gltf Webinar | Fall 2022

How Do We Solve the Challenges of glTF Asset Creation?
November 2022
How to Participate

• Speaker Questions
  - During the presentations, please submit your questions to the speakers by using the Zoom Q&A feature, not the chat button. At the end of the talk, our moderator will put as many questions as possible to the speaker.

• Recording
  - We are recording this webinar and will be sharing it via the event page on the Khronos website. A direct link will be posted in chat.

• Survey
  - To help us design future glTF events, we would appreciate it if you could complete the short survey form that will pop up at the end of the webinar. The survey link will also be sent out in our follow up email.
Today’s Agenda

● Eric Chadwick - About me:
  ○ Staff Technical Artist, Wayfair
  ○ Real-time 3D and rendering pipelines
  ○ Co-Chair @ 3D Commerce Asset Creation TSG

1. Asset Creation introduction - Eric Chadwick
2. Building a Scalable Pipeline - Paweł Nikiel
3. Conforming to Requirements - Max Limper
4. Validating Assets - Mike Festa
5. Open Discussion / Q+A
Diverse Technology and E-commerce Companies Working Together
3D Commerce Deliverables

**Material Variants**
Efficient transmission of many e-commerce products

**Metadata**
Supports for XMP Extensible Metadata Platform ISO 16684-1 to hold consistent data for product discovery, dimensions, how a virtual product interacts with the physical world, defining variants, etc.

**PBR Materials**
Transmission
- Clearcoat
- Sheen
- Refraction
- Specular Color
- Color Attenuation
- Volumetric Properties

**Consistent Asset Creation**
Free guidelines for tools and product designers to create high-quality real-time 3D models for e-commerce

**3D Commerce Viewer Certification Program**

**Rendering Technologies**
- Retailer 3D Viewers
- Open-Source 3D Viewers
- Non-retailer 3D Viewers

**End User Experiences**
On the Web and in Apps
- Retailer Web Storefronts
- Non-Retailer Web use cases
- Social, Ads, Search...
- Brands / Manufacturers
- Future Experiences
- Web, Apps, Mobile, AR...

**How to use KTX 2.0**
Supercompressed textures for minimized glTF download size at high quality

**Next Steps**

- Iridescence, subsurface scattering, anisotropy, interactivity & behaviors
- Open-source asset checker tool in design to guide creation and assess compliance of reliable e-commerce 3D assets
- Certification to go beyond testing rendered pixels and achieve ecosystem consistency around tone mapping and display calibration

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Delivering at Scale

- How to scale your delivery capabilities
  - Asset Journey
  - General Flow
  - Changes in the Approach

- Paweł Nikiel - About me:
  - Director of Technology @ CGTRADER
  - Contributor to 3D Commerce & 3D Format WGs
  - Over 10 years of experience in 3D art, VR & AR development, pipeline & automation, data visualization
  - Working with everything interactive
TRANSITION

CONTROLLED ECOSYSTEM

DCCS
BLENDER
SOLIDWORKS

3DS MAX
ETC.

FLEXIBILITY

FORMATS
USD
JT

FBX
ETC.

EXPECTATIONS

BEST POSSIBLE RESULTS

IF USER INPUT IS AVAILABLE -> ALLOW INTERACTIONS

IF BANDWIDTH IS A FACTOR -> MINIMIZE

IF PERFORMANCE IS A FACTOR -> OPTIMIZE

IF HARDWARE / NETWORK IS NOT LIMITING -> REACH UNCANNY VISUAL QUALITY

CONSISTENCY

ASSET CREATION GUIDELINES

ASSETS VALIDATION TOOLS

VIEWER CERTIFICATION PROGRAM

PREDICTABLE FORMAT
DISTILLATION

AUTHORING
CONTROLLED ECOSYSTEM

FLEXIBILITY

DELIVERY
 EXPECTATIONS

BEST POSSIBLE RESULTS

- IF USER INPUT IS AVAILABLE --> ALLOW INTERACTIONS
- IF BANDWIDTH IS A FACTOR --> MINIMIZE
- IF PERFORMANCE IS A FACTOR --> OPTIMIZE
- IF HARDWARE / NETWORK IS NOT LIMITING --> ACHIEVE UNCOMPROMISING VISUAL QUALITY

CONSISTENCY

- ASSET CREATION GUIDELINES
- ASSET VALIDATION TOOLS
- VIEWER CERTIFICATION PROGRAM
- PREDICTABLE FORMAT

DISTILLATION

GLTF

EFFORT

AUTOMATION

PLATFORMS --> WWW = WILD WILD WEST

MOBILE
CLOUD
AR
VR

EYEWEAR
PC
HAPTIC TOOLS

VR RIG
ETC.
**Delivery process and scale**

**Scenarios:**

**Single small studio**  
(600 assets/month, custom requirements, in-house/freelance team, manual checks)

**One company scope**  
(6,000 assets/month, same requirements, freelance team, partial automation checks)

**Multiple company scope**  
(60,000 assets/month, different requirements, freelance community, full automation checks)
Changes while moving to high scale

- Single unit/batch approach
- Assembly line process (factory)
- Project management
- Process management
- Custom inputs
- Standardized of inputs
- Custom outputs delivered by designers
- Standardized outputs generated by automation
Delivery at scale - perfect case scenario

**Design Phase** - Best for designers to provide always same deliverables

**QA phase** - Validation and QA workflow - support for thousands of designers and multiple workflows in parallel

**Delivery phase** - Need to convert to different outputs
Conforming to Requirements

- How to make 3D assets fit different requirements?
  - Software
  - Hardware
  - Application

- Max Limper - About me:
  - Main focus: automating 3D data processing
  - Co-Chair @ 3D Commerce Asset Creation TSG
  - Co-founder & CEO @ DGG, makers of RapidCompact

Visit us at SIGGRAPH 2022!
Booth #734
https://rapidcompact.com/siggraph/
Many Publishing Targets

Cp. Khronos 3D Commerce Asset Creation Guidelines v1.0 (section: Publishing Targets)
# Hardware & Bandwidth Constraints

<table>
<thead>
<tr>
<th>Publishing Target</th>
<th>Max. Target File Size</th>
<th>Max. Target Triangle Count</th>
<th>Target (Max) Number of Draw Calls</th>
<th>Max. Target Bitmap resolution, to meet bandwidth requirements (JPG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Item Mobile AR or 3D Web Catalogue View</td>
<td>3MB</td>
<td>150,000</td>
<td>&lt;20 (500)</td>
<td>2K</td>
</tr>
<tr>
<td>Banner Ad View</td>
<td>500KB</td>
<td>30,000</td>
<td>&lt;5 (100)</td>
<td>512</td>
</tr>
<tr>
<td>Web-based Planning Tool (recommendations for one out of multiple items)</td>
<td>1MB</td>
<td>40,000</td>
<td>&lt;5 (50)</td>
<td>1K</td>
</tr>
<tr>
<td>Single-Item Desktop 3D Web View</td>
<td>3MB</td>
<td>250,000</td>
<td>&lt;100 (800)</td>
<td>2K</td>
</tr>
<tr>
<td>Offline Rendering</td>
<td>No Limit</td>
<td>No Limit</td>
<td>No Limit</td>
<td>No Limit</td>
</tr>
</tbody>
</table>

Compression Example

Experiment: Different texture image encodings for “Stained Glass Lamp” model
Software & Format Requirements

- Portability across platforms?
  - glTF extensions
  - Formats: glTF (non-iOS) & USDZ (iOS)

- glTF extensions: Support & fallbacks
  - Rendering with fallbacks = usually different
  - Design decision (which extensions to use)

- USDZ on iOS: Limited material effects
  - USD format by itself = more powerful
  - iOS implementation = de facto “standard”
  - Distillation from glTF to use USDZ fallbacks

KHR_materials_variants
KHR_materials_transmission
Conforming to Requirements: Summary

- **Challenges**
  - Large number of publishing targets
  - Hardware & bandwidth constraints
    (mesh/texture resolution, MB size, ...)
  - Various software / format requirements
    (glTF extensions, USDZ on iOS vs. glTF elsewhere, ...)

- **Solutions**
  - Automated pipelines for 3D data processing & optimization
  - Definition of publishing targets (Asset Creation Guidelines)
  - Definition of fallback mechanisms & 3D viewer conformance
Creating and Validating Assets

- Create 3D models once that can be used everywhere
  - Creation Process
  - Use Cases
  - Asset Validator Project

- Mike Festa - About me:
  - Software Developer / Entrepreneur
  - Founded Wayfair Next in 2015
  - Founded 3XR in 2019
  - Latest project: 3dmf.com
Assuring Asset Quality during Creation

Quality Assurance – A key step in the Asset Creation Process consuming significant time & cost

Over 30 Major Parameters for Quality Assurance of an Asset e.g.
- Color Hue, Saturation/Lightness
- Pattern & Texture: Metalness/Roughness
- Shape/Dimensions
- Normal Map/Height Map
- Transparent/Transmissive/Opaque
- Scale/Pivot/Orientation etc.

15-20% of Effort in Asset Creation goes to Quality Assurance

QA using an Automated Asset Validation Tool
- An open-source tool by Khronos to enhance the Asset Creation Efficiency

Source: SuperDNA 3D Lab Analysis

Asset Creation Workflow

Source File → Model development → Model QA → Texturing & Lightning → Texturing QA → Final QA & Delivery → QA by Client

Rejected
Asset Validation

Motivation:

- Brands market and sell their products across many different channels.
- Advertisers and retailers have different requirements for 3D files based on their unique balance between quality and performance.
- Investing in 3D is too expensive if new models are required for each use case.
3DC Asset Validator

Javascript package for checking a 3D Model against a Schema Definition

Khronos 3D Commerce Asset Validator

SPDX-License-Identifier: Apache-2.0

This is a work in progress.

This is a typescript package that contains classes for checking a 3D file, currently only in glTF format, against a 3D Commerce use case schema definition in JSON.

This package is used for both a command line interface, as well as a front-end web interface, published separately.

Attributes Checked

- File size
- Triangle count
- Material count
- Object count
- Dimensions match product
- Texture resolution
- Texel density (px per meter)
- PBR safe colors
- UV layout in 0-1 range
- Overlapping UVs
- Inverted UVs
- Proper transforms
- Beveled edges
- Manifold edges
3DC Asset Validator

2 sample integrations for using the NPM package:

**Web Browser**

- **Code:** [https://github.com/MikeFesta/3dc-validator-web](https://github.com/MikeFesta/3dc-validator-web)
- **Demo:** [https://mikefesta.com/3dc-validator/](https://mikefesta.com/3dc-validator/)

**Command Line Interface (node)**

[https://github.com/MikeFesta/3dc-validator-cli](https://github.com/MikeFesta/3dc-validator-cli)
Ask the Experts

Use the Zoom Q&A feature to ask your questions
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