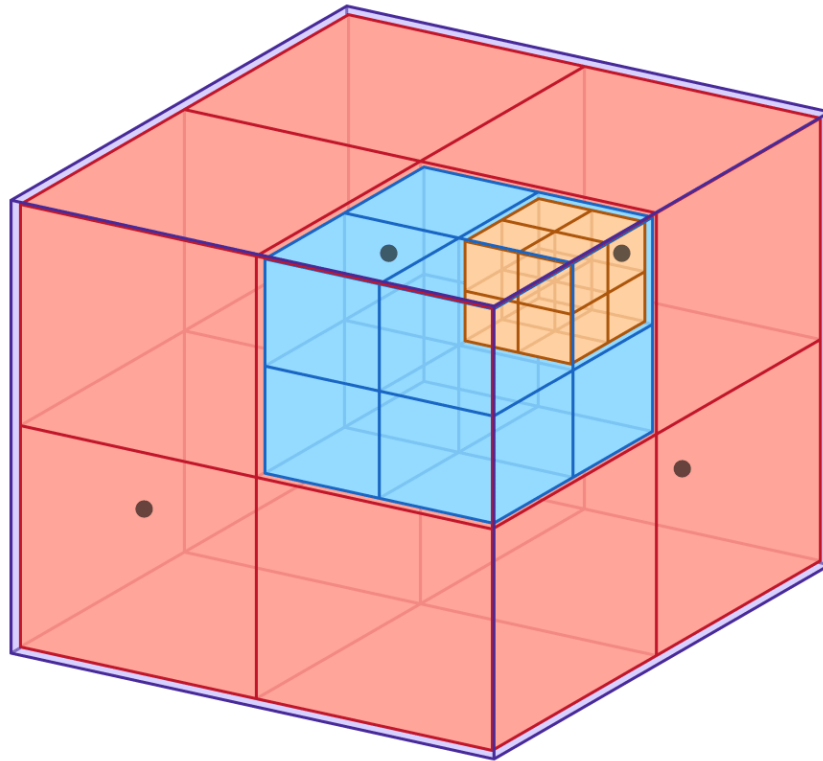
- Shared viewing for multiple HoloLens users
- HoloLens users or MRS Director may lead sessions
- WebRTC gateway for secure remote participation

## Data Integration

- Connects MR Studio with external IT systems
- Modular Apache NiFi dataflow based architecture
- Modules to connect with IoT sensors, big data etc.



# LOD Data Pyramid



Full 3D model

2<sup>nd</sup> Level of Detail

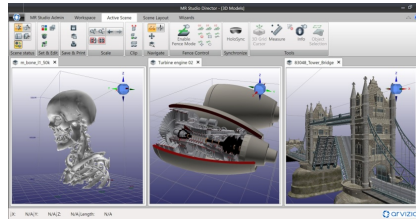
3<sup>rd</sup> Level of Detail

4<sup>th</sup> Level of Detail

# Immerse App Framework



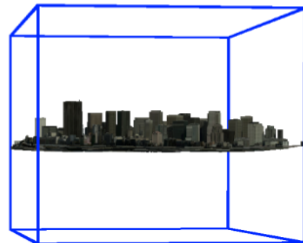
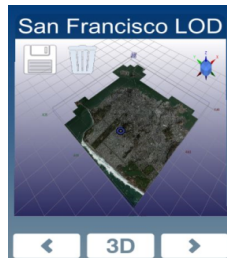
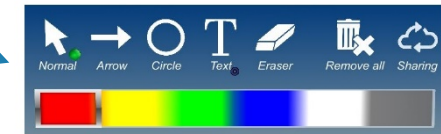
MR Studio Immerse



MR Studio Director



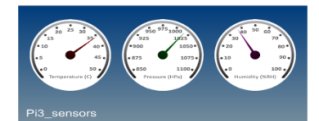
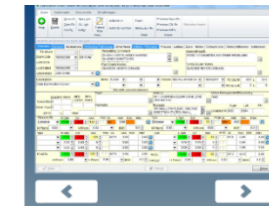
Annotation



3D Model Viewing with LOD  
Life Size Model Walk Through  
Sharing for Multiple HoloLens



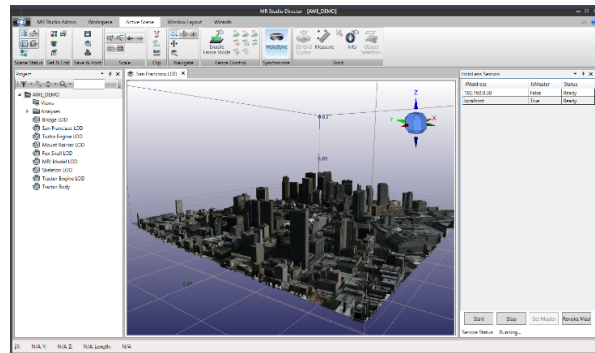
Remote Video Chat  
Mixed Reality RTC Feed



Data integration with IT systems  
Big Data Systems, IoT Streams

# Local & Remote Collaboration

HoloSync allows **MRS Director** to interactively publish 3D scenes and models



WebRTC

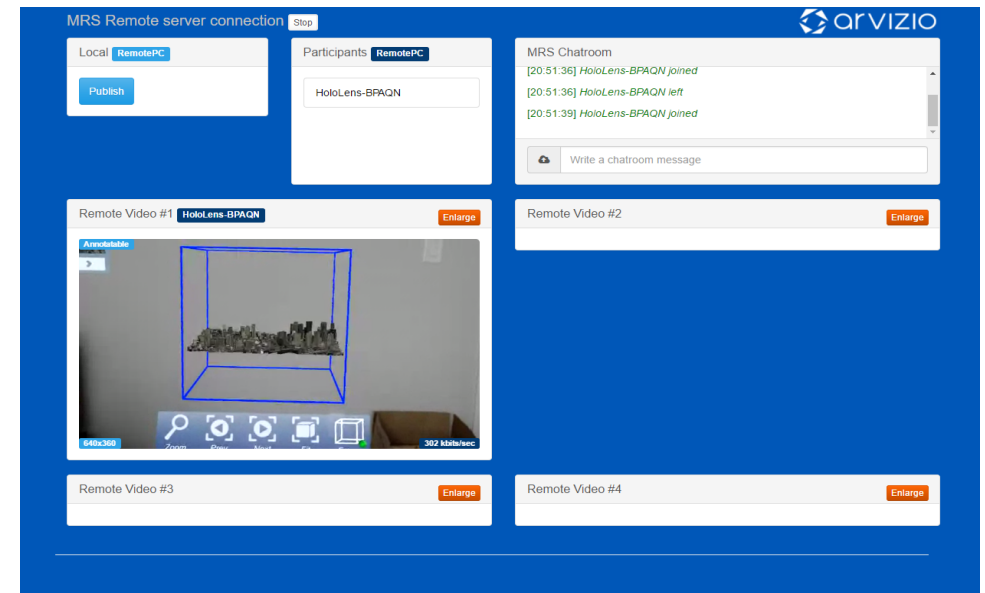


LOD Data Served on Demand

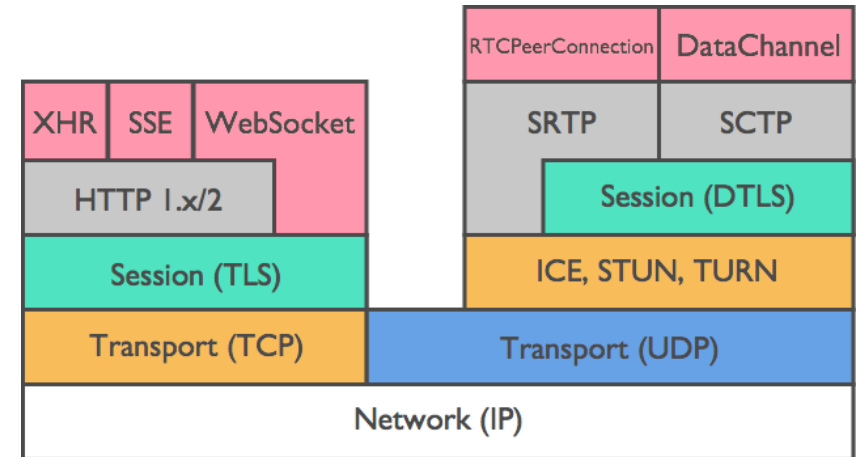
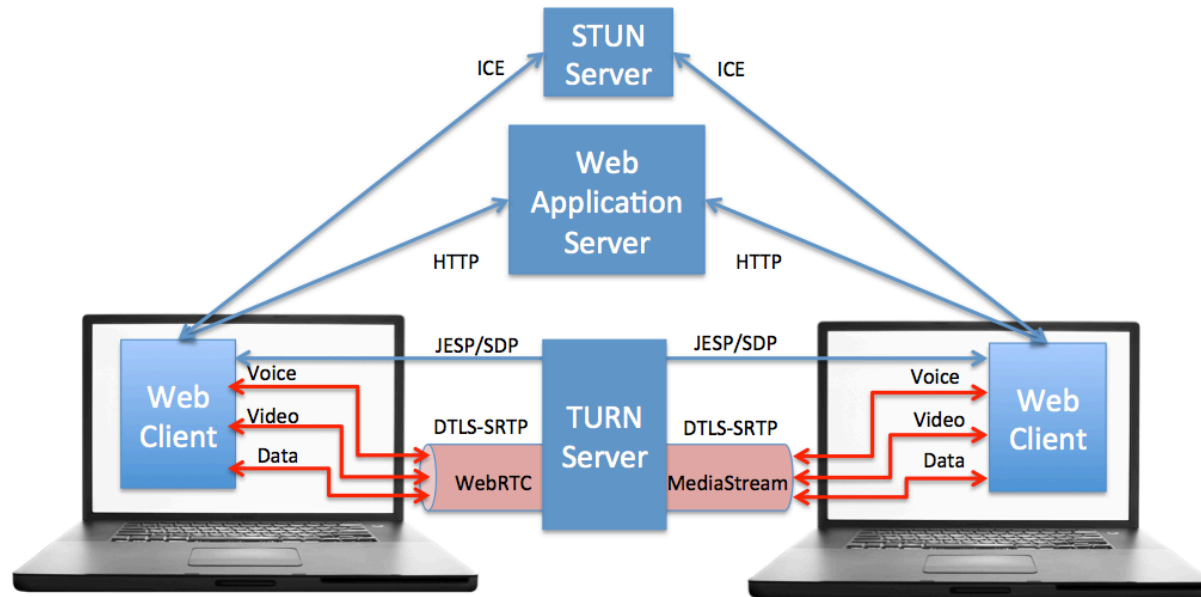
WebRTC Audio, Video & Spatial Data Exchange

## MR Studio Remote

Active viewing and annotation of the HoloLens feed  
Create textual or graphical holograms in the scene



# WebRTC Recap



VP8/9 & H.264 Video Compression - Apple offers only H.264 in IOS 11

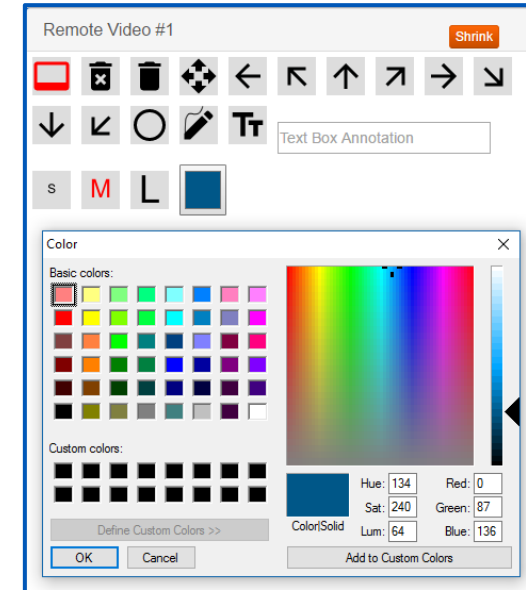
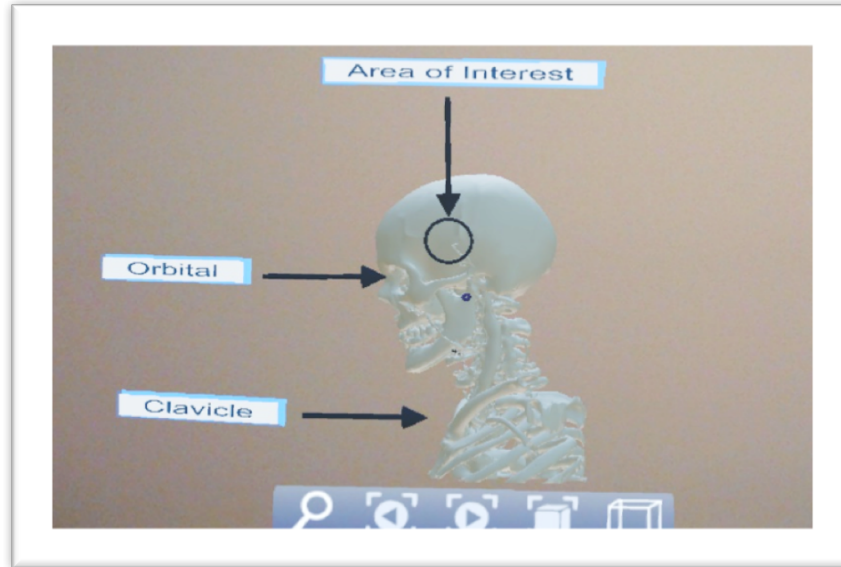
STUN & TURN Allow NAT Router Traversal

ICE – Interactive Connectivity Establishment manages the connectivity process

# Remote viewing & annotation over WebRTC



MR Device View



Remote Annotation Toolbar

- Remote users may place holographic annotations into the field of view
- Supported on many browsers across multiple platforms
- Bandwidth efficient - operates over bandwidth constrained wide area networks
- HoloLens feed is limited to 720p, also head movement can be a challenge

# Capturing the Shared Experience

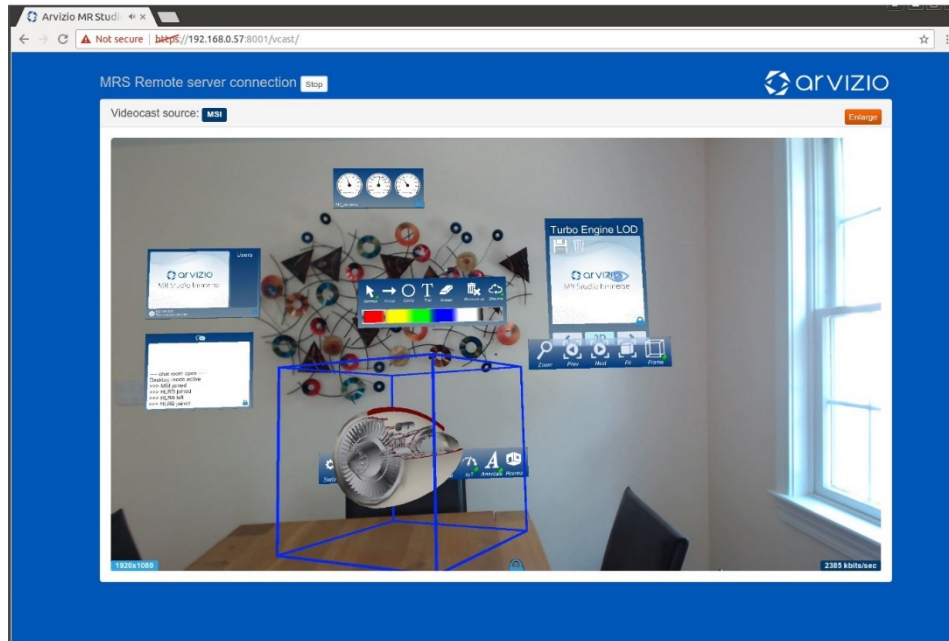
## HoloLens Spectator View



- Local viewing of mixed reality scenes in HD but no remote streaming
- Calibration checkerboard required, complex software install
- Requires dedicated HoloLens & digital SLR, milled aluminum bracket
- Powerful concept, could this be improved upon?

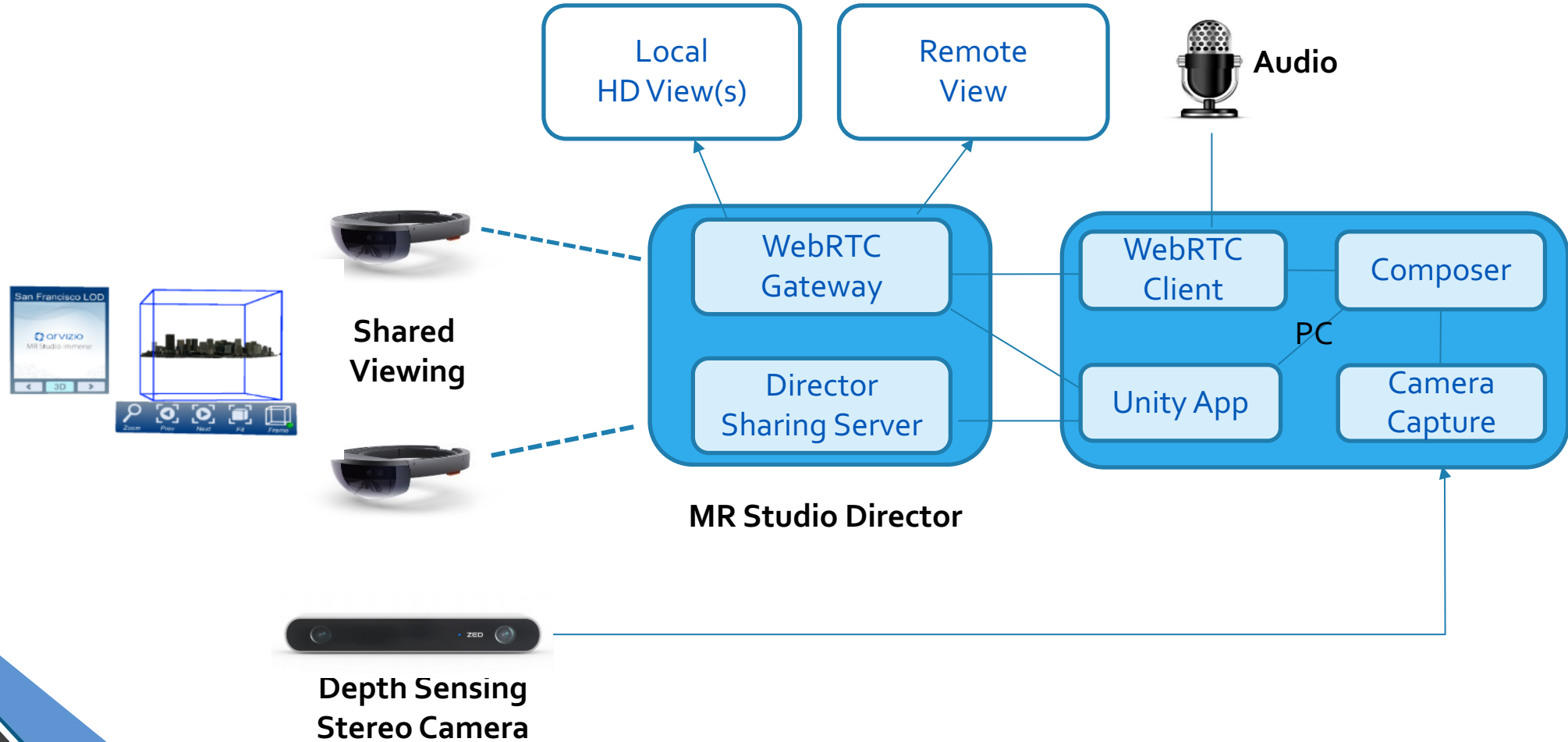
# MR Studio ViewPoint

## Streaming of Mixed Reality in HD



- Local viewing/recording & remote WebRTC streaming of mixed reality scenes
- Headset required during initial set up only
- Use depth camera or webcams (static placement) in place of DSLR
- Potential to work across multiple types of device

# MR Studio ViewPoint Architecture



# MR Studio Use Cases

## AEC (Architecture, Engineering & Construction)

- Visualization during the design, engineering and construction process
- Bringing projects to life during the sales process
- Accelerate project approval process

## Industrial Design & Engineering

- 3D visualization of complex machinery
- Assisted maintenance tasks with remote video expert assistance

## Training & Education

- Training & education across industries
- Classroom, lectures, on site training and remote participants

## Healthcare

- MR hospital room concept, MR assistance for telemedicine
- Pre surgery visualization, prepare for complex surgeries

# Demonstration