

# Standardization for Metaverse

Cullen Jennings, Nov 2022

A photograph of a person from behind, wearing a dark patterned shirt and shorts, standing in a room with floor-to-ceiling projection screens. The screens display a virtual landscape with green fields, blue water, and distant mountains under a blue sky. The person is wearing a head-mounted display (HMD) and has cables connected to it. The room appears to be a research facility at MIT.

The Metaverse is coming  
... Are you ready?

MIT, 30 years ago

# Angry Graybeard Ape

... tells me NFTs and DoH are bad.

- Creating jobs for power plant workers worldwide.
- Safely storing the life saving of senior citizens.
- Enabling of the dream of making a living helping people decrypt their disks.



\* Image “Crypto Ape #89” acquired for cost of a right click

\*\* Google has proven clicks are more valuable than you might think

# NO - Not that Metaverse

But a different one (and it might be more distributed than the web).

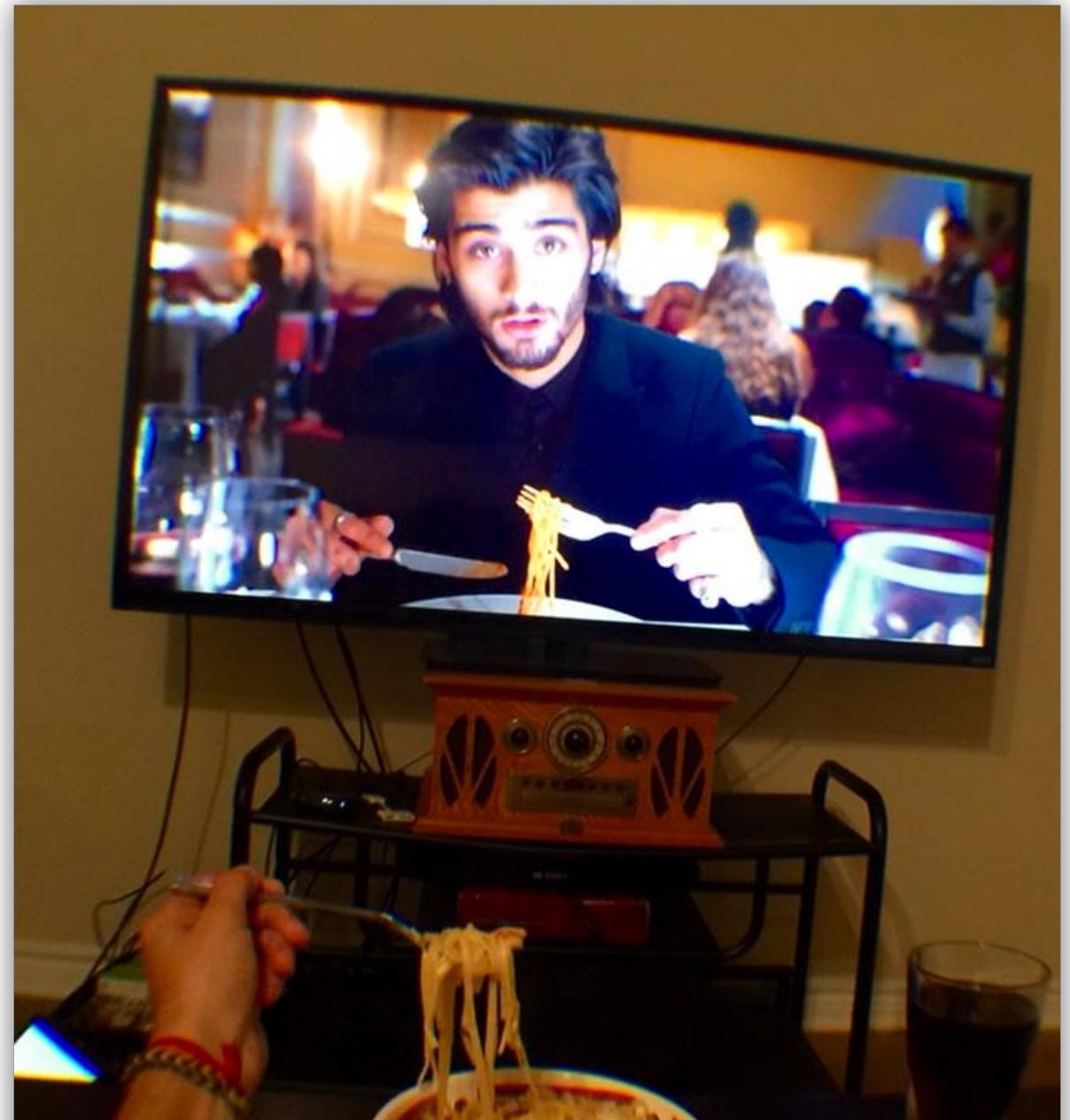
We don't need to work on bitcoin.

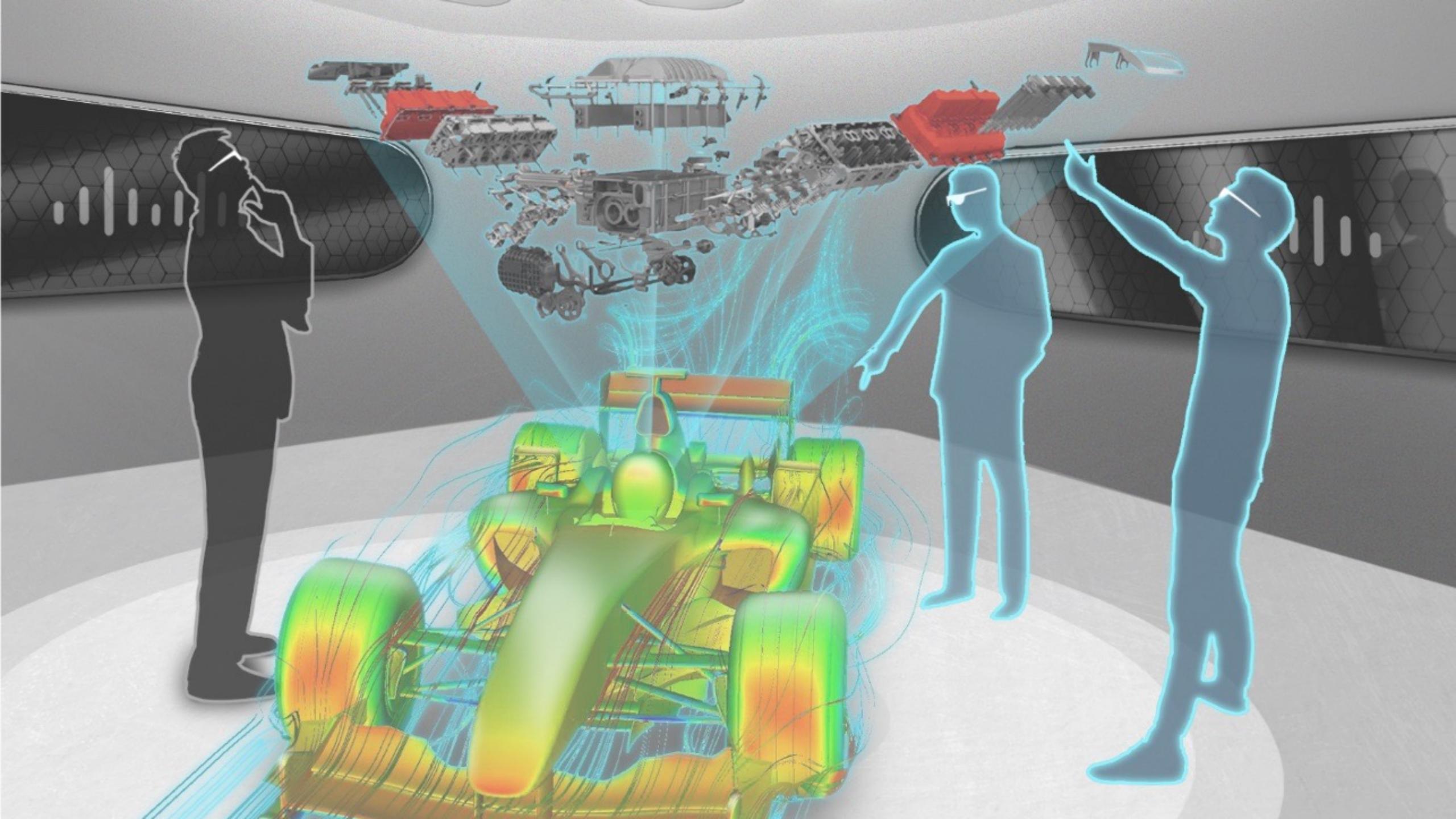
We don't need to work on NFT scams.

We don't need better ways to distribute ransomware.

# Problem to solve

**2D experiences are never the same as being there in person.**





Experience	Discovery	Creator Economy	Spatial Computing	Decentralize	Human Interface	Infrastructure

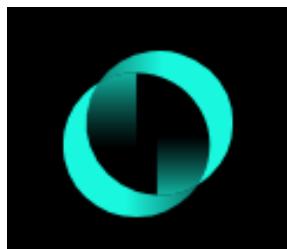
Source: Building the Metaverse—Jon Radoff



All Things Metaverse



Web 3.0 Conference



CRYPTØ EVENTS



TECH CIRCUS

XR Fair Tokyo -VR/AR/MR-

VentureBeat



META /FESTIVAL

NEXT

tmrw/conf

00:22:06



People



Chat



React



Notes

...



Mic



Camera



Share

Leave

# Microsoft Mesh, HoloLens

Kim So Yeon

That's great, I'm in Seoul visiting the new office.

Cailyn Muller

만나서 반갑습니다. 저는 더블린 오피스에 있습니다.

# Meta



# Nvidia - Omniverse



# Roblox

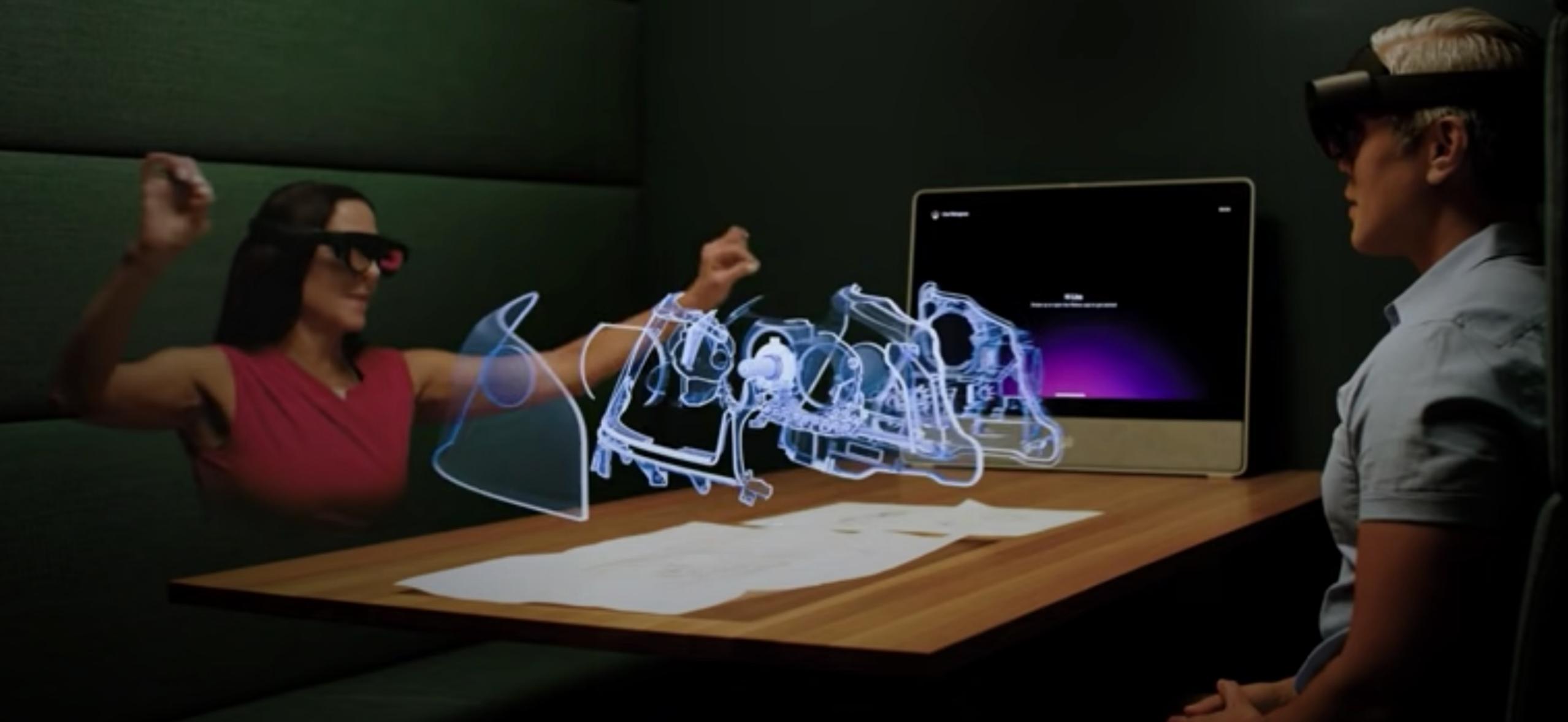




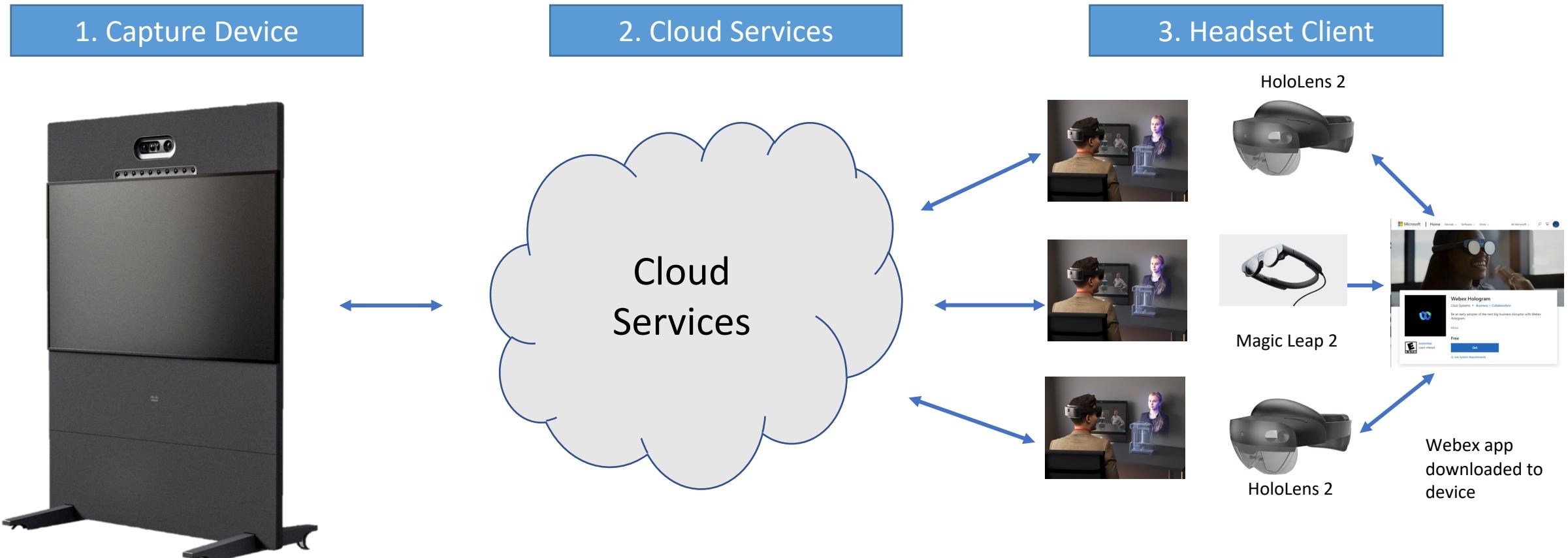
Google (Starline, Glass, Tango)

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# Cisco



# High-Level Overview



# Fluffy's view of what the metaverse is:

- 3D space where users, objects, and applications from multiple vendors or creators can interact.
  - Web2 allowed a 2D version of web where pages could embed a YouTube video, a chat app, or a WebRTC call.
  - Bring in ads or other media from another site.
  - Users represented with chat, voice, video, avatars, and holograms.
- Tasks: Training, Games, Design Review, Co-Design, Collaboration
- Some also view it as a decentralized platform capable of distributed financial transactions and having distributed proof of ownership registries.
- Closely related to VWRAP work at IETF done by developers on 2nd life.



# Space and Comms

- Way to form the 3D space, find the components in a given space, control access to that space, and distribute messages between applications in that space.
  - (Think of this like DNS + HTTP in Web2.)
- Ways to describe a scene and provide links to media and applications.
  - USD (Universal Scene Description) + parameter extensions for example.
  - (Think of this like HTML in Web2.)

# Media Representations

Texture-mapped  
polygons with  
incremental  
downloads

Point clouds

Lightfields

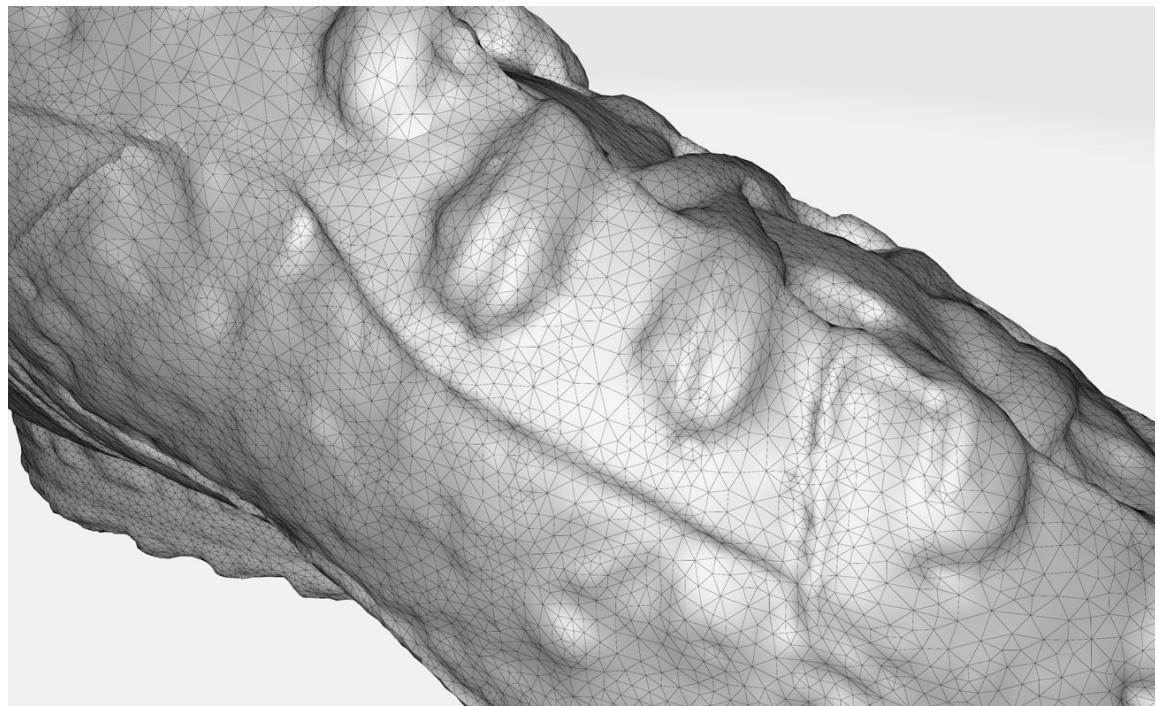
Haptic media

Avatar controls

Inventory and  
objects

# Texture-Mapped Polygons

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# Point Clouds

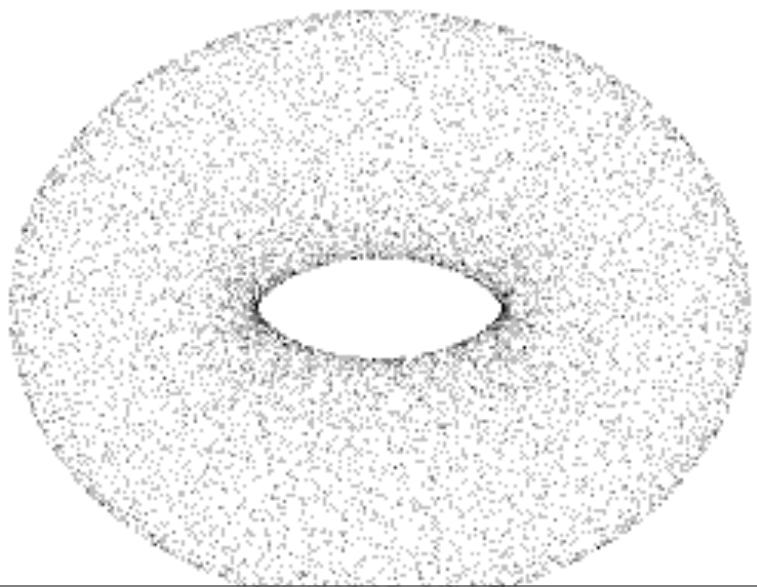
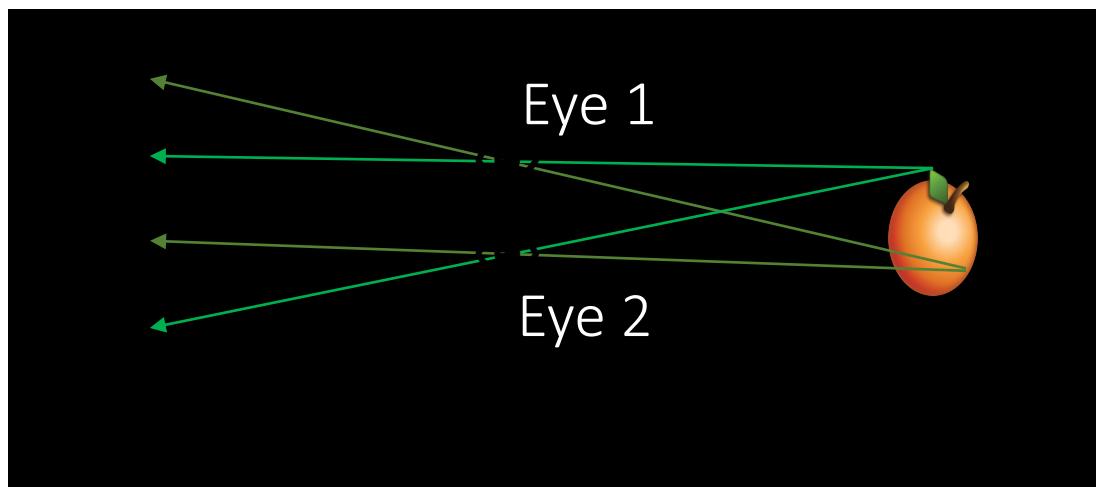


Image from Lucas Vieira



Model from Michael Nicolayeff

# How Light Fields Work



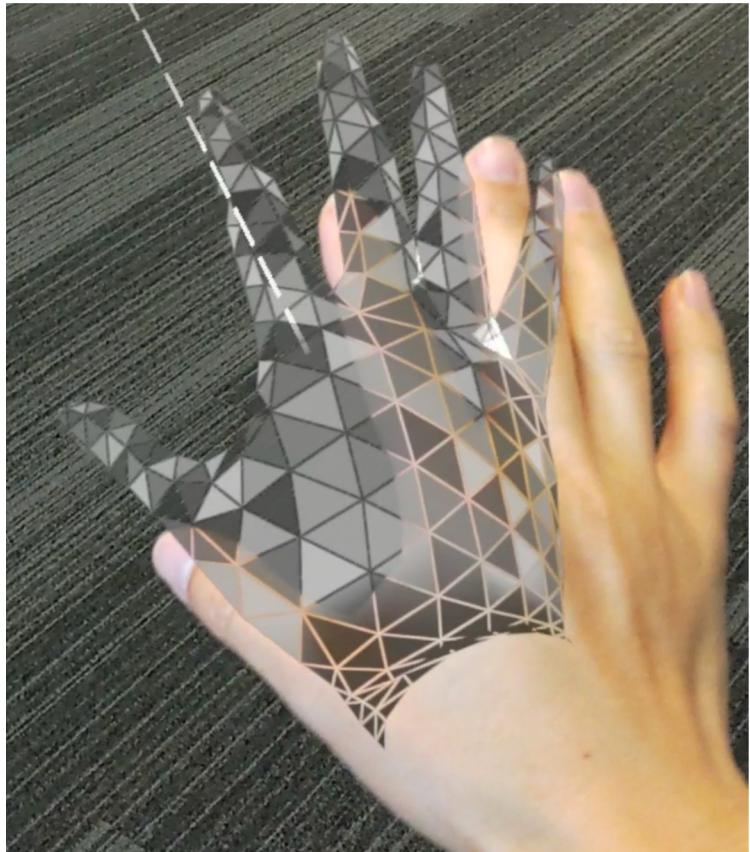
# Light Field Holograms



# Comparisons

	Captured Polygons	Point Clouds	Light Fields
Capture	One depth camera	Several depth camera	Many cameras
Data size	Small	Large	Huge
Fidelity	Meh	OK	Great
Impact of Artifacts	Horrible	Bad	Subtle
Interaction and Intersection	Easy	Hard	Challenging
Translucent Objects	No	No	Yes
Reflective Objects	Bad	No	Awesome
Real-Time Capture	Not great	OK	Super

# Game Moves Data



Microsoft Mixed Reality Toolkit (MRTK) widely used.

- Encode hand joint locations in RTP.
- Encode rate of change.
- Allows receiver to render smooth hand motion.

<https://datatracker.ietf.org/doc/html/draft-jennings-dispatch-game-state-over-rtp>

# Metaverse Standards

- Volumetric Video
- Texture mapped mesh
- Point Cloud
- Light fields
- Game State Sync
- Common Inventory
- Roster & Friends
- Messaging
- Real time translation
- Scene Description & Composition
- Insertable Applications
- Distributed Name System
- Content Distribution at Scale
- Haptics
- Low Latency Transports
- Connection to Real World
- Permissions
- Privacy