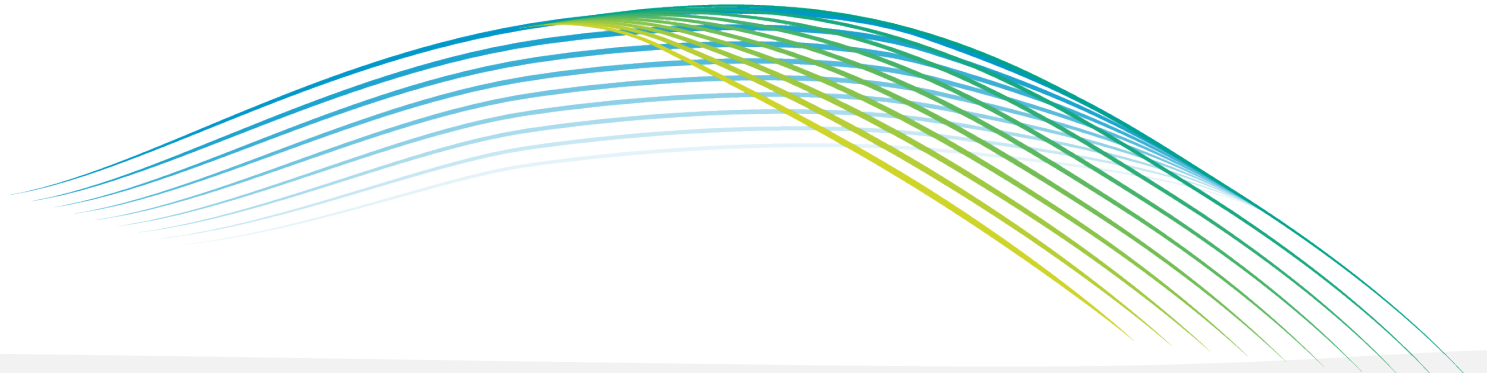




Metaverse
STANDARDS FORUM™

A Unique Organization Supporting the Open Evolution of the Internet

Overview
January 2024



Metaverse will be Built on Interoperability Standards

The metaverse combines the connectivity of the Web
with the immersiveness of Spatial Computing
through enabling multiple disruptive technologies to work together
(AI, GPU, XR, Web3, 5G/6G)



Building bridges between
applications to scale beyond a
series of disconnected silos



Depends on
Interoperability



Evolving a platform that is open
and inclusive for all – an
immersive evolution of the web



Pervasive metaverse interoperability will need a constellation of open standards ...
... involving 100s of standards organizations (SDOs)



How can we organize for cooperation on interoperability for the benefit of all?

Where can industry go to engage efficiently with multiple SDOs?

How do SDOs make sure they can reach industry stakeholders?

How can SDOs engage with each other to avoid overlaps, gaps, and needless divergence?

How do open-source projects get visibility into SDOs' plans and industry requirements?

How can we accelerate and fund open source and standard development projects?



A Unique Cooperative Venue for Metaverse Interoperability

Standards organizations, open-source developers, and industry stakeholders
Cooperation to align and accelerate a wavefront of business opportunities
Fostering 'brick-by-brick' interoperability on the road to the metaverse

Neutral venue to *ASSIST* standards organizations

Not another standards organization

'Meta Standardization'

Broad global participation

Driving meaningful consensus on requirements

Wide visibility and adoption for initiatives and deliverables

Pragmatic, bottom-up, industry-driven projects

Address immediate interoperability gaps and opportunities

Multiple Forum meetings happening almost daily



Metaverse
STANDARDS FORUM™

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

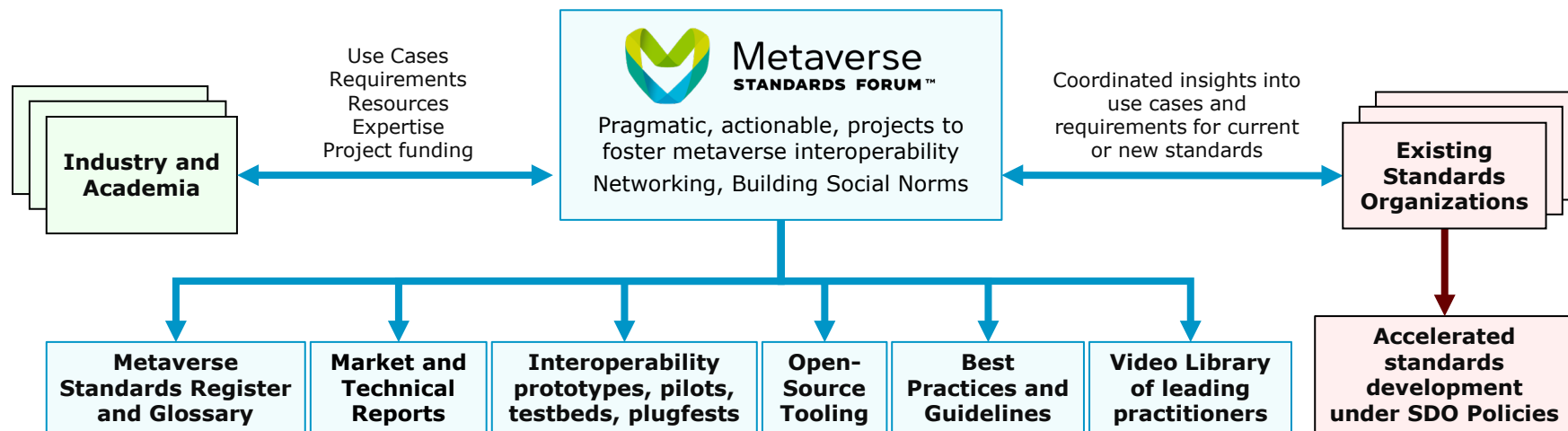
FAST COMPANY

Honorable Mention in
'World Changing Idea' Awards!



How Does the Forum Work?

- The Forum aims to *accelerate the development of metaverse interoperability*
 - The Forum does not create standards itself, but encourages broad standardization cooperation
- A neutral and welcoming venue for all standards organizations and companies to cooperate
 - Open to any organization, free membership tiers, no NDA, no patent licensing obligations
- Pragmatic, active and agile – strongly connected to industry activities
 - Multiple Forum meetings happening almost daily



2600 Global Members and Counting...

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, Ottoy, 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, Ookla ...

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 ...

Broad membership fosters collaboration across a spectrum of industries, standards organizations, and academic institutions

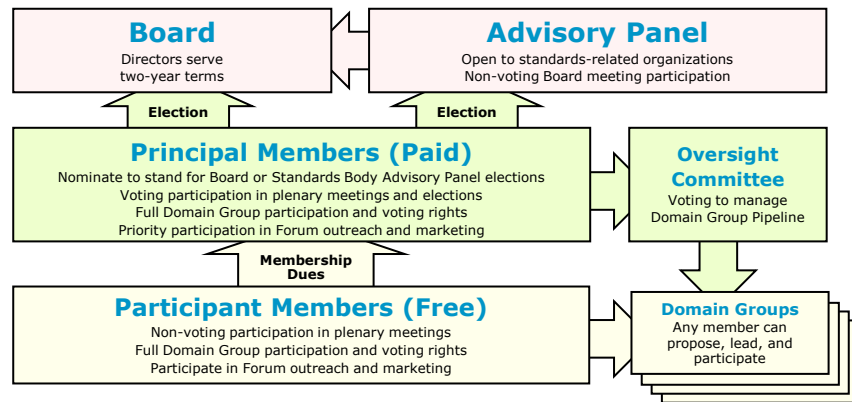
Global participation gathers diverse requirements and expertise

Strong industry involvement drives pragmatic projects and deliverables



Forum Organization Since Incorporation

- Participant Membership is free
 - For access to Domain Group activities
- No NDA or patent licensing obligations
 - All Forum-generated 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 and voting rights in Oversight Committee which manages Domain Groups
 - Voting rights in plenary meetings
- Principal Member Benefits
 - Influence the strategic direction and priority of Forum projects
 - Priority inclusion in the Member Directory
 - Priority participation in seminars and webinars, and Forum's Speaker Bureau



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 to Enable Diverse Participation



Forum Domain Group Process



Metaverse
STANDARDS FORUM™

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

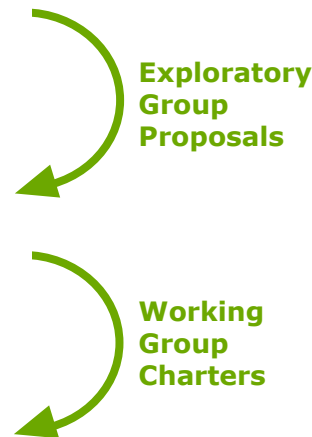
Build consensus and capture in a draft Working Group Charter pragmatic actions that can address key interoperability topics

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 pragmatic projects to create a wavefront of immediate standardization and business opportunities



Forum Domain Groups (December 2023)



3D Interoperability

glTF/USD 3D Asset Interoperability

Cooperation between USD and glTF 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

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

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

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

Engagement and Education

End-User Technical Troubleshooting

Enabling end-users to ensure reliable metaverse experiences

Educational Research

Using the metaverse for education

Accessibility

Ensuring the metaverse is accessible to all

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 identity and ownership

Use Case Verticals

Metaverse Use in the Real Estate Industry

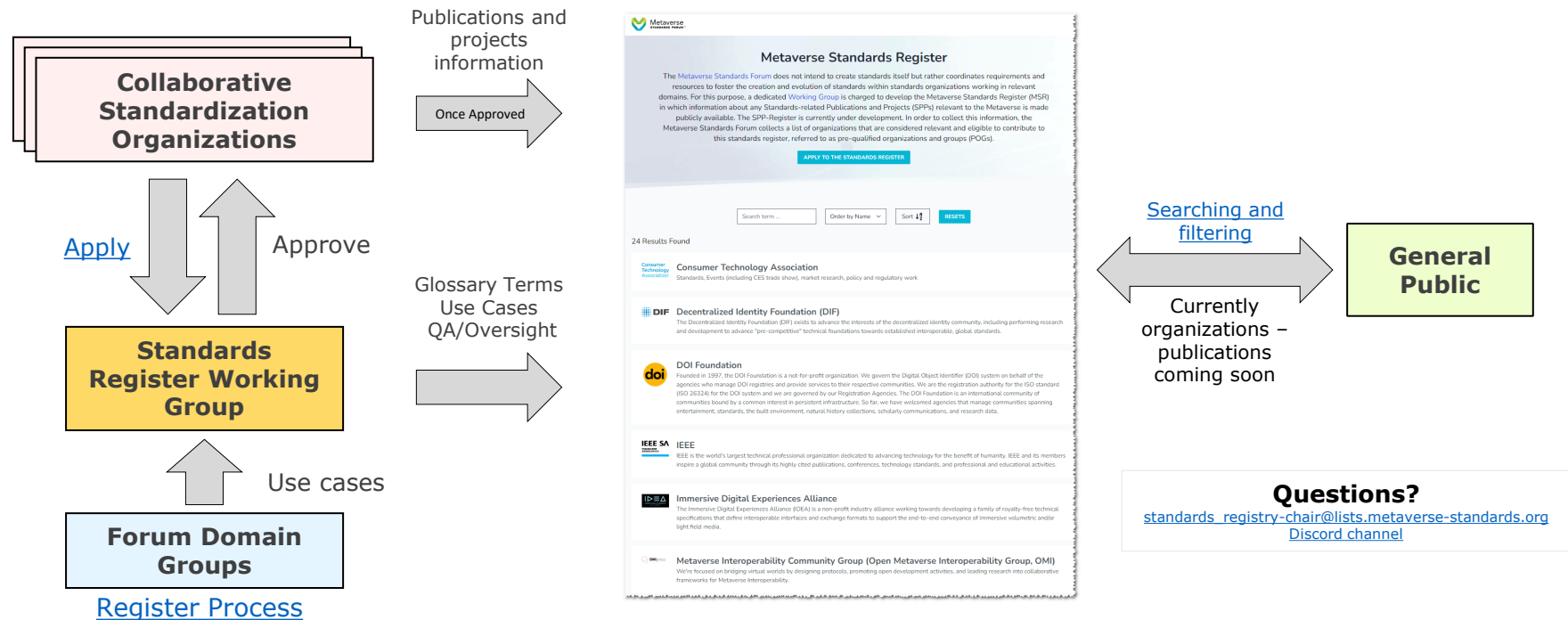
How Metaverses can be used in the real estate industry

**Key
Working Groups
Exploratory Groups
Exploratory Group Proposals
Domain Group activities**



Forum Standards Register

Navigating the metaverse standardization landscape Organizations, Standards and Publications, Open Source Projects, Glossary, Use Cases



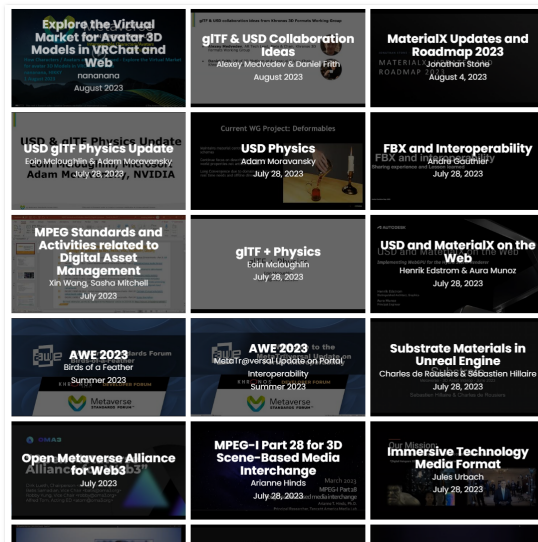
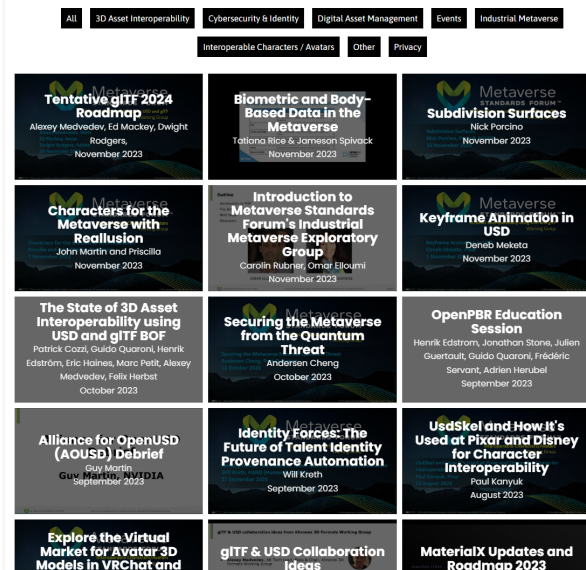
Forum Video Presentation Library

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



gITF USD Asset Interoperability Working Group

- Encouraging cooperation between USD and gITF
 - >550 Members
 - Leveraging each others' strengths and ecosystems
 - Avoiding friction points through needless divergence
 - Encouraging normative references to reduce duplicated effort
- Roadmap Alignment discussions
 - PBR Materials
 - Physics
 - Subdivision surfaces
 - Interactivity
 - Absorbing FBX functionality into gITF/USD

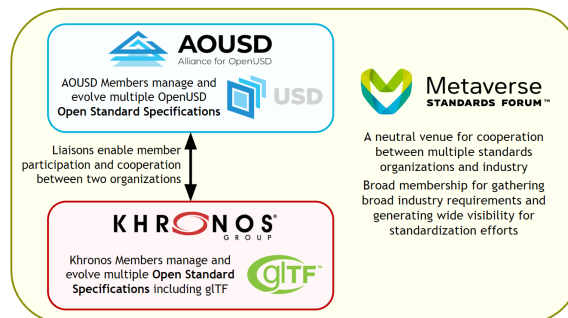


Proposed gITF/USD Roundtripping Project

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



Working Group BOF Meeting at SIGGRAPH 2023



[AOUSD/Khronos Liaison Announcement](#)

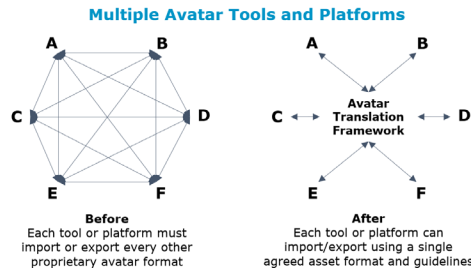
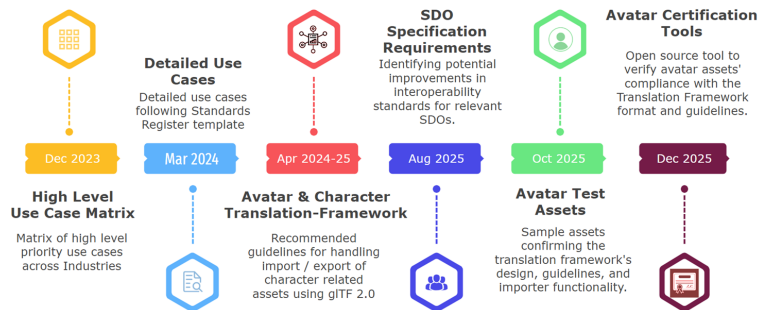


[2023 In Review Blog](#)



Interoperable Characters/Avatars Working Group

- Encouraging character/avatar interoperability
 - >220 Members
- Avatar Translation Framework
 - Build consensus on common data representations and guidelines for avatar and character data interoperability
 - Tools and engines may voluntarily leverage the framework if they want to increase avatar portability
 - Builds consensus around interoperability over time
 - Possibility for open-source translation tools



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



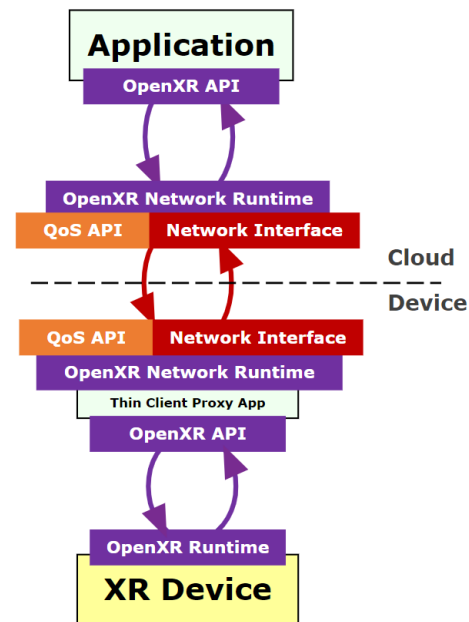
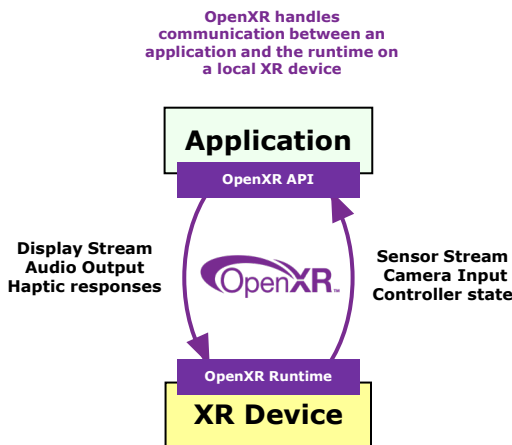
Network Requirements and Capabilities Working Group

- Collecting service and application use cases
 - Delivering Metaverse content across multiple access networks
 - >220 Members
- Identifying and describing distribution scenarios and architectures
 - Splitting computation and rendering across different entities
- Identify, and describe QoS requirements
 - Latency, jitter, throughput, reliability, time synchronization, etc.

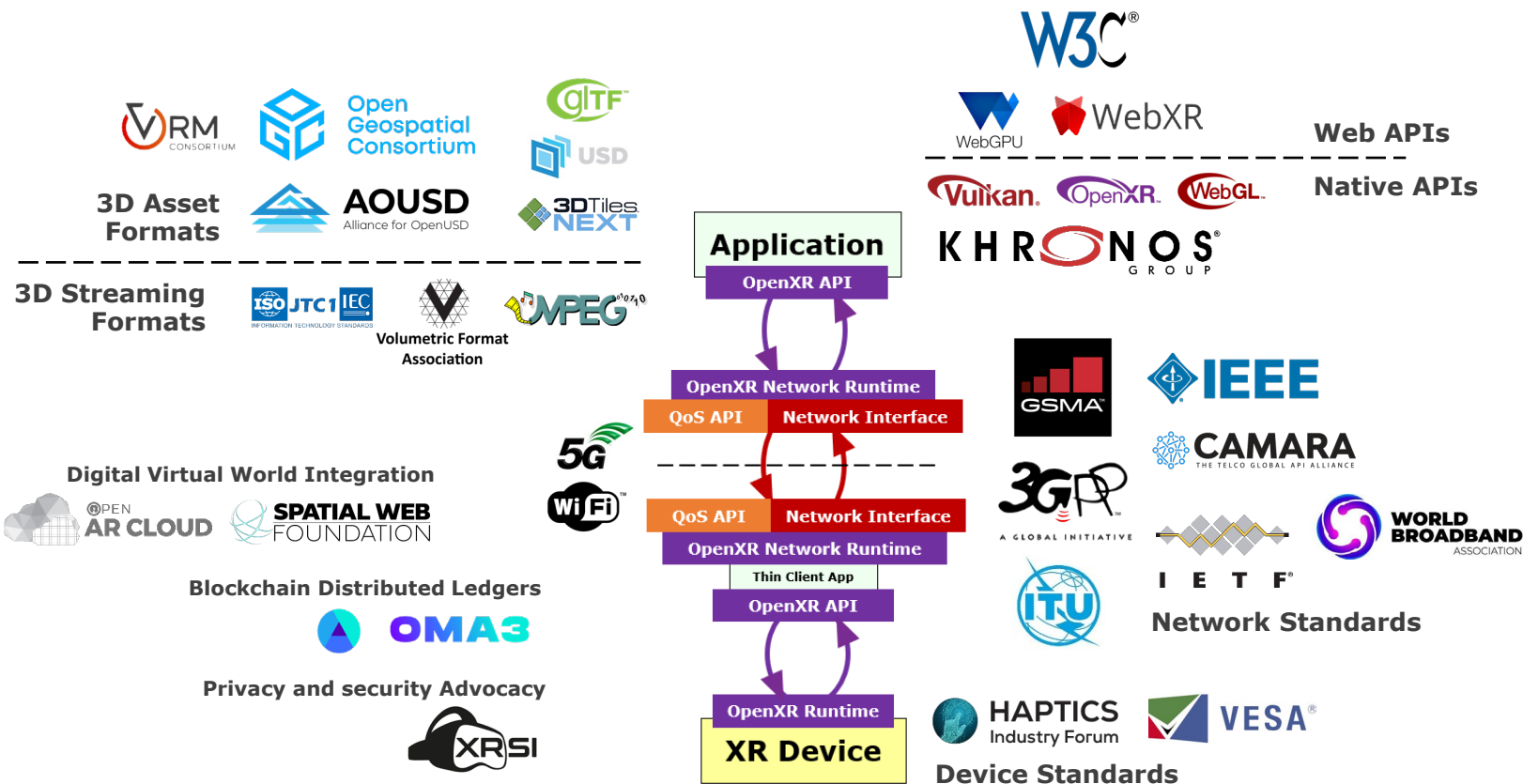
A QoS API would enable the network to be configured to meet the data streaming needs of the application and devices being used. Integrating a QoS API alongside the XR runtime API could hide network configuration details from the application that may not even know it is running in the cloud

Split Rendering Use Case

Distributing compute and rendering between client device and edge server



A Constellation of Standards



A Unique Venue Promoting Metaverse Interoperability

Opportunity for accelerating and promoting meaningful standards for the next evolution of the internet

Results-driven Organization

Pragmatic projects that support standardization efforts such as pilots and plugfests that test real-world interoperability

Reports, best practices, guidelines, pilots, testbeds, plugfests, open-source tooling, frameworks and sample implementations

Inclusive and Accessible

Open to any organization to encourage a wide array of perspectives and expertise

Broad Cooperation across a spectrum of industries, standards organizations, and academic institutions

Open and Transparent

No NDA or patent licensing requirements

All Forum deliverables are freely and publicly distributed, promoting open access to information



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