Open Standards Update
Vulkan, WebGL, ANARI, OpenXR
glTF and 3D Commerce
Khronos Connects Software to Silicon

Open interoperability standards to enable software to effectively harness the power of 3D and multiprocessor acceleration

3D graphics, XR, parallel programming, vision acceleration and machine learning

Non-profit, member-driven standards-defining industry consortium

Open to any interested company

All Khronos standards are royalty-free

Well-defined IP Framework protects participant’s intellectual property

Founded in 2000

>150 Members ~ 40% US, 30% Europe, 30% Asia
Khronos Active Initiatives

- 3D Graphics
  Desktop, Mobile, Web
  Embedded and Safety Critical

- 3D Assets
  Authoring and Delivery

- Portable XR
  Augmented and Virtual Reality

- Parallel Computation
  Vision, Inferencing, Machine Learning

Guidelines for creating APIs to streamline system safety certification
glTF 2.0 Scene Description Structure

- **.gltf (JSON)**
  - Node hierarchy, PBR material textures, cameras

- **.bin**
  - Geometry: vertices and indices
  - Animation: key-frames
  - Skins: inverse-bind matrices

- **.png**
- **.jpg**
- **.ktx2**
  - Textures

**Mandatory Metallic-Roughness Materials**

**Optional Specular-Glossiness Materials**

**Geometry**

**Texture based PBR materials**
glTF Draco Mesh Compression Extension

- glTF extension for compressed geometry
  - Typically 10-25x geometry size reduction

- Google Draco technology - designed for decompression efficiency and speed
  - [https://github.com/google/draco](https://github.com/google/draco)

- Draco geometry encoders and decoders in open source
  - C++ source code encoder
  - C++ and JavaScript decoders
  - [https://github.com/google/draco/tree/gltf_2.0_draco_extension](https://github.com/google/draco/tree/gltf_2.0_draco_extension)

- glTF Draco compression adoption is growing in tools, applications and engines
  - glTF pipeline, FBX2glTF, AMD Compressorator and glTF sample models

![Mesh Compression Ratios](chart.png)
glTF Universal Texture Extension

- Supercompressed textures that can be transcoded for native acceleration on any GPU
  - Eliminates need for multiple texture assets for different target platforms
- Uses ‘Basis Universal’ compression technology from Binomial
  - Compressed textures transcodable on-the-fly to native GPU-accelerated texture formats
  - RDO-encoded, block-compressed UASTC with optional zstd compression - for highest quality
  - Block-compressed ETC1S with custom LZ supercompression - for JPEG-sized textures
    - https://github.com/BinomialLLC/basis_universal
- KTX 2.0 container for consistent, cross-vendor asset generation and validation
  - Open source tools to create, transcode and upload to WebGL, OpenGL and Vulkan
    - https://github.com/KhronosGroup/KTX

Original Texture Assets (.png) → Encode and Supercompress → Universal Texture
Basis Universal supercompressed texture in KTX container

Transcode on-the-fly to platform-supported compressed GPU format
GPU-accelerated Texture
Desktop: BC1-5, BC7
Mobile: ETC1/2, PVRTC1/2, ASTC

OSS Tool: 'toktx'
OSS Tool: 'libktx'
Next Generation PBR
glTF Meeting 3D Commerce Requirements

glTF is evolving a series of new generation PBR materials that can be realistically and reliably displayed on multiple platforms.
... Working Together at Khronos on 3DCommerce

World-Leading 3D Technology Companies

World-Leading E Commerce Companies
3D Commerce Khronos Synergy

glTF Extensions  Viewer Certification  Asset Creation Guidelines

3D Asset Format

Interactive 3D on the Web

OpenXR™  Portable AR and VR Apps

Vulkan®  High-performance cross-platform 3D graphics

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Overview
HTC Announcement
Vulkan® Update
ANARI - Analytic Rendering API

**Scientific Visualization Portability**

Common API to describe objects in a scene

The renderer takes care of generating imagery

Ray tracing was catalyst to create a standard

But ANARI design will enable any style of renderer

Not limited to scientific visualization

E.g. Data Analytics and other domains with lots of data

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**Scene Graphs**

SciViz Apps and Engines

**Renderers:**

Intel OSPRay, Radeon ProRender, NVIDIA VisRTX etc.

**Acceleration APIs:**

Embree, OptiX, Radeon Rays, CUDA, OpenCL, Vulkan etc.

**Hardware:**

CPUs, GPUs etc.

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**Industry Support**

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Using Khronos standards help you sell into international markets and directly grow your business
Thank You! Any Questions?

Live Q&A on December 10th @ 10am Singapore time
(December 9th 6PM Pacific Time)

Contact us if you have any questions about participating in Khronos
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