

3D Asset Interoperability using USD and glTF

Domain Working Group Charter

FINAL

Approved by Oversight Committee February 8, 2023

1. Status and Change History

9Jan23 - First Draft

16Jan23 - Second Draft

- One chair and two vice-chair instead of three co-chairs as initial officer positions
- Clarity on what class of projects the Working Group can initiate without rechartering
- General language polishing

24Jan23

- Final wordsmithing

8Feb23 – Approved by Oversight Committee

2. Officers

The Working Group will follow current Forum Domain Group processes, with initial elected officer positions of a minimum of 3 co-chairs.

3. Motivation and Goals (and NON-Goals)

3.1 Background

The growth in usage of real-time 3D graphics is driving the rapid emergence of increasingly sophisticated tools and platforms to author and distribute real-time 3D content for numerous use cases. Multiple industry sectors are employing a broad diversity of run-time 3D technologies, including in-browser engines, game engines, and simulation engines. The combinatorial explosion of tools, engines, platforms, and use cases is driving an urgent need for 3D asset interoperability standards.

Many existing 3D-related standards and open source projects were originally created with a narrow focus to solve a specific problem set, but are now facing pressure to increase their scope to address additional use cases. This Working Group is a venue for discussion and coordination between industry constituents, open source projects, and Standards Developing Organizations (SDOs) to encourage and enable the 3D interoperability landscape to evolve in a coordinated fashion to maximize technical and commercial opportunities for all, while minimizing needless incompatibilities and duplicated effort.

More specifically, the scene layering and composition concepts implemented by Pixar in their USD open source library are considered by many companies across multiple industries as a solid and proven foundation to represent virtual worlds and interactive experiences. At the same time, many industries and applications are embracing glTF as an efficient 3D object representation. The Working Group aims to facilitate productive communication and cooperation between the USD and glTF communities, to the benefit of all involved and the wider industry.

3.2 Principles

Our intention is to be minimally prescriptive to the USD and glTF communities, but to foster interoperability, including in the short term, through providing the opportunity for sharing experiences, insights and feedback across multiple use cases and platforms that will be essential to development of an open and fair creator economy.

Metaverse experiences will be authored once but delivered across a variety of platforms, and so will need to be conformed to the capabilities of specific target platforms for optimal performance while maximizing visual fidelity to the creator intent.

We expect virtual worlds to be persistent and therefore, the authoring process should support multi-tool and multi-user collaboration as well as concurrent editing while running live.

Experiences and virtual worlds will be assembled from multiple data types and data sources, including variations of 3D data types and non-3D media such as audio, video etc., plus additional media types yet to be envisioned.

As we are in the early days of the development of the metaverse, the next generation of the Internet, it is vital that standardization does not inhibit innovation and competition. Therefore the Working Group will be intentional in encouraging canonical standardization only of technologies that have a strong consensus for interoperability.

The Working Group will encourage leveraging interoperability standard extension mechanisms to develop and share experimental projects and data with the community.

3.3 Goals

The primary goal of the Working Group is to gather requirements, use cases, and other insights and data to influence the evolution of existing standards (or the creation of new ones) to support the following requirements:

- The representation of complex static scenes, but also dynamic virtual worlds and interactive experiences including consistent presentation (live-rendering) and rendering out across different tools.
- The aggregation of scenes from objects represented in a number of formats, particularly existing standards, including 3D objects, audio, video, and other media types.
- Loading, editing and saving experiences/scenes, or portion thereof, concurrently and collaboratively using multiple authoring tools while the content is live, available and shared, (i.e. persistent).
- The definition of scene elements such as objects, geometry, materials, lights, physics, behaviors in a form that allows straightforward and lossless conversion between formats such as USD and glTF, or relevant subsets thereof.
- Leverage existing mechanisms to extend standards and open-source projects to experiment with advanced mechanisms such as procedural content generation systems, rigging, logic, interactivity frameworks, spatial audio and video streaming and identify those which show promise for standardization.
- Encourage data transformation mechanisms that can take generalized assets and procedurally generate platform-specific and optimized representations of the experience/scene for optimal runtime performance on each target platform.
- Work with SDOs to coordinate the extension of existing specifications, or the creation of new standards, to support scene layering and compositing which we consider a foundational enabler of interoperability for the metaverse.

3.4 Non-goals

The working group is not a SDO, therefore we will not directly design standard specifications; but we will work with SDOs to provide requirements, use cases, test data/results and other information to foster and assist their standardization efforts related to 3D asset interchange.

Asset validators and viewer/engine certification programs are also not part of our mandate as they are typically the responsibility of the SDOs managing the specification, but the working group may offer test assets for use in SDO programs.

4. Projects and Deliverables

Working Group project deliverables will broadly fall into the following five categories:

- Coordinated requirements to SDOs
- Test assets and testing results to SDOs
- Experimentation results and conclusions to SDOs
- Open Source Tooling
- Outreach and advocacy

The projects below are the first round of Working Group activities. New projects may be initiated without additional Oversight approval as long as they fall within the broad scope of this Charter and the deliverable categories above.

4.1 Lossless Asset Conversion Requirements

Collect and organize requirements and use cases to enable lossless conversion and round tripping of glTF through USD while preserving visual fidelity. The deliverable is a report of collected requirements and use cases, and recommendations for future work. The initial areas of focus are:

1. Animations
2. Materials and shading models
3. Behaviors
4. 3D objects including implicit geometry representations (e.g., subdivision surfaces)
5. Physics, with an initial focus on rigid body physics

The Working Group may add more areas to cover the convertible representation of all elements necessary for the creation of interactive experiences as it makes progress with these initial topics.

4.2 Scene Layering and Compositing Standardization Advocacy

Mechanisms to generate 3D virtual worlds and interactive experiences by layering and compositing various content elements will be a foundational building block of the metaverse—analogue to how HTML enabled the composition of 2D media elements into pages on the world wide web. The Working Group will attempt to contribute to the identification of a minimal viable scope of scene layering and compositing capabilities that should be included into a standard, and publish and propose its findings to SDOs.

4.3 Scalable Asset Distillation for Diverse Runtime Platforms

Exploration to enable optimal runtime performance of interoperable authored content in various environments, including existing native commercial platforms and browser-based 3D standards such as WebGL, WebGPU, and WebAssembly. Investigate best practices for optimizing 3D content representations to match the capabilities and performance requirements of diverse runtime platforms (a.k.a, cooking or distilling, support for optimized geometry or texture formats, LODs etc), and identify opportunities to create shared resources or techniques to automate and facilitate this process.

4.4 USD glTF Interoperability Test Bed

Coordinate the development of open source projects to test and exercise proposed requirements and recommendations for glTF and USD interoperability, and demonstrate their practicality and viability. For example, using an open-source glTF plug-in for the USD library that enables glTF assets as first-class citizens in USD compositions and enables bidirectional conversion between USD and glTF.

4.5 Asset Interoperability Open Source Infrastructure and Tooling

Analyze existing shared resources for open source and data repositories, and create a central hub that will list and signpost existing resources to encourage and support effective collaboration on asset interoperability. If needed, create new resources to support the mandate of the Working Group, including asset datasets, reference implementations, tools, validation and regression tests. Cooperation should be explored with the Forum Standards Register working group, and SDOs with established open source resources.

5. Milestone Plan

The pace at which we can generate consensus on proposals and projects is not yet known, but the intent is to release a pipeline of deliverables from Working Group projects, to demonstrate sustained progress and build increased interest and participation. Project deliverable milestones will often be tied to key industry events such as GDC, Siggraph, and Siggraph Asia. It is expected that the first project deliverables will be launched within 12 months of the Working Group's foundation.

6. Coordination

The Working Group will engage cooperatively with groups within and external to the Forum, including:

- Metaverse Standards Forum Domain Groups: e.g., Digital Asset Management, Avatars, and Digital Fashion
- Khronos 3D Formats working group, responsible for glTF
- Academy Software Foundation (ASWF), MaterialX, USD Working Group, OCIO, OTIO
- Web3D Consortium responsible for X3D & HAnim
- IDEA and OTOY regarding ITMF
- The OMA3 Asset Transfer Working Group
- ISO/IEC JTC 1/SC 29 responsible for the MPEG-I Scene Description
- Object-Based Media Working Group
- Open Geospatial Consortium [Geo for Metaverse Domain Working Group](#)

- 3GPP SA4 work on Media Capabilities for AR ([Link](#) to zip file with the Work Item Description)

7. Communication Plan

Effective outbound communication is vital to our mission. We will create and foster industry credibility by focusing on tangible deliverables and proactively communicating their availability and benefit to the community, often leveraging key industry events.

8. Risk Factors

This Working Group relies on the goodwill of many individuals and corporations whose trust, focus and interest in the group may fluctuate over time. This risk can be mitigated by strongly focusing on activities, projects, and deliverables where there is strong consensus and that produce immediate short-term benefits to participants.

Working Group participation can be time consuming. To mitigate that risk, the Forum and Working Group officers will aim to provide supportive resources to streamline participation overhead, increasing member ROI.

9. Working Group Reporting and Renewal

The long-term goals of this Working Group will require a sustained multi-year effort. To keep the Charter in sync with evolving member, community, and industry needs and to encourage ongoing engagement in oversight and direction we propose:

- 1) The Working Group Charter is renewed at least every 30 months (2-1/2 years)
- 2) Semi-annual reports to Oversight on Working Group progress towards goals and member participation
- 3) Annual reports to the Forum to be used as part of an overall Forum public annual report.

10. Project Funding and Resources

To foster efficiency and momentum, we propose dedicating two full time resources to assist and support the group's charter: one FTE to coordinate and support technical writing for proposals, and one FTE to coordinate and support technical deliverables. How we achieve this has yet to be determined pending the Forum's administrative structure and funding model post incorporation.