

X3D and glTF Features	Web3D Consortium	revised 3 November 2017
glTF (GL Transmission Format) is a specification for efficient transmission and loading of data to a GPU.		
X3D is a stable, proven, evolving file format and run-time specification allowing 3D scenes to be used by a wide variety of diverse applications.		
glTF binary is a file format for mesh, appearance and animation to be loaded directly on a GPU/CPU for a Web browser or other application.		
X3D similarly renders mesh and appearance, includes metadata and various extensions to support data interchange and future compatibility.		
X3D can be used by many 3D applications and Web browsers: viewers, authoring tools, text editors, 3D Printing apps, AR/VR, and XML tools.		
X3D is an appropriate choice for sharing interactive 3D scenes among multiple applications and preserving future archival compatibility.		
glTF is a changing format to support evolving GPU capabilities and future features might not guarantee backward compatibility.		
glTF is primarily used for moving low-level assets across the network (uri) that map directly to GPU data structures		
Technology Summaries and Feature Comparison		
X3D: A royalty-free open ISO-IEC standards file format and run-time architecture to represent and communicate 3D scenes and models.		
X3D: Data Interchange and Rendering format, useful for both general Web deployment and diverse 3D applications.		
X3D: Interoperability with other verticals and international Web standards.		
X3D: Metadata Support is thorough, working groups are currently mapping to external metadata vocabularies.		
X3D: Stable long-term archival stability and re-usability, two decades of proven capability.		
X3D: Ensure portability and consistency across multiple file formats, programming languages and platforms.		
X3D: Forward/backward compatibility and extensibility are specification goals that have been demonstrated successfully for 20 years.		
X3D: Strong intellectual property rights (IPR) policy, no cost-bearing patents allowed (royalty-free), IPR fully aligned with W3C Web standards.		
X3D: Strong community, wide industry compatibility, many importers/exporters, many standards-organization liaisons.		
X3D: Full Inline support for glTF features, especially compressed geometry plus advanced lighting model planned for X3D version 4.		
glTF: "a royalty-free specification for efficient transmission and loading of 3D scenes and models by applications."		
glTF: Transmission format designed for applications rendering using WebGL or OpenGL ES.		
glTF: A delivery format including optimized mesh, appearance and animation data for rendering, delivered from source to client.		
glTF: Backward compatibility, archivability, are not listed as specification goals.		
glTF: Strong community, excellent industry support.		
glTF: data structures include support for highly optimized geometry representations		
glTF: model requires external scene for lighting, rendering, viewing		
Feature	X3D Support V3.3 Full Profile	glTF Support (V2.0 binary + ASCII)
Triangular meshes	Yes	Yes
Points and lines	Yes	Yes
Quad meshes	Yes	No
Primitive shapes: box, sphere, cone, cylinder, text	Yes	No
NURBS curves and surfaces	Yes	No
CAD Structure (assemblies, parts, layers)	Yes	No
Animation (general)	Yes	Yes
Picking (touch/over TouchSensor, PickableGroup)	Yes	No
Clipping planes	Yes	No
Character animation (H-Anim): skeleton joints, skin mesh deformation	Yes	Yes
Morph targets	No	Yes
High-level reusable animation of humanoid bodies	Yes if using similar HAnim bodies	No
Scripting	Yes	No
Extensibility by authors (prototype mechanism)	Yes	No
Document metadata	Yes	Yes
Structured metadata	Yes	No
Annotation	Planned X3D v4.0; partial support now	No
Material	Yes	Yes
Physically Based Rendering	Planned X3D v4.0	Yes (e.g. metallic-roughness model)
Custom Shader	Yes (multiple shader languages supported)	No
Bump mapping	Planned X3D v4.0	Yes
Occlusion map	Planned X3D v4.0	Yes
Emissive map	Planned X3D v4.0	Yes
Normal map	Yes	Yes
Image (2D) texturing	Yes (image files or embedded pixel map)	Yes
Texture mapping	Yes	Yes
Volume (3D) textures, imaging	Yes	No
Movie (2D + time) texturing	Yes	No
Audio	Yes, spatialization improvements planned	No

Model loading and importing	Planned support for glTF, STL, PLY	No
Inline loading	Yes, other X3D	Yes, other glTF
Formats/encodings	ASCII (XML, ClassicVRML, JSON, languages) Binary .x3db, Efficient XML Interchange (EXI)	Binary & ASCII (JSON based)
Content security	Signature, encryption in X3DB (including Inline) including individual external XML documents (with convertability of other X3D encodings)	No inherent encryption, with individual external IETF JSON encryption, signature
Future issues to address for loading glTF as X3D Inline/ExternalGeometry/ExternalShape		
Transformation matrix, units, etc.		
Providing animation values into glTF model?		
Utilizing data-structure values within glTF model?		
Error detection and error handling mechanisms.		
Are there any specific glTF constructs that do not map to X3D capabilities (for example skin)?		
How to adapt SRC pre-compression techniques and corresponding X3D Binary Encoding goals		
glTF: proposed Draco extension by Microsoft provides further model compression		
glTF user interaction?		
X3D advanced lighting model to allow rendering of physically based materials: needed changes?		
Is current X3D lighting model incompatible or a subset of advanced features?		
References		
https://www.khronos.org/glTF		glTF Overview
https://github.com/KhronosGroup/glTF/tree/master/specification/2.0		glTF 2.0 specification
http://www.web3d.org/documents/specifications/19775-1/V3.3/index.html		X3D 3.3 specification
https://standards.ieee.org/downloads/3DBPWhitePaper.pdf		IEEE 3D Body Processing (3DBP) Paper
https://docs.google.com/spreadsheets/d/15wCQ8CHJnQD_tmwaRPF	(Requires access approval)	IEEE 3DBP Features of Interest
https://standards.ieee.org/develop/wg/3DBP.html		IEEE 3DBP WG