Ecosystem Forum
SIGGRAPH, Los Angeles, July 2019

Thank You to the glTF BOF Presenters!

- **AGI, Ed Mackey**
- **Facebook, Renee Rashid**
- **Cesium, Omar Shehata**
- **DGG, Max Limper**
- **Uber, Georgios Karnas**
- **UX3D, Fabian Wahlster and Moritz Becher**
- **Esri, David Körner**
- **Sketchfab, Alban Denoyel**
- **Google, Adrian Perez**
- **Wayfair, Shrenik Sadalgi**

Agenda

- **Introductions**
- **Latest glTF developments**
- **CGI and 3D Commerce. Tammy Jacobson, Target**
- **Is runtime the new interchange format? Jules Urbach, CEO, OTOY**
- **Panel on Standards Organizations & 3D Formats**
  - George Percivall, CTO at Open Geospatial Consortium
  - Carol McDonald, Co-Chair, IEEE 3D Body Processing Industry Connections working group
  - Phil Spreier, Executive Director, 3D PDF Consortium
- **Open discussion on opportunities and issues in the glTF ecosystem**
  - What tools and workflows do you need that do not yet exist?
  - What issues are you facing deploying glTF?
  - How do YOU think that glTF should evolve?
    - Universal textures & KTX2 container
    - PBR Next
- **6pm Reception. Yes that means FREE BEER!**

Remember glTF 1.0???

October 2015 Press Release:

KHRONOS GROUP
CONNECTING SOFTWARE TO SILICON

Developers ▾   Conformance ▾   Membership

Khronos Finalizes glTF 1.0 Specification

Extensible format to enable ongoing innovation in 3D streaming and compression

HTML5DevConf– October 19th 2015 – San Francisco, CA –The Khronos Group, an open consortium of leading hardware and software companies, today announced that the glTF™ 1.0 (GL Transmission Format) royalty-free specification for transmission and loading of 3D content has been finalized for Ratification and is immediately available for use by tools and application vendors. glTF is an efficient, interoperable asset delivery format that compresses the size of 3D scenes and models, and minimizes runtime processing by applications using WebGL™ and other APIs. glTF also defines a common publishing format for 3D content tools and services. More information on glTF specifications and activities is available at: https://www.khronos.org/gltf/.

February 2016 version of
https://www.khronos.org/gltf/

three.js Loader
https://github.com/mrdoob/three.js/

CESIUM
It's the native format!
http://cesiumjs.org/

Microsoft
Babylon.js Loader (in development)
http://www.babylonjs.com/
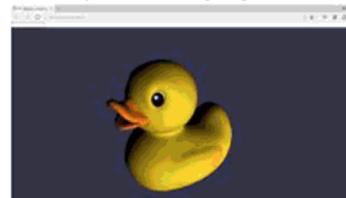
PIPELINE TOOLS
collada2gltf converter
https://github.com/KhronosGroup/glTF

Online drag and drop COLLADA to glTF converter
http://cesiumjs.org/convertmodel.html

FBX to glTF Convertor
(in development)
Drag and drop convertor coming
http://gltf.autodesk.io/

AUTODESK

glTF Today!

Late-breaking glTF projects #1058
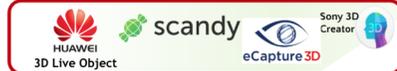
Open pjcozzi opened this issue on Aug 5, 2017 · 243 comments

glTF Tools
Converters, Importers, and Exporters

Tool	Input	Output	Description
Khronos Group Blender Importer/Exporter	glTF 2.0	glTF 1.0	Official importer/exporter, included with Blender 2.80 and higher
3DS Max Exporter	—	glTF 1.0	Export glTF files using BabylonJS plugin for 3DS Max 2015 or later
Maya Exporter		glTF 2.0	Export glTF files using BabylonJS plugin for Maya 2018 or later
Unity Exporter (Sketchfab fork)		glTF 1.0	Unity editor wizard that exports to glTF Format
Unity COLLADA & glTF Exporter Unity 5 & Unity 2017		glTF 1.0	Commercial unity asset store editor extension to export COLLADA and glTF via collada2gltf
Sketchup export and import	—	glTF 1.0	Separate extensions for export and import
PBR extension for SketchUp	SKP	glTF 2.0	PBR Material Editor, glTF Exporter, PBR Viewport
obj2gltf	OBJ	glTF 1.0	Command-line converter
Kupoman blendergltf	—	glTF 1.0	glTF exporter for Blender aimed at streaming scenes to other applications
ksons Blender Importer	glTF 2.0	—	Blender importer for glTF 2.0 (alpha)
BlackThread.io converter	Multiple	glTF 1.0	Online drag and drop converter powered by

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Blender 2.80 Supports Full glTF Import/Export

Project driven by Mozilla, Khronos and the glTF community

https://docs.blender.org/manual/en/2.80/addons/io_scene_gltf2.html

Blender's Principled BSDF Shader node maps to glTF's PBR materials

Welcome Autodesk to Khronos!

KHRONOS® GROUP
CONNECTING SOFTWARE TO SILICON

Developers ▾   Conformance ▾   Membership ▾

Autodesk joins The Khronos Group; glTF gains momentum

🕓 July 24, 2019   🏷 Members

Big news! 3D software developer, Autodesk has joined the Khronos Group. Autodesk is an industry-leading provider of 3D design, engineering and entertainment software, that joined the 3D Formats Working Group to support the Khronos glTF file format and the 3D Commerce Exploratory Group, a group of companies exploring standards and guidelines for the production and distribution of real-time 3D representations of products. glTF is an open standard for efficient and reliable encapsulation and transmission of 3D assets and scenes, including PBR materials and animations.

AUTODESK.

Universal Textures for glTF

- **Fragmentation of GPU texture formats is significant issue for developers**
  - Binomial's 'Basis Universal' technology enables JPEG-sized texture assets
  - Transcodable on-the-fly to natively supported compressed GPU formats

- **glTF Universal Texture extension uses KTX2 as a flexible container**
  - Precisely defined specification for consistent, cross-vendor generation and validation
  - Can contain wide range of texture formats used in Vulkan/DirectX/Metal
  - Supports streaming and full random access to MIP levels
  - Subset of full KTX2 - mandating supercompressed textures using Basis Universal technology

Original Texture Assets (.png) → Encode and Supercompress → Universal Textures KTX2 Container with Basis Universal - compressed payload → Transcode to GPU formats → GPU-accelerated Texture

Encoding decoupled from target device. One encode pass per texture asset

Transcode *on-the-fly* to a natively supported *compressed* GPU formats
Desktop: BC1-5, BC7
Mobile: ETC1/2, PVRTC1, *ASTC
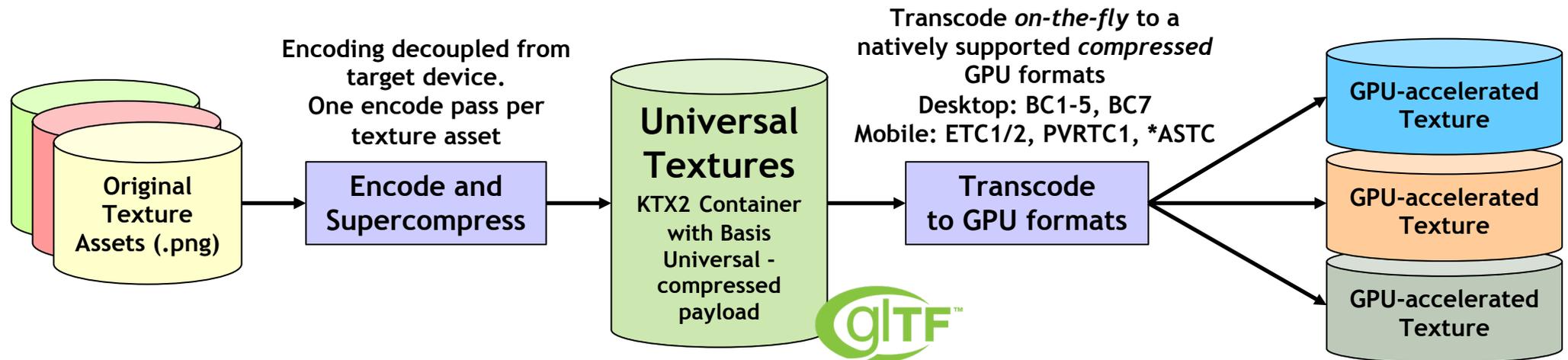
*ASTC support in development

Compare File Sizes: 512 x 768 RGB Photo

CGI and 3D Commerce

Tammy Jacobson, Target

Is runtime the new interchange format?

- **gITF is designed for efficient runtime, but we are seeing import, archive, and "light" interchange usage**
  - Robustness
  - Binary
  - Open standard
  - Precision
  - Feature rich enough?

Panel on Standards Organizations & 3D Formats

- George Percivall, CTO at Open Geospatial Consortium
- Carol McDonald, Co-Chair, IEEE 3D Body Processing Industry Connections working group
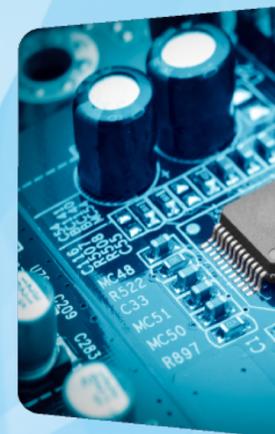- Phil Spreier, Executive Director, 3D PDF Consortium
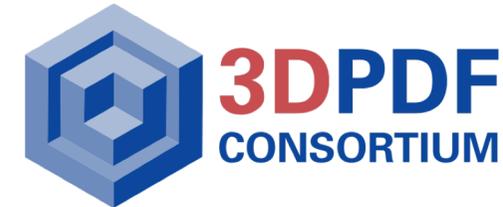
Open Geospatial Consortium (OGC)

Innovation – Interoperability – Collaboration

3D Tiles – OGC Community Standard

George Percivall, CTO Chief Engineer

IEEE INDUSTRY CONNECTIONS 3D BODY PROCESSING (3DBP)

Carol McDonald – Gneiss Concept

IEEE 3DBP IC WG
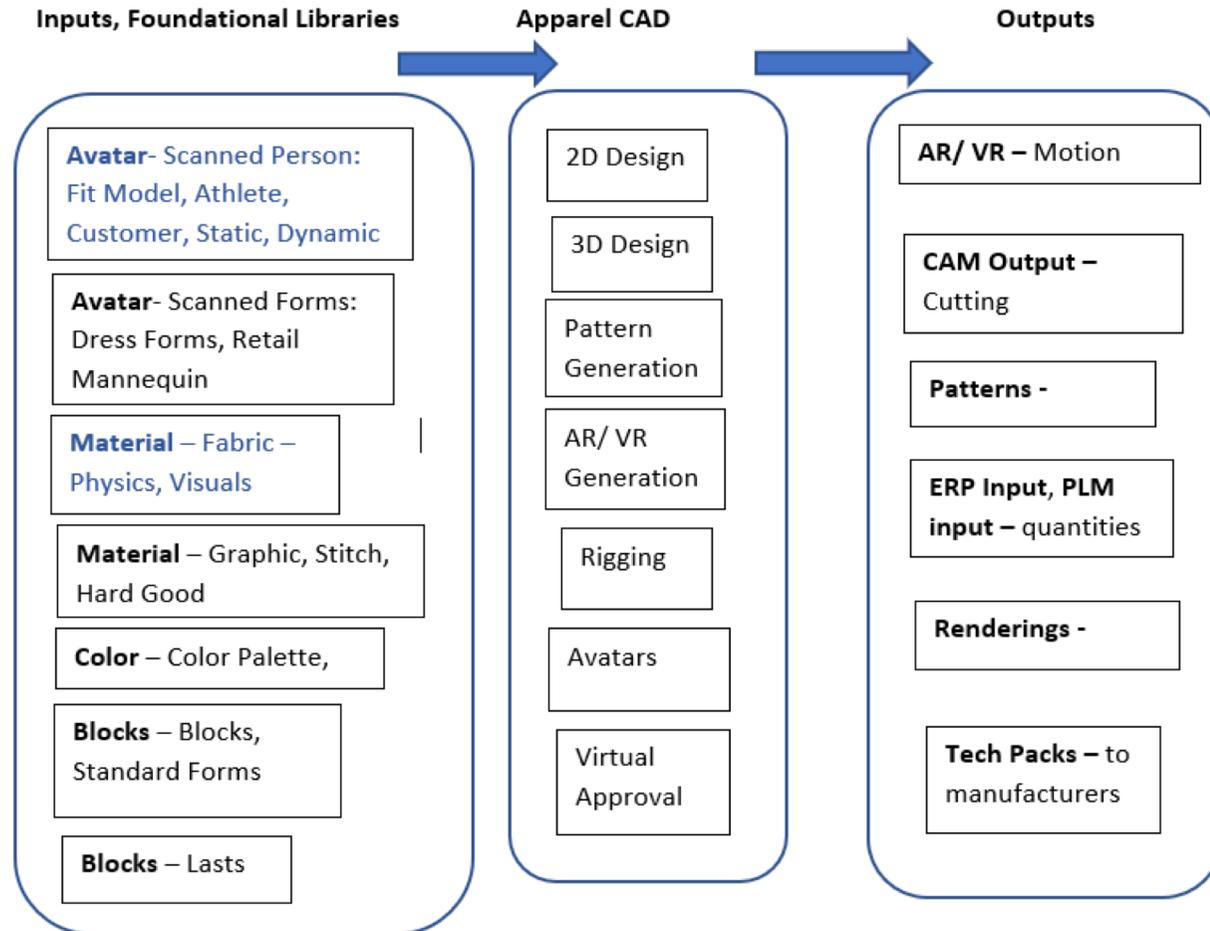
https://standards.ieee.org/industry-connections/3d/bodyprocessing.html

The motivations and goals of this program are to bring together diverse stakeholders from across technology, retail, research and standards development to build thought leadership around 3D body processing technology standards in areas such as 3D capture, processing, storage, sharing and (augmented) representation.

Retail Environment

Inputs, Foundational Libraries	Apparel CAD	Outputs
Avatar- Scanned Person: Fit Model, Athlete, Customer, Static, Dynamic	2D Design	**AR/ VR –** Motion
Avatar- Scanned Forms: Dress Forms, Retail Mannequin	3D Design	**CAM Output –** Cutting
Material – Fabric – Physics, Visuals	Pattern Generation	**Patterns -**
Material – Graphic, Stitch, Hard Good	AR/ VR Generation	**ERP Input, PLM input –** quantities
Color – Color Palette,	Rigging	**Renderings -**
Blocks – Blocks, Standard Forms	Avatars	**Tech Packs –** to manufacturers
Blocks – Lasts	Virtual Approval	

Gneiss Concept

- IEEE 3DBP Working Group Co-chair

- Focus of improving existing made-to-measure techniques or employing the latest mass customization strategies

- Experience
  - 30 years of experience in New Product Introduction Engineering and Sustaining Engineering for Consumer, Medical, Testing equipment and Fitness products. Lean Manufacturing focus
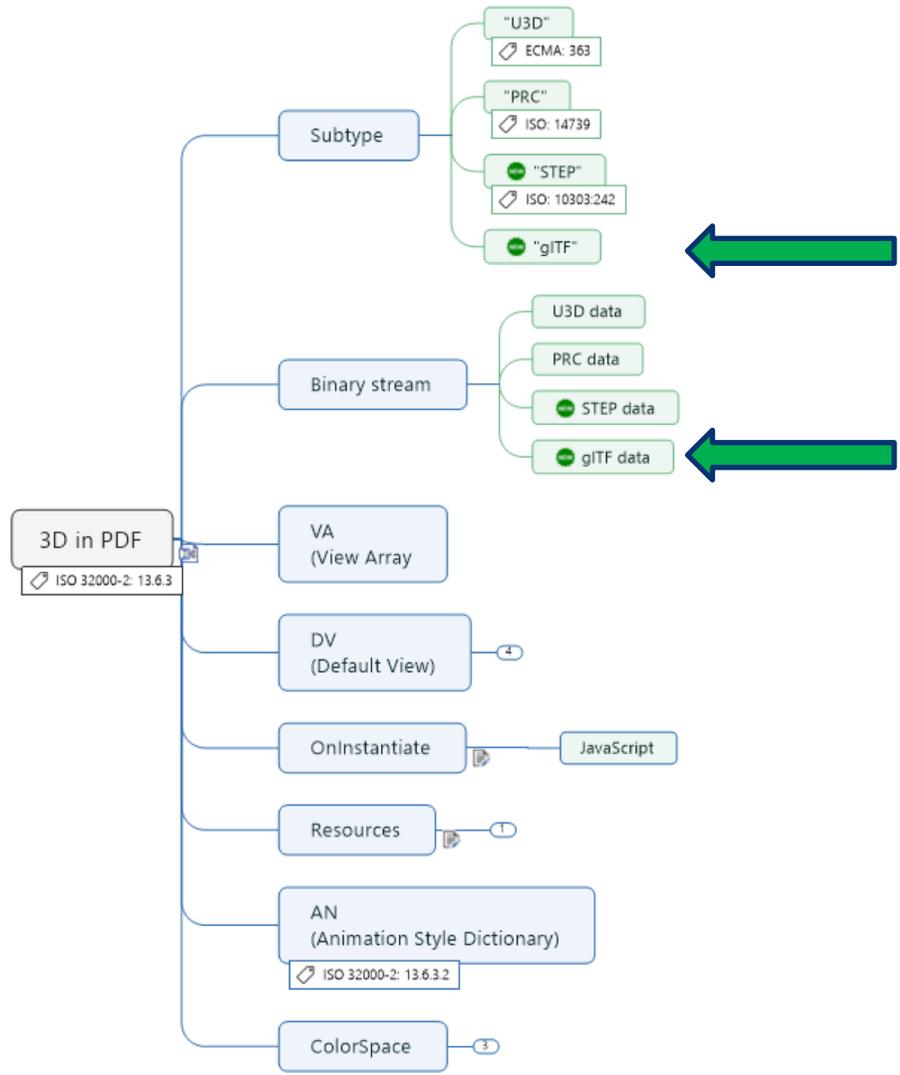
3D PDF CONSORTIUM

A worldwide, non-profit community dedicated to driving adoption of **3D PDF** across industries	The recognized **experts** in 3D PDF	The ANSI accredited ISO standards developer for PDF **TC 171 SC 2**

aras corp

NATIONAL ARCHIVES

PROSTEP

PURDUE POLYTECHNIC

AFPConsortium — Advanced Function Presentation

ITI — International TechneGroup

Adobe

Theorem Solutions

ANARK

PDF association

BOEING

datakit

TECH SOFT 3D — Dependable. Dynamic. Durable.

ELYSIUM

PDFTRON

NIST

gITF AND PDF

Proposal

3D PDF USE CASES
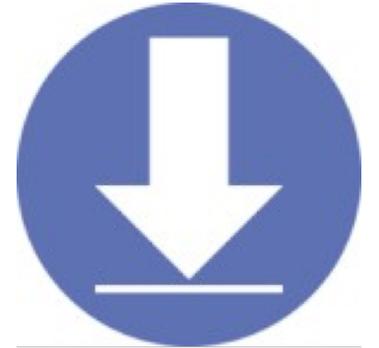
The delivery mechanism for a model base enterprise

Archival / Retention

Delivery / Access to Co-Production Partners

Delivery / Access to Customers

Delivery / Access to Suppliers & Shopfloor

Discussion Topics

- PBR Next and rich material standardization
- Consistency and efficiency
- More primitive types/LOD but without descending into interchange format hell
- Universal textures & KTX2 container
- **USD to glTF tool flow**
- **Metadata**
- **Instancing**
- **CAD/BIM models**
- **Encryption and security - native or container**
- **Spheres and cylinders for molecular modelling**
- **Mesh compression**
- **Streaming of large models - geospatial**

Universal Textures – Get Involved!

- **Design discussions**
  - https://github.com/KhronosGroup/glTF/pull/1612

- **Khronos open source tools**
  - https://github.com/KhronosGroup/KTX-Software/tree/ktx2
  - toktx - create a KTX2 file from a set of .png images
  - ktxsc - convert images in KTX2 file to supercompressed images using Basis transcoder

- **Ecosystem forming around KTX2**
  - Khronos glTF texture tool with GUI for generating supercompressed textures
  - Increasing number of run-times integrating prototype KTX2 support

Applications and engines with prototype KTX2 support

https://www.khronos.org/assets/uploads/developers/library/2019-siggraph/
glTF-KTX2-Basis-SIGGRAPH_Jul19.pdf

KTX2 and .basis files

BINOMIAL

'Basis Universal' texture compression technology

Enables JPG-sized textures that can be transcoded on-the-fly to natively supported *compressed* GPU formats
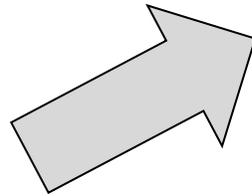
Binomial and Google open sourced 'Basis Universal' compressor and transcoder

C++ or WebAssembly code for handling '.basis' format textures in native apps and web sites

https://github.com/binomialLLC/basis_universal

Fine if you are in full control of your texture assets and rendering
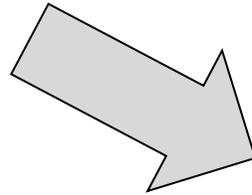
Binomial's 'Basis Universal' technology contributed to glTF

Rigorously-defined KTX2 container format supports wide range of texture formats used in Vulkan/DirectX/Metal with streaming and full random access to MIP levels
glTF extension uses KTX2 subset with supercompressed payload using Basis Universal Technology

Great for cross-vendor distribution of textures to multiple applications and engines

glTF™

Next Generation glTF PBR Materials

- **Demand for advanced PBR for photorealistic assets**
  - Beyond current 'Metallic-Roughness' and 'Specular-Glossiness'
  - E.g. Absorption/attenuation, clear coat, subsurface scattering, anisotropy

- **Extending Metallic-Roughness parameters**
  - Consistency and fallbacks for performance for any device

- **Inspiration from Dassault Systèmes Enterprise PBR Shading Model (DSPBR)**
  - https://github.com/DassaultSystemes-Technology/EnterprisePBRShadingModel/tree/master/gltf_ext

- **Wide industry collaboration for compatibility**
  - Dassault Systèmes
  - Google Filament
  - Microsoft BabylonJS
  - NVIDIA MDL
  - OTOY Octane

Images from https://dassaultsystemes-technology.github.io/EnterprisePBRShadingModel/

Join the GitHub Discussion!
https://github.com/KhronosGroup/glTF/issues/1442