

3D Web Interoperability

Domain Exploratory Group Proposal

FINAL

1. Proposers

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2. Exploratory Group Goals

Build consensus and draft a proposed Metaverse Standards Forum Domain Working Group Charter for 3D Web Interoperability. The Working Group would potentially enable the broadest possible interoperability of Metaverse Content using the Web. To make the Metaverse fully interoperable with the WWW and the Standards ecosystem in order to enable new Metaverse capabilities to flourish on a strong foundation.

3. Potential Working Group Goals (and non-Goals) and Deliverables

The proposed charter would set out goals and key activities to generate insights into leading 3D interoperability initiatives and to foster their evolution in order to meet prioritized Use Cases. Special attention will be paid to opportunities for cooperation to increase synergy and reduce duplication of Standards effort, gaps, fragmentation and confusion, for the good of users and the industry.

- Allow and support mixed-use of different asset formats in a single world
- Interconnect 3D worlds and experiences into many runtime environments
- Increase synergy and reduce duplication of standards. Identify gaps and fragmentation
- Create a roadmap to meet the gaps and provide SDOs guidance on future standardization

4. Investigations

Collect and organize Metaverse Use Cases considering real-time 3D asset interoperability with WWW technologies.

- a. Identify current capabilities and fitness-for-purpose of existing Web-compatible International Standards in the Forum Register.
- b. Inventory patterns for addressable, shareable, 3D assets descriptions across Standards platforms. For example:
 - Geometry and material and appearance format capabilities including topology and units / scale
 - Lighting, animation, interaction, reproducible runtime behavior such as direct manipulation, LOD, interpolation, and sequencing.
 - Scene composition methods for content-negotiated assets across URI/URLs including Linked Data and the Semantic Web
 - Representations for WebXR and WebAudio experiences
 - Technologies for 3D graphics compression and streaming
 - Synchronization and Networking
 - Security, Identity, and Privacy
- c. Explore and enumerate the requirements and gaps for meeting the Use Case requirements within the current Standards ecosystem

5. Outcomes

Inventory patterns of Metaverse data representations and linking

Enable robust patterns for interoperable Metaverse content authoring and delivery workflows across the Web

A roadmap to meet the gaps: provide member SDOs clear guidance on future standardization

6. Projects

Match Web Use Cases to the profiles in the Forum Standards Register: Survey and testing of Standards ecosystem and tool robustness with the following scope:

- **Visual graphics** (model translations, rendering, appearance, lighting etc.) baselined by SVG, glTF 2.0 and X3D 4.0, allowing any other format.
- **Interface capabilities** (animation, user interactions, behaviors) that support functionality defined by each of the Metaverse Standards Domain Working Groups)
- **Web Architecture** (HTML, JavaScript, CSS, WebXR, [Web Audio](#) + [MIDI2](#), url/uri and addressing, namespaces, server-side/client-side communications, User Experience UX, [Semantic Web](#), etc.)
- **Compression and streaming technologies** (geometry, appearance, animation) facilitating the transmission and exchanges between virtual worlds.

Curate or create benchmarking assets to be made freely available. Also, how do real-time use cases compare to offline use cases, and how may this evolve?

Demonstrate the cross-platform interoperability of assets and behaviors in a variety of use cases and run-time engines, especially on the Web. [See Resources below for existing examples].

7. Engagement

Collaborate with and complement existing working and exploratory groups as well as SDO open standards and open source efforts

Reach out to diverse tools and communities to experiment with benchmark assets and report back findings and issues

8. Coordination

Liaison relationships among SDOs is important for evolving interoperability. The Web3D Consortium has long-standing official Liaison SDO status and representatives with ISO, W3C, OGC, Khronos, DICOM, HL7, and INCITS.

Create engagement and communication cadence among members:

- Standards Registry WG
- Metaverse Standards Forum Digital Asset Management Domain Exploratory Group
- Metaverse Standards Forum glTF USD Interoperability Working Group
- Khronos 3D Formats Working group
- Web3D Consortium X3D Working Group
- World Wide Web Consortium W3C including the Immersive Web WG
- Open Geospatial Consortium
- IEEE including the Metaverse WG, 3D Body Processing, and Distributed Interactive Simulation (DIS)
- MPEG Coding for 3D graphics and haptics (ISO/IEC JTC 1 SC 29 WG 7)
- ...

SDO Liaison and Web3D Consortium Member Support

- [Open Geospatial Consortium](#) (OGC) - Scott Simmons
- MPEG Coding for 3D graphics and haptics ([MPEG](#)) - Marius Preda
- [World Wide Web Consortium](#) (W3C) - François Daoust
- [Khronos](#) - Neil Trevett
- [Harvard University](#) - Andreas Plesch
- [Threedly](#) - Johannes Behr
- [3dMD](#) - Chris Lane
- [Castle Game Engine](#) - Michalis Kamburelis

9. Risk Factors

The proposing members have history, coverage, and communications to minimize the following risks:

- Sizing initial scope to insure something achievable
- Lack of resources for prototype projects
- SDO participation and responsiveness to new models of collaboration

10. Target timeline to create proposed Domain Working Group charter:

8 weeks

11. Additional Contributors/Supporters

(Participants contact Main Contact to be added; Alphabetical by last name)

<Forum members who wish to proactively contribute to this activity>

12. Resources

Khronos, Web3D, OGC, MPEG, IEEE, and WWW Standards already work together across numerous platforms; specifically, using open Standards HTML and X3D for front-end logic, lighting, 3D presentation/interaction around glTF models, and composing and streaming scenes with OGC and MPEG. Below you can see some relevant examples from the last couple of years:

- Simple X3D viewer with GLTF models: <https://x3dom-gltf-iiif.glitch.me>
- Multiple GLTF models lit and animated with interactive X3D:
 - https://www.kshell.com/pages/webinar_20220531/drinking/goblets_inline_html.html
 - http://metagrid1.sv.vt.edu/~polys/x3doodles/gltf_X3D_HTML_DOM/AP_NP.html
- Web3D.org Consortium YouTube Webinars including Dr. Marchetti's "Authoring Interactive Dynamic X3D and glTF Together" (2022): <https://youtu.be/N5eWCFnSwU4>
- MPEG serie for 3D graphics compression standards (ISO/IEC 23090-5, ISO/IEC 23090-9, ISO/IEC 14496-16)

The [ACM SIGGRAPH Web3D Conference](#) series provides 24 years of rich background for numerous 3D graphics innovations and techniques for the WWW. Full peer-reviewed proceedings are in the ACM Digital Library at :

<https://dl.acm.org/conference/web3d>

The **Web3D** and **OGC 3D Portrayal Interoperability Experiment** demonstrated X3D as a viable platform for the Web3D Service. Results of this IE have been published as an [OGC Engineering Report, OGC 12-075](#) and gone on to inform the current OGC API.

Web3D Consortium members founded the [Declarative 3D Community Group in the W3C](#), which demonstrated exciting integration methods between X3D, HTML, and the DOM, that which are now common practice across the 3D Web.

13. Future Activities

Successful pursuit of these many capabilities is not some sort of final “status quo” but rather an enabler for much follow-on work. Example future activities include:

- URL/URI addressing leads to possibility of Linked Data cross-referencing
- ...