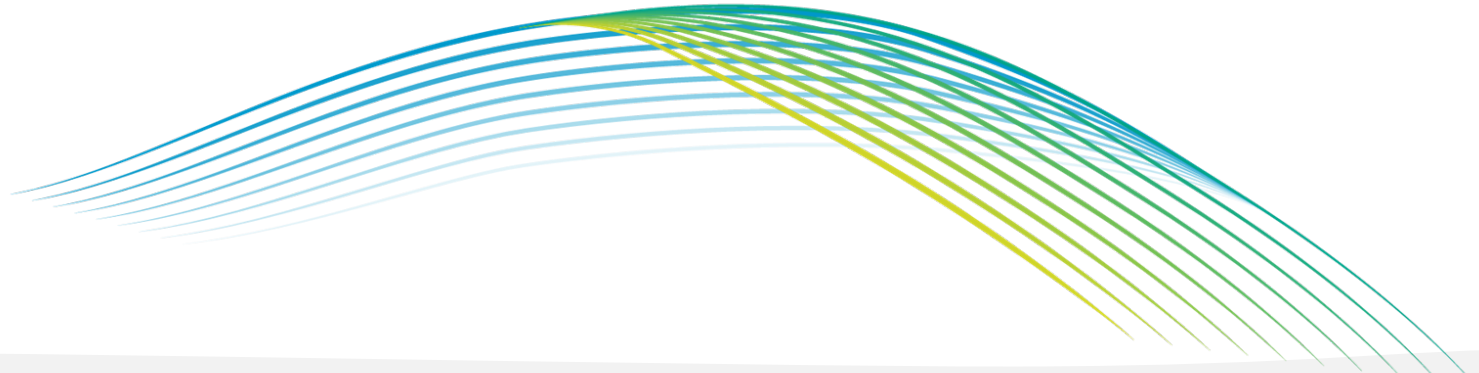




# A Unique Opportunity to Support the Open Evolution of the Internet

## Forum Overview

<https://metaverse-standards.org/>



# Interoperability Will Drive Metaverse Evolution

**The metaverse combines the connectivity of the Web with the immersiveness of spatial computing**

**The next generation of the Web =  
Ubiquitous Connectivity + Spatial Computing**

**Need for diverse enabling technologies to work  
together: AI, GPU, XR, Web3, 5G/6G ...**

**Interoperability is foundational to the metaverse!**

- 1) Reliable connected functionality of sophisticated technologies
- 2) Leveraging of third party products and services – ‘you don’t have to build everything yourself’
- 3) Break out of silos for a larger, connected economic opportunity for all!

**The Metaverse will require a CONSTELLATION of interoperability standards**  
and recommendations/guidelines from HUNDREDS of SDOs, consortia, non-profits, companies, universities ...



**Metaverse**  
**STANDARDS FORUM™**

**A unique, neutral, and welcoming venue for  
pragmatic cooperation between the  
standards community and industry**  
**NOT another standards organization!**



# 2600 Global Forum Members and Counting...

## Broad global membership creates unique collaborative opportunities

Diverse participation by industry, standards, and academia

Generate wide consensus on requirements and use cases

Opportunity for far-reaching visibility

Strong industry involvement drives pragmatic projects & deliverables



**Metaverse**  
**STANDARDS FORUM™**

**Non-Profit 501(c)(6)  
Consortium founded in 2022  
and incorporated in 2023**

**FAST COMPANY**  
**Honorable Mention in**  
**'World Changing Idea' Awards!**

## Forum members include a wide diversity of organizations, including...

### Standards Organizations

Khronos, W3C, Open Geospatial Consortium, IEEE, Web3D Consortium, OMI, ASWF, Spatial Web Foundation, VRM Consortium, XRSI, OMG, Open AR Cloud, OMA3 ...

### Platforms

Meta, Microsoft, Sony, Google, Baidu, VISA, VMware, Huawei, General Motors, RedHat, Siemens, Tencent, Mozilla, Paramount ...

### Tools and Engines

Epic, Unity, Adobe, Autodesk, Otoy, SideFX, Maxon, Cesium, ESRI, Dolby, Blackshark.ai, Lamina1, Niantic, Ready Player Me, DGG, Manticore ...

### XR

HTC, Magic Leap, Nreal, Pico, Panasonic, Tobii, zSpace ...

### Hardware

NVIDIA, Intel, AMD, HP, Acer, Dell, Qualcomm, Samsung, Arm, Sony, MediaTek, Oppo, Lenovo, ZTE, LG, China Unicom ...

### Wireless and Networking

Nokia, Ericsson, China Telecom, Deutsche Telekom, T-Mobile, Verizon, NTT, Orange, AT&T, BT, Telefónica, Juniper, Comcast, CableLabs, ZTE, Oookla ...

### Industrial and Enterprise

Siemens, Bosch, Schneider, BMW, Daimler, Philips, Hitachi, Fujitsu, Trimble, Capgemini, IKEA, Alibaba, Target, Wayfair ...

### Universities and Institutes

Stanford, John Hopkins, Yale (XRP), Cornell, Queens University Belfast, Fraunhofer, New York Institute Technology, APMG ...

### Advocacy

XRSI, AREA, XR Association, VRAR Association, XR Guild, Web3 Marketing Association, International Virtual Reality Healthcare, Swiss Institute for Disruptive Innovation, IOT Consortium, Metaverse Japan, RIAA ...



# Forum Mission – *Pragmatic* Metaverse Interoperability

## Assist standards organizations in their mission to create interoperability for an open metaverse

Gather broad input to inform standards development and drive visibility, adoption, testing and usage

Enable standards organizations to leverage each other's work and minimize overlaps/fragmentation

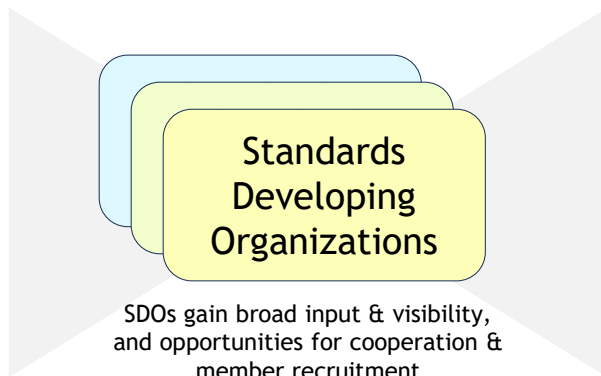
### Pre-standardization

Identification of standardization gaps

Discovery of opportunities for standards organizations to leverage or align each others work

Create broad consensus on use cases and requirements

Generating reviews and feedback for draft specifications



### Post-standardization

Interoperability testing and testbeds

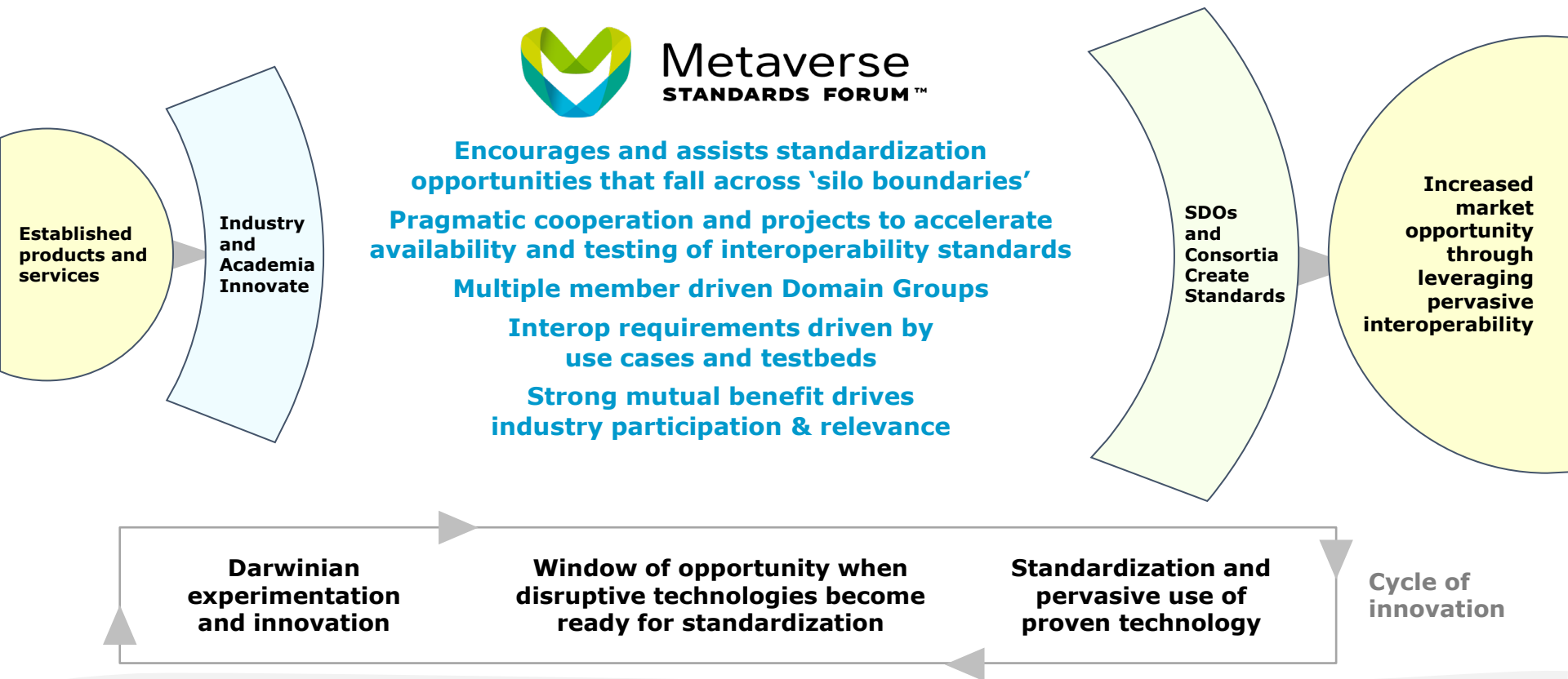
Development of conversion and layering tools

Publication of educational materials, reports, best practices & guidelines etc.

**Bottom-up, pre- and post-standardization activities help address urgent 'pain points' creating a wavefront of short-term business opportunities on the road to an open, standards-based metaverse**



# Wavefronts of Innovation and Standardization



# Forum Domain Group Process



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## Poll members and rank standardization topics

Members suggest and upvote interoperability problems and opportunities affecting their organization  
Over 200 topics suggested by Forum membership - and counting

### Any Forum members may propose and lead Exploratory Groups

Build consensus and capture in a draft Working Group Charter pragmatic actions to address key interoperability topics  
Regular Exploratory Group Meetings open to all Forum members

### Forum Working Groups execute their Charters

Any Forum members may participate to execute projects creating and delivering agreed public deliverables  
Focus on projects to further immediate standardization and business opportunities



Exploratory  
Group  
Proposals

Approval Steps



Working  
Group  
Charters



# Forum Domain Groups (Sep 24)

## 3D Interoperability

### gITF/USD 3D Asset Interoperability

Cooperation between USD and gITF to increase synergy and reduce duplication of effort, gaps, fragmentation

### Interoperable Avatars

Cross-platform avatars and characters for film, gaming, fashion and social platforms

### Digital Fashion/Wearables

Clothing (including layering), shoes, hats, accessories

### Volumetric Media Interoperability

Capture, transport and display

## Digital Twins and Geospatial

### Real/Virtual World Integration (Digital twins, IOT)

Constructs to describe and integrate the physical world and created representations

## Engagement and Education

### End-User Technical Troubleshooting

Enabling end-users to ensure reliable metaverse experiences

### Metaverse Educational Register

Using the metaverse for education

### Accessibility

Ensuring the metaverse is accessible to all

## Often multiple Forum Domain Groups meeting daily



## Ecosystem Navigation and Discovery

### Metaverse Standards Register

Publicly available database mapping the landscape of metaverse-relevant standardization activities, organizations, standards & specifications, use cases, and terms

### Mapping Virtual World Platforms

Understanding of the evolution and trajectory of the upcoming Metaverse

### Metaverse Ontology

Discuss/formalise Metaverse sector-specific words / meanings and define the relationships between them.

## Technology Stack

### Network Requirements and Capabilities

Industry requirements for seamlessly transitioning traffic on multiple wireline and wireless technologies for deploying metaverse applications at scale

### 3D Web Interoperability

Enable the broadest possible interoperability of Metaverse Content using the Web

### XR Device Interoperability

Establishing a platform for facilitating the discussion between identified stakeholders and working on identifying and recommending solutions to XR ecosystem issues to help accelerate the time-to-market, performance, and usage of XR experiences.

### Base interoperable communication layer via IPSME

When two disparate systems want to speak with each other, there needs to be at least a fundamental basis of communication to start negotiation

### Distributed Web3.0 Services requirements and capabilities to support Metaverse applications

Aims to drive the rapid adoption and success of Web3.0 Metaverse applications. By providing essential infrastructure, tools, and protocols, these services enable the creation of scalable, interoperable, and feature-rich applications.

## Legal

### Asset Management (web3, protection, digital rights)

Digital rights, protection, portability, access, availability

### Privacy, Cybersecurity & Identity

Recommendations for responsible innovation that mitigates human and societal harm from objective and subjective privacy risks – including cybersecurity and identity risk management

### Ethical principles for the metaverse and its implementation

Define a set of ethical principles and an implementation methodology for the development, use, procurement and commercialization of the metaverse

### Ownership and Identity

Decentralized identify and ownership

## Use Case Verticals

### Industrial Metaverse

Enabling collaboration between geographically dispersed teams through virtual environments, expert avatars, digital twins, data visualization, AR/VR and the emerging concept of Shared Reality

### Metaverse Use in the Real Estate Industry

How Metaverses can be used in the real estate industry

### Urban Design & Development

The Urban Design and Development involve large but localized community and stakeholders along designated areas and corridors to organize, manage, operate, regularize and optimize the interactions. The stakeholders include Property Owners, Architects, Planners, construction companies, service providers, AEC professionals, traders, manufacturers, supply-chain etc.

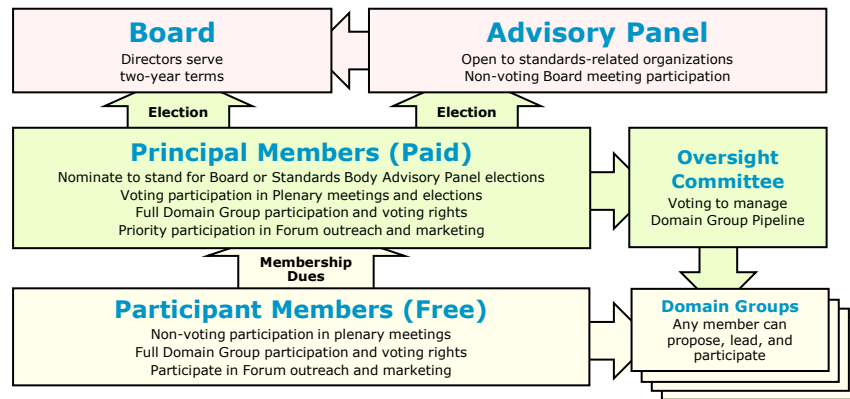


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# Forum Participation Structure

- Participant Membership is free
  - Full access to Domain Group activities
- No NDA or patent licensing obligations
  - All Forum materials publicly available
- Principal Members play a significant role in Forum Governance and operations
  - Eligibility to stand and vote in elections to the Board of Directors and Advisory Panels
  - Participate with voting rights in Oversight Committee to manage Domain Group Process
  - Voting rights in Plenary meetings



Principal Dues	Tier
\$0	SSOs and Non-profits approved for Principal Fee Waiver Invited Industry Experts (individuals)
\$50 per employee	Micro Enterprises (< 10 emp. AND <\$2M revenue/assets)
\$999	Small Enterprises (< 50 emp. AND <\$10M revenue/assets) Accredited Academic Institutions SSOs without fee waiver
\$4,999	Medium Enterprises (< 250 emp. AND <\$50M revenue/assets)
\$9,999	Large Enterprises (>250 emp. OR > \$50M revenue/assets)

**Scaled Membership Dues Enable Broad Participation**





# Benefits of Forum Membership

## **Resource-efficient, results-oriented engagement with standardization community**

- Gain visibility and insights into a wide diversity of standardization activities
- Opportunity to influence activities in the global standardization community
- Help build consensus on use cases and requirements as input to standardization
- Opportunity to seek synergy and encourage coordination between standards organizations
- Drive engagement, and membership, at standards organizations
- Networking and collaboration opportunities with other Forum members

## **Principal Membership is a unique opportunity for industry leadership**

- Guide the Forum's strategic direction and focus
- Direct Forum processes and activities
- Co-sponsor and participate in projects that will accelerate your objectives
- Highlighted inclusion in Forum Member Directory
- Priority participation in Forum Speaker Bureau, seminars, and webinars



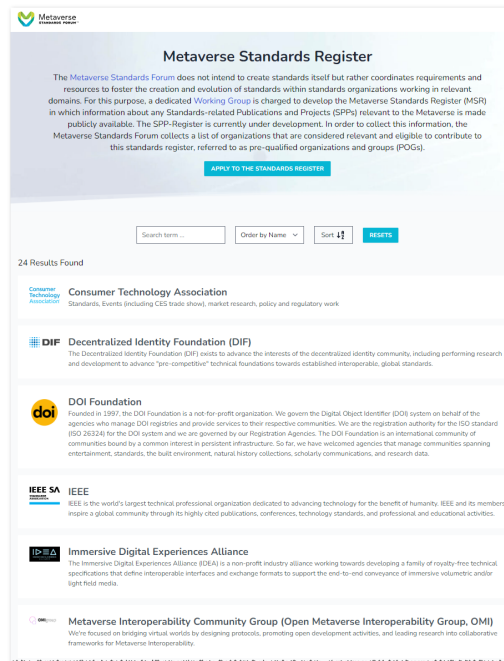
# Metaverse Standards Register

<https://register.metaverse-standards.org>



A publicly-accessible, searchable database of pre-qualified **organizations and groups**, standards-related **publications and projects**, **glossary** terms and **Use Cases**, relevant to Metaverse interoperability

Includes formal and informal standards organizations, emerging, completed and adopted standards, standardization projects, specifications, guidelines, or open source projects.



## Metaverse Standards Register

Foundational to informing Forum activities

Maintained by a Forum Working Group open to all members

Providing context and insights into the metaverse standardization landscape



# Forum Video Presentation Library

Invited speakers at Forum Domain Groups are posted to a growing public video library

<https://metaverse-standards.org/presentations-videos/>

<https://www.youtube.com/@metaversestandardsforum>

## Video Gallery

Filter tabs: All, 3D Asset Interoperability, Cybersecurity & Identity, Digital Asset Management, Events, Industrial Metaverse, Interoperable Characters / Avatars, Other, Privacy

<b>Tentative gITF 2024 Roadmap</b> Alexey Medvedev, Ed Mackey, Dwight Rodgers, November 2023	<b>Biometric and Body-Based Data in the Metaverse</b> Tatiana Bica & Jameson Spivack, November 2023	<b>Metaverse Standards Forum Subdivision Surfaces</b> Nick Paracio, November 2023
<b>Characters for the Metaverse with Realism</b> John Martin and Priscilla, November 2023	<b>Introduction to Metaverse Standards Forum's Industrial Metaverse Exploratory Group</b> Carolyn Rubner, Omar Eloumi, November 2023	<b>Metaverse Keyframe Animation in USD</b> Deneb Mekata, November 2023
<b>The State of 3D Asset Interoperability using USD and gITF BOF</b> Patrick Cozzi, Guido Quaroni, Henrik Edstrom, Eric Haines, Marc Petit, Alexey Medvedev, Felix Herbst, October 2023	<b>Securing the Metaverse from the Quantum Threat</b> Andersen Cheng, October 2023	<b>OpenPBR Education Session</b> Henrik Edstrom, Jonathan Stone, Julien Guertault, Guido Quaroni, Frédéric Servant, Adrien Herbulot, September 2023
<b>Alliance for OpenUSD (AOUSD) Debrief</b> Guy Martin, J. DTA, September 2023	<b>Identity Forces: The Future of Talent Identity Provenance Automation</b> Will Keith, September 2023	<b>UsdSkel and How It's Used at Pixar and Disney for Character Interoperability</b> Paul Kanyuk, August 2023
<b>Explore the Virtual Market for Avatar 3D Models in VRChat and Web</b> nananana, August 2023	<b>gITF &amp; USD Collaboration Ideas</b> Alexey Medvedev & Daniel Fahn, August 2023	<b>MaterialX Updates and Roadmap 2023</b> Joseph Stone, August 4, 2023

<b>Explore the Virtual Market for Avatar 3D Models in VRChat and Web</b> nananana, August 2023	<b>gITF &amp; USD Collaboration Ideas</b> Alexey Medvedev & Daniel Fahn, August 2023	<b>MaterialX Updates and Roadmap 2023</b> Joseph Stone, August 4, 2023
<b>USD &amp; gITF Physics Update</b> Eoin McLaughlin, Adam Moravovsky, Adam Medvedev, NVIDIA, July 28, 2023	<b>USD Physics</b> Adam Moravovsky, July 28, 2023	<b>FBX and Interoperability</b> Juliane Coulmier, July 28, 2023
<b>MPEG Standards and Activities related to Digital Asset Management</b> Xin Wang, Tomo Mikosait, July 2023	<b>gITF + Physics</b> Eoin McLaughlin, July 28, 2023	<b>USD and MaterialX on the Web</b> Henrik Edstrom & Auro Munoz, July 28, 2023
<b>AWE 2023</b> Birds of a Feather, Summer 2023	<b>AWE 2023 to the Metaverse (Update on Part 1)</b> Interoperability, Summer 2023	<b>Substrate Materials in Unreal Engine</b> Charles de Roziers & Sébastien Hillard, July 28, 2023
<b>Open Metaverse Alliance for Web3</b> July 2023	<b>MPEG-I Part 28 for 3D Scene-Based Media Interchange</b> Arianna Hinds, March 2023, July 28, 2023	<b>Immersive Technology Media Format</b> Julio Bruch, July 28, 2023

<b>The Role of Open Source in Metaverse Development</b>	<b>The Emergence SDK</b> July 2023	<b>The Role of Open Source in Metaverse Development</b> Multiple Speakers, July 2023
<b>gITF 2.0 Extensions in MPEG and 3GPP for the Metaverse</b> Fred Hoarast, July 28, 2023	<b>gITF Interactivity and Behavior Graphs</b> Ben Houston, July 28, 2023	<b>3D PBR: past, present, future</b> Boris Dubrovski & Phil Gibson, July 28, 2023
<b>Metaverse Overview and Standardization</b> July 2023	<b>Eluvio Content Fabric Overview &amp; Use Cases</b> July 2023	<b>gITF Extensions: An gITF Extensions open Metaverse 2023 interoperability Group</b>
<b>Metaverse Characters As A Service (Non-Humanoids)</b> Jeno Savour, June 2023	<b>Khronos' Body Anchoring Standards and gITF Extension Proposal</b> Tamas Hecsey, June 2023	<b>Metaverse Standards and gITF Interoperability - MPAI</b> Leonardo Chialiglione, May 2023
<b>Metaverse MPEG-SD: User Representation Avatar</b> Quentin Avril, May 2023	<b>THE SANDBOX: Building the Open Metaverse</b> Sebastian Borgert, April 2023	<b>Empowering Avatar Interoperability: An Introduction to VIM and VIMD Projects</b> Ytorn, April 2023
<b>Metaverse Avatar LOD</b> Jin, March 2023	<b>Asset Interop USD/gITF Update</b> Marc Petit, March 2023	<b>EO: Metaverse Decentralized Assets - The Glue Between the Metaverses</b> July 2023



# Example: Broadening 3D Asset Industry Cooperation

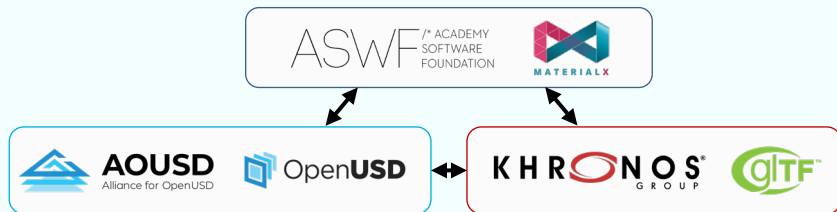


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Venue for *multiple* standards organizations and industry to cooperate *together*  
Accesible membership to encourage broad participation

## Forum 3D Asset Interoperability Working Group

550 Members in the Forum working group includes many participants from both SDOs AND broader industry  
Actively fostering understanding and cooperation between glTF and USD Communities  
Wide cooperation complements 1-1 liaisons between SDOs



Participation by multiple SDOs  
Each SDO evolves its own standards  
Limited 1-1 interaction through liaisons



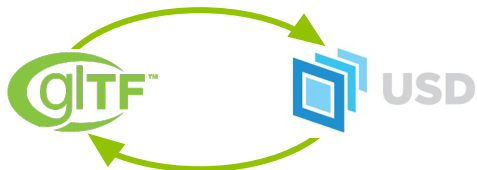
**FBX Migration Project**  
Investigation of roadmap recommendations to Khronos and AOUSD so key toolchains can migrate from FBX dependence

**glTF ⇌ USD Conversion Project**  
Guidelines and recommendations for key conversion pain points with associated test assets



# Forum Project Sponsorship

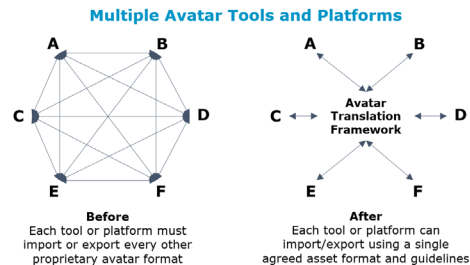
- Forum Members can choose to participate in cooperatively funded Forum projects
  - Leveraging matched funding from the Forum and other members
- Generating data, insights, and visibility into real world interoperability
  - Grounded, pragmatic action-based projects
- Enabling and encouraging SDOs to fast-track essential standards development
  - Market reports, best practices, guidelines
  - Prototypes, pilots, testbeds, plugfests
  - Open-source tooling, frameworks, and sample implementations



## gITF/USD Roundtripping

Creating test assets and exercising tools and engines generates real-world insights and encourages standards cooperation and alignment between key asset formats

## Example Forum 3D Asset and Avatar Projects



## Avatar Translation Framework

Guidelines and tooling for handling import and export of meshes, materials, skeletons, animations, physics, and metadata enables interoperability and encourages platform alignment

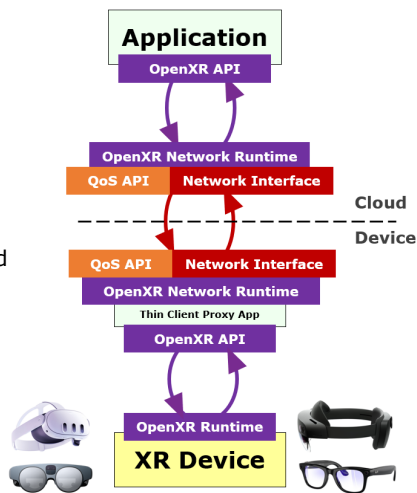


# Project Sponsorship Benefits

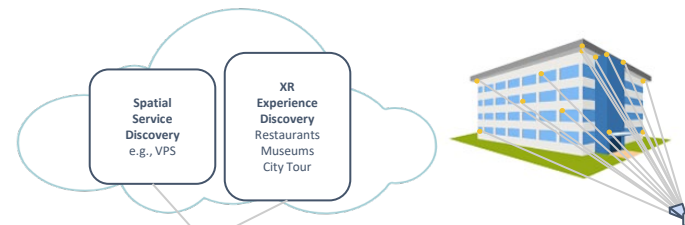
- **Visibility:** significant industry exposure of commitment to an open standards-based metaverse
- **Leadership:** funding directed initiatives to lead the development of metaverse infrastructure
- **Influence:** opportunity to steer project priorities and outcomes, aligned with sponsor strategic interests
- **Networking:** open doors to deeper collaboration and partnership with other key metaverse players
- **Innovation:** be among the first to access cutting-edge insights and initiatives

## XR Split-Rendering Test Bed

Enabling transparent split XR rendering between cloud and client devices – with a standardized QoS network configuration API



Potential Forum  
Cloud and  
Geospatial Projects



## Visual Positioning System Tooling and Test Bed

Generalized VPS service with swappable localization algorithms simplifying R&D  
User-friendly map creation pipeline  
Map alignment and registration tools  
Map management tools  
Web-based content creation tools



# Get Involved!

**Forum Membership is a unique opportunity for leadership in driving meaningful interoperability cooperation to help create the next evolution of the internet**

## **Effective Standardization Engagement**

Gain visibility and insights into a wide diversity of standardization activities  
Opportunity to interact and influence the global standardization community

## **Results Driven Organization**

Venue for fostering industry-driven standardization cooperation  
Impactful projects and activities to create a wavefront of short-term benefits on the road to an open metaverse

## **Broad Global Networking**

Wide participation enabled by inclusive and accessible membership terms - no NDA or patent licensing  
Join a gathering of a diverse array of insights, perspectives and expertise



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