



The Development and coming of the Industrial metaverse

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Industrial Metaverse

Topics

- Alternatives and current limitations
- Taking a practical approach to integration
- Future visions of progressing the technology for the industry



Metaverse definition

How does it work?

Let's understand how Metaverse works with the help of an example:

- Imagine you have a pair of spectacles that can virtually augment your workspace in your room, so you don't have to be present anywhere physically. Your workspace will not be real, but it will be very close to reality.
- The virtually augmented space will keep on getting real as the Metaverse technology advances.

What is Metaverse?

Metaverse is a place where the hybrid and digital space co-exist.

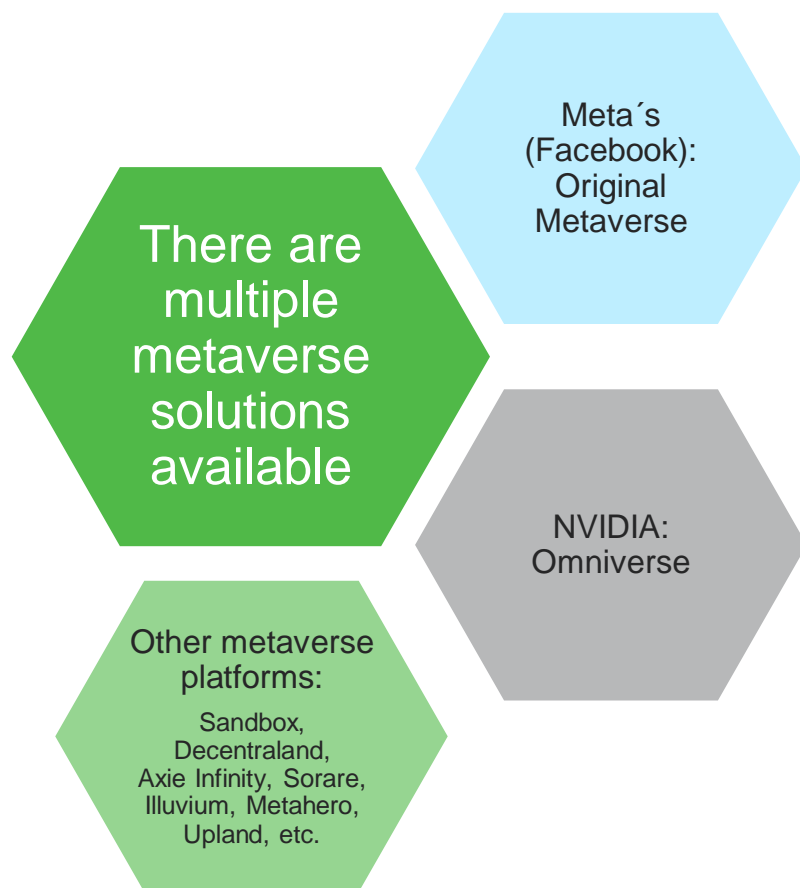
- In straight terms, Metaverse is a three-dimensional web powered space based on [AR \(Augmented Reality\)](#) and VR (Virtual Reality).
- Users in Metaverse can come together in a digital universe and perform any given activity available. It is like a virtual interconnected space consisting of digital items, [NFTs](#), avatars and a lot more.

Integrations?

[IoT \(Internet of Things\)](#), [AI \(Artificial Intelligence\)](#) and holographic avatars can be brought to its arena, according to the recent development in Metaverse.

- For the industry Digital Twins can be used for the virtual systems.

Alternatives and current limitations



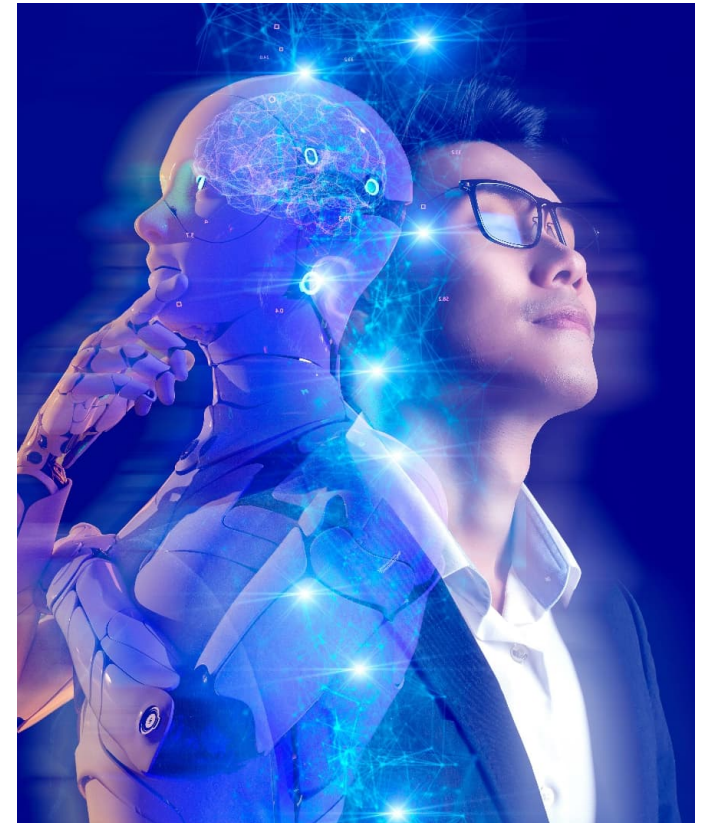
- **Limitations:**

- Scalability like how large virtual environment can be loaded (can be solved with multiple scenes loaded from disk or streaming solution, only some available now)
- Cybersecurity like industrial cases need high security & access rights
- AR / VR devices still fast development (high resolution), Android devices short life cycle (currently ~2 years)
 - Varjo XR-3, first human resolution VR headset
- Connectivity 5G or Wi-Fi 6 (needed in any case as scenes can be loaded over wireless connection or streamed), plus minimal latency

Industrial Metaverse use cases

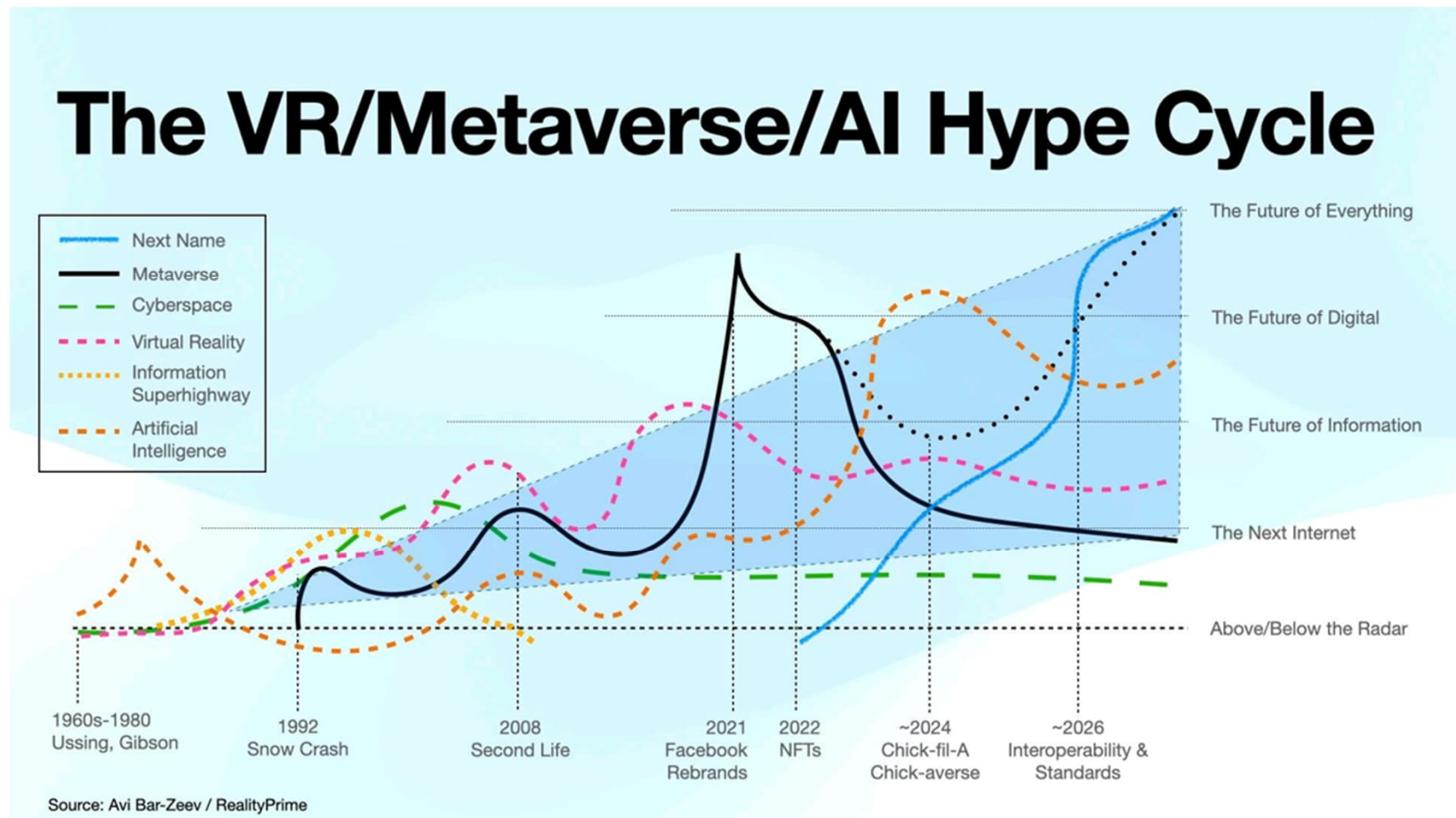
- Gaming
- Travel and Tourism
- Manufacturing
- Remote working
- Education & Learning
- Retail
- Automotive
- Healthcare
- Real estate

- According to a recent market survey, it was reported that the global augmented virtual reality and augmented reality market is valued at around \$2.6B in 2018 and is expected to grow to almost \$815B by 2025.



The VR/Metaverse/AI Hype Cycle

Focus on interoperability & standards



Taking a practical approach to integration

Industry focus on interoperability

Real-time data

- OPC UA – Unified architecture defines standard communication and data models
 - Contains certificate-based security & encryption, access rights and permissions
- OPC UA – Pub/Sub model another good choice
- REST API – protocol level standard, not the actual content but can be good starting point

3D VR model

- Decimated to “fit” to current hardware, simple and working. Scalability though multiple 3D model files.
- Streaming another choice if connectivity is fast enough, “pre-decimated” Level Of Details (LOD)
- 360 photos can be one fast & simple solution now (just in case you do not have 3D CAD models)

Digital Twins

- Not yet available in standard format, different backend systems used for the modeling & implementing
- Animated domain symbols: legacy implementation or based on graphics engine like Unity / Unreal

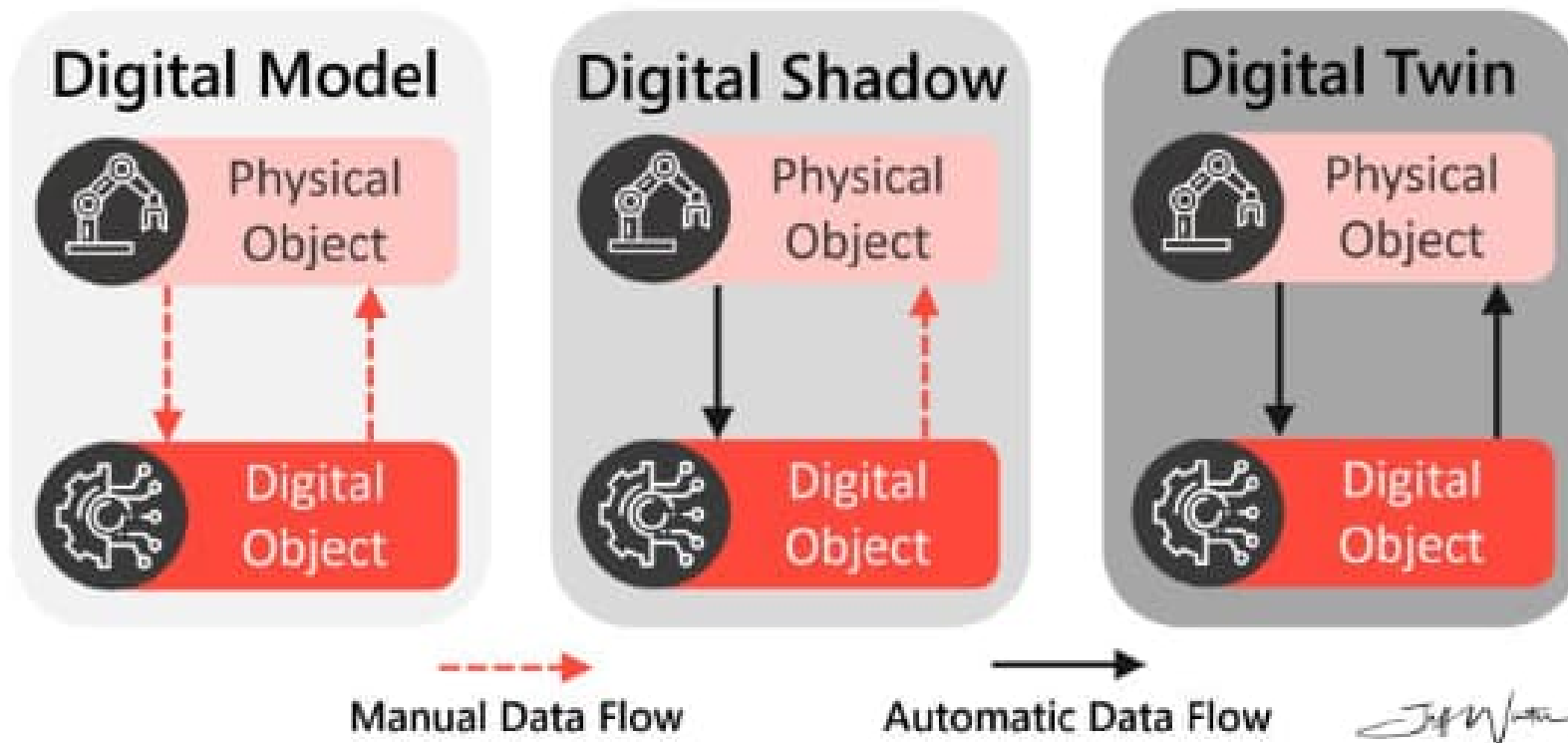
Avatars

- Creation coming more easy, actual reason is consumers in AltSpaceVR and other high-volume platforms (own user identity needed, skin creation & editing)
- Digital Assistant with domain knowledge

From the Digital Model -> Digital Shadow -> Digital Twin

Maturity of Digital Twin

Relationship Between the Physical World & Digital World



Context awareness through location

Photo based visual position system: From consumer Google VPS to industrial Immersal

What is Visual Positioning System?

Visual Positioning System (VPS) refers to an augmented reality navigation service that uses a user's smartphone camera to recognize the surroundings. Also, combine it with Google's database of street view images to identify the user's location. This new technology uses real-time images by using the users' mobile phone camera to identify the location and define the direction.

So, if you are using Google maps, you might have experienced some difficulties in finding a place or a route once you come to a certain place. In such cases, Google VPS can help you in finding your path using 3D directions and more precise distances.

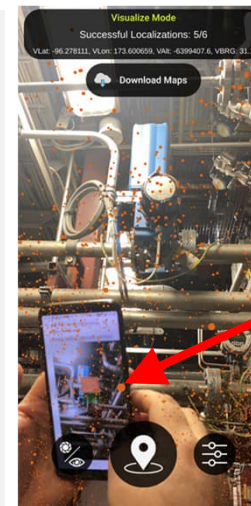
Look also Google Geospatial API:

[Google Developers Blog: Make the world your canvas with the ARCore Geospatial API \(googleblog.com\)](#)



Immersal provides position system for industrial use:

- Needs one-time spatial mapping (in case of changes partial re-mapping)
- Hot spots for high accuracy (some centimeters)
- **Marine use case: virtual x, y, z**
(not GPS lon, lat, alt or relative to current GPS)

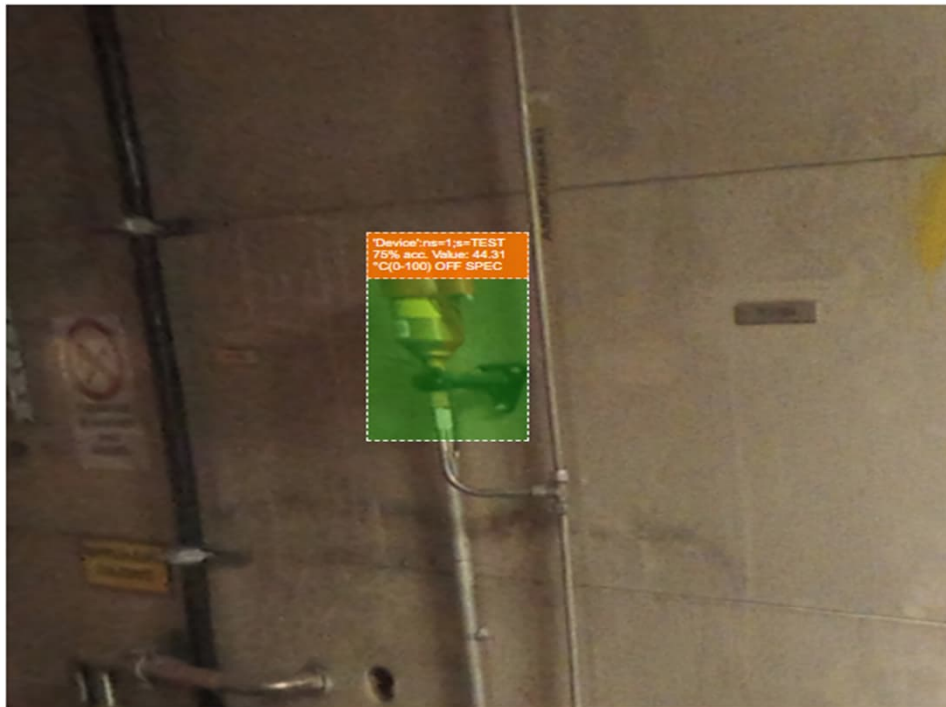


Immersal:
Spatial map with “features”

- Device:
- 1) Identification with position
 - 2) Find device
 - 3) Real-time value + status

Valmet – TensorFlow with AutoML model – visual device detector

OPC UA integrated with REST API – real-time value & status from the device



3D model: Instant NeRF (Neural Radiance Fields)

One new alternative



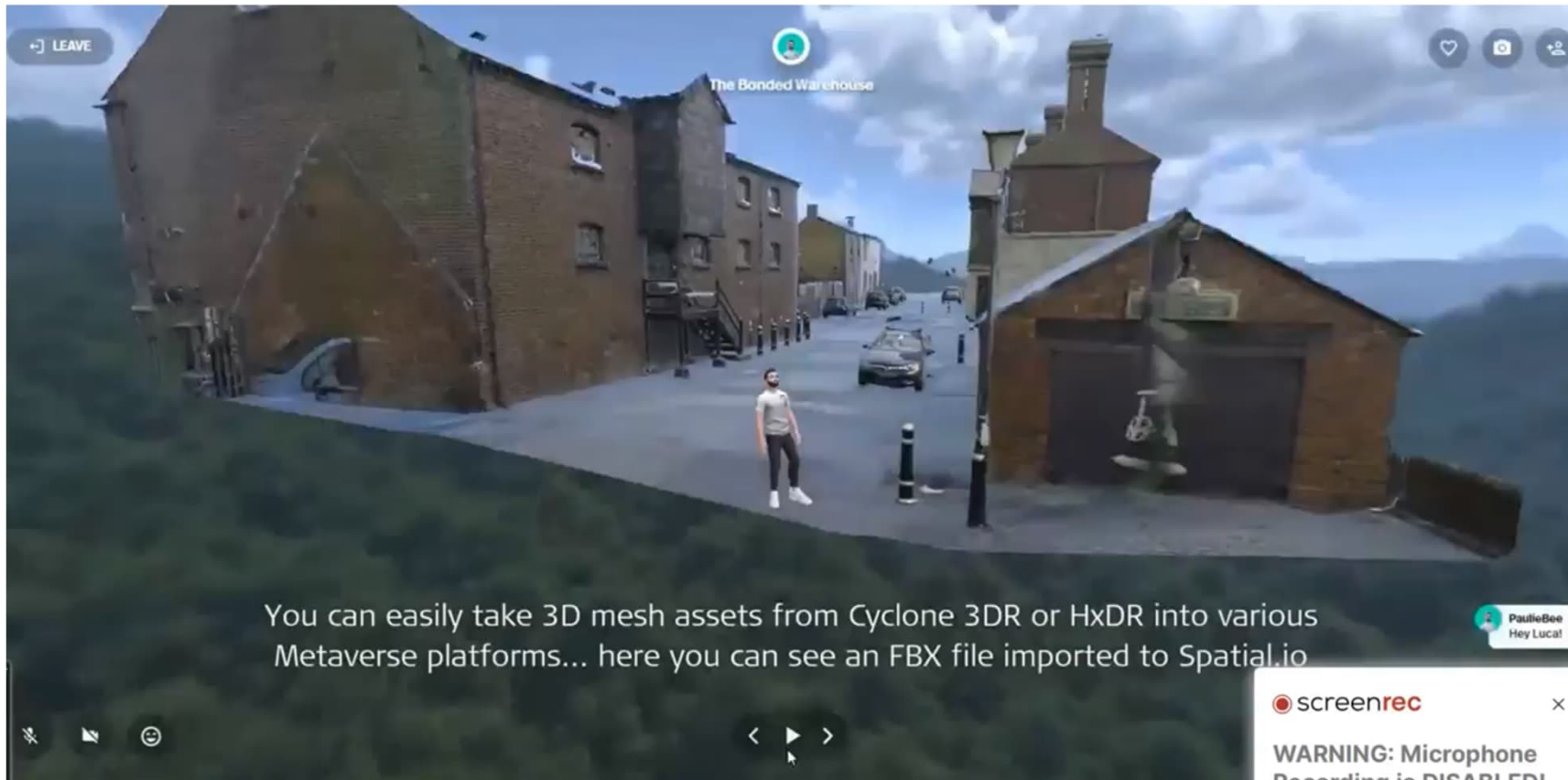
Industrial plant 3D model: Instant NeRF (Neural Radiance Fields)

One new alternative



Consumer Metaverse with avatar

3D mesh assets: Spatial.io (environment size 90MB)



You can easily take 3D mesh assets from Cyclone 3DR or HxDR into various Metaverse platforms... here you can see an FBX file imported to Spatial.io

Valmet360 with real-time values and animated symbols

Web page: Motor temperature and hand valve open/closed, links to asset management etc.



Industrial XR: Avatars for collaboration

Current state and vision

- Robot like avatar with name above head, color & logo can be customized with skin editor



- Avatar will miss emotions, eyes, lip sync, legs etc.

- Avatars with own face, created by phone 3D scan (few seconds, ~150 photos)
- AI tools can be used to keep eye contact & lip sync



D-ID with AI and given text script

Combine with ChatGPT: Digital Assistant



CES 2023 Made it Clear AR Glasses Are Coming Back, and Soon

Vuzix Ultralite AR glasses last up to two days on a single charge

- Vuzix Ultralite AR glasses weigh about the same as a normal pair of sunglasses, but are actually smart lenses that have a remarkably long battery life. While Vuzix is best known for augmented reality solutions for enterprise and military use, the Ultralite is designed for consumers.
- Weighing just 38 grams, Vuzix Ultralight promises to solve the problem of fatigue that has plagued early AR glasses. It also solves battery life issues with a reported two-day battery life. Unlike some solutions that are bulky or feature camera humps, the Vuzix Ultralight is slim and stylish with only a tiny hint of technology hidden behind the right lens.
- The monocular display is [based on advanced waveguide and micro-LED technology](#), which has previously only been available in the most expensive TVs, so it should be quite bright and crisp. The full details are not yet available, but it will be compatible with both iPhones and [Android](#) phones to display notifications, directions, translations, workout status, and more.



TCL's prototype RayNeo X2 AR glasses were quaint, but they needed polish and better screens. Knowing what tech is already out there, both issues are not big hurdles.



Future visions of progressing the technology for the industry

- Current solution: 360 photos and Lidar with point cloud to build 3D scenes
- Future: NERF AI for content creation (small scale, not yet full factory), more details: <https://www.plainconcepts.com/nerf-3d/>
- Phone based face scanning for the Avatars + other AI tools for more real-time features
- Digital Twins:
 - Reusable & dynamically connectable models
 - Visual object that will act according model values / state
- Even Microsoft “ended” MRTK, AltSpaceVR will be replaced by Mesh, HoloLens team suppressed, core team focusing on solving problems

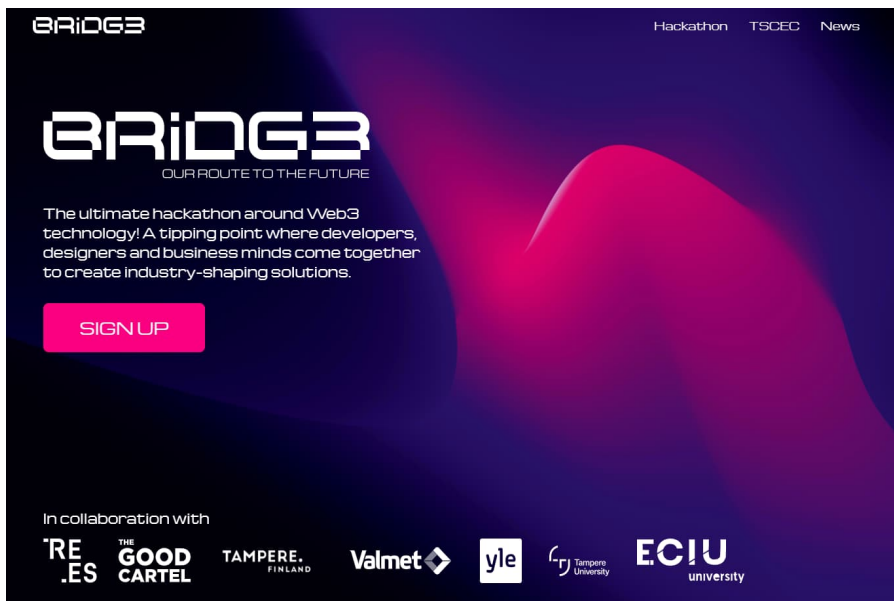


Summary

Building blocks for industrial metaverse

- Ecosystem with partners needed
 - Experts to implement, configure and deploy
- Open-source libraries for the content
 - Assets (industrial 3D symbols)
 - Digital Twins (general for main domain objects, can be customized)
 - Code snippets, examples for integration
- Systems that provide standard interfaces
 - OPC UA, not just protocol contains information models for industry
 - REST API
 - MQTT, ZEROMQ etc.

Advertisement: Industrial Metaverse hackathon



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Nokia Arenalle huipentuva kuukauden mittainen hackathon yhdistää opiskelijat, mentorit sekä yritykset tulevaisuuden Internetin ja Metaversen mahdollisuuksien äärelle.



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