



CREATING
THE LIVING NETWORK.
TOGETHER.

Volumetric Immersive Experience

InterDigital

Volumetric Immersive Experience

- **Targets & Objectives**

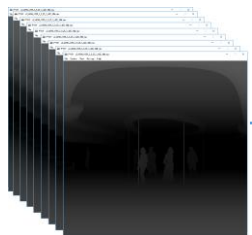
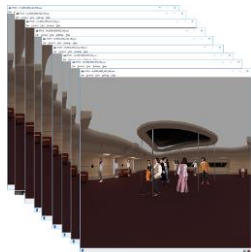
- Expanding user viewing experience to 360° degree video & head motion parallax
- Bandwidth efficient adaptive streaming of 360° video over HTTP

- **Technology**

- Real-time HEVC decoding & view synthesis
- Real-time head tracking to detect viewing position and orientation
- Adaptive multi-view streaming based on head motion tracking or joystick

Volumetric Immersive Experience

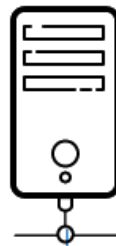
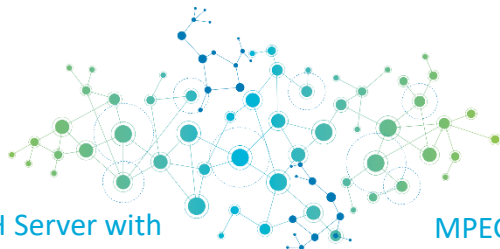
Texture HEVC streams
2048x2048@30fps



Depth HEVC streams
2048x2048@30fps



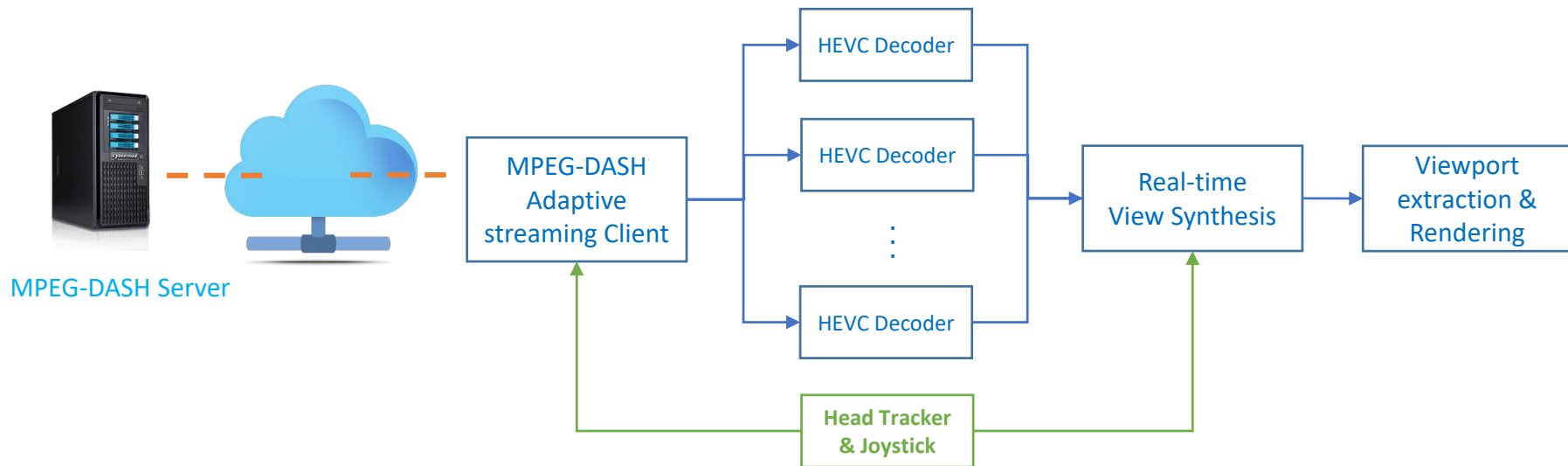
MPEG-DASH Server with
360°/3DOF+ Video streams



MPEG-DASH Client with Head Tracker / Joystick,
Video Decoding, View Synthesis & Rendering



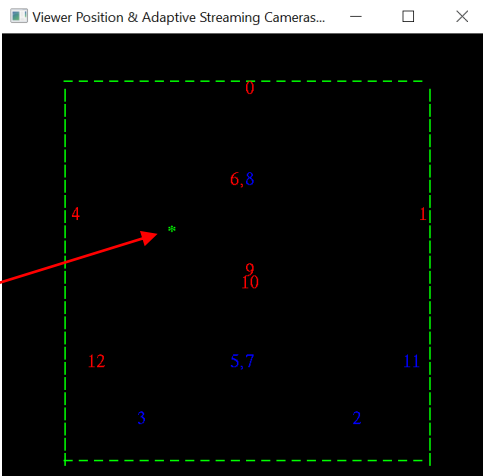
Volumetric Immersive Experience



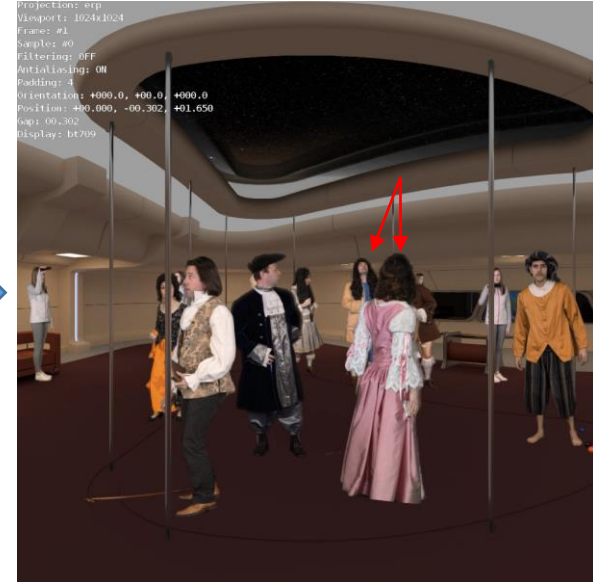
Volumetric Immersive Experience

```
Viewport: 2048x2048  
Views: 1 4 9 10 6 12 0  
Orientation (degree): -017.5, -03.3, +011.1  
Position (meter): +00.075, +00.128, +01.577  
FPS: 30.0624
```

Adaptive Streaming



Motion Parallax: disocclusion from view position changes



Position changes (x,y,z) with head tracker or joystick. Above shows ~1 feet movement away from center position

View Synthesis

From a discrete number of camera views toward any virtual view corresponding to user's point of view

- Visibility based processing to compute depth information for new viewpoint
- Specific processing to remove ghosting artefacts and aliasing on depth contours
- Confidence based final color definition



MPEG DASH Server: Video content captured before-hand

13 cameras: v0~v12, color 8-bit, depth 10-bit, 2kx 2k,
HEVC encoded, segmented for streaming per DASH MPD

	Position (x,y,z) in meter	Orientation (Yaw, Pitch, Row) in °
v0	[0.3000, -0.0000, 1.6500]	[0, 0, 0]
v1	[0.0927, -0.2853, 1.6500]	[0, 0, 0]
v2	[-0.2427, -0.1763, 1.6500]	[0, 0, 0]
v3	[-0.2427, 0.1763, 1.6500]	[0, 0, 0]
v4	[0.0927, 0.2853, 1.6500]	[0, 0, 0]
v5	[-0.1500, 0.0000, 1.3902]	[0, 0, 0]
v6	[0.1500, 0.0000, 1.3902]	[0, 0, 0]
v7	[-0.1500, 0.0000, 1.9098]	[0, 0, 0]
v8	[0.1500, 0.0000, 1.9098]	[0, 0, 0]
v9	[0.0000, -0.0000, 1.6500]	[0, 0, 0]
V10	[0.0000, -0.0000, 1.6500]	[180, 0, 0]
V11	[-0.1500, -0.2598, 1.6500]	[225, 0, 0]
v12	[-0.1500, 0.2598, 1.6500]	[135, 0, 0]

