Best Practices for Compressing glTF Textures

Which to Use and When

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- **DGG roles:**
  - **Client project support**
  - **Product owner for RapidPBR**
  - **Community support & engagement**
- **Game development background**
- **Previously at Wayfair**
- **Khronos Group standards development**

Best Practices for Compressing glTF Textures
Overall Takeaways

1. **Delivery?** — **WEBP for everything, JPEG or PNG for normal maps**
2. **Multi-Asset?** — **KTX2 for everything**
3. **Translation?** — **PNG for everything**

Three Issues

1. Asset File Size

Downloading quickly to the user

2. GPU Upload

Loading/unloading constantly

configurators, room planners, geospatial

3. GPU Memory

Rendering multiple models at once

configurators, room planners, geospatial

Strengths & Weaknesses

- Lossless
- Large (depends)
- Uncompressed on GPU
- Alpha channel
- Best support

- Single models
- Highest quality
- Best compatibility

- Lossy
- Small
- Uncompressed on GPU
- No alpha
- Best support

- Single models
- Smaller download
- Best compatibility

- Very Lossy
- Tiny
- Uncompressed on GPU
- Alpha channel
- Extension required

- Single models
- Tiny download

- Lossy
- Medium
- Compressed on GPU
- Alpha channel
- Extension required

- Configurators, Geospatial
- Faster loading
- UASTC best

General Recommendations

- Lossless
- Large (depends)
- Uncompressed on GPU
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- Best support

- Single models
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Lossiness

▪ Lossless	▪ Lossy	▪ Very Lossy	▪ Lossy
▪ Large (depends)	▪ Small	▪ Tiny	▪ Medium
▪ Uncompressed on GPU	▪ Uncompressed on GPU	▪ Uncompressed on GPU	▪ Compressed on GPU
▪ Alpha channel	▪ No alpha	▪ Alpha channel	▪ Alpha channel
▪ Best support	▪ Best support	▪ Extension required	▪ Extension required

Lossiness: Normal Bump Textures

FlightHelmet asset from Microsoft, public domain

png
file size: 3.32 mb
memory: 21.33 mb

jpeg 100
file size: 3.18 mb
memory: 21.33 mb

webp 100
file size: 0.17 mb
memory: 21.33 mb

ktx2 uastc
file size: 4.00 mb
memory: 4.00 mb

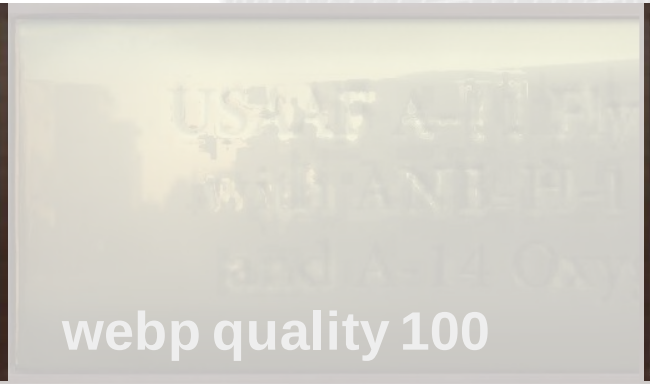
2048 x 2048
24 bits per pixel

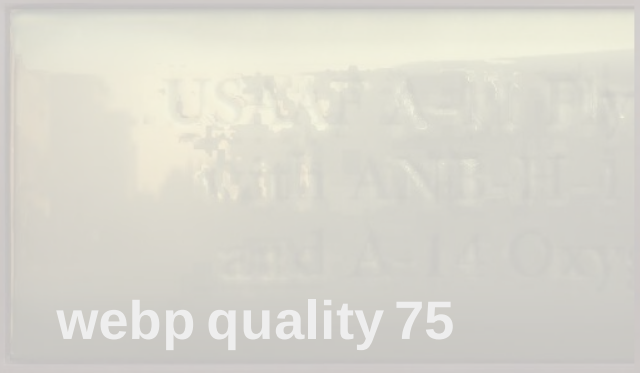
jpeg 75
file size: 0.41 mb
memory: 21.33 mb

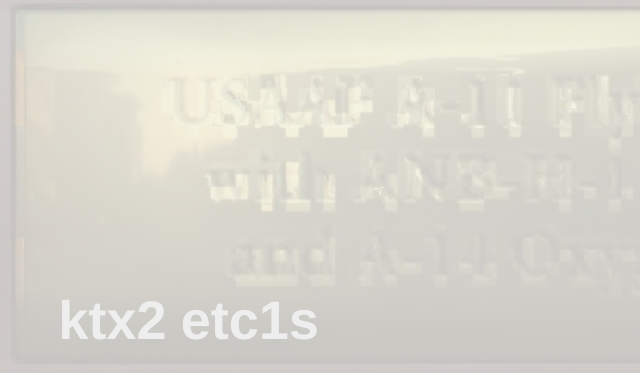
webp 75
file size: 0.14 mb
memory: 21.33 mb

ktx2 etc1s
file size: 0.31 mb
memory: 4.00 mb

Lossiness: Normal Bump Textures







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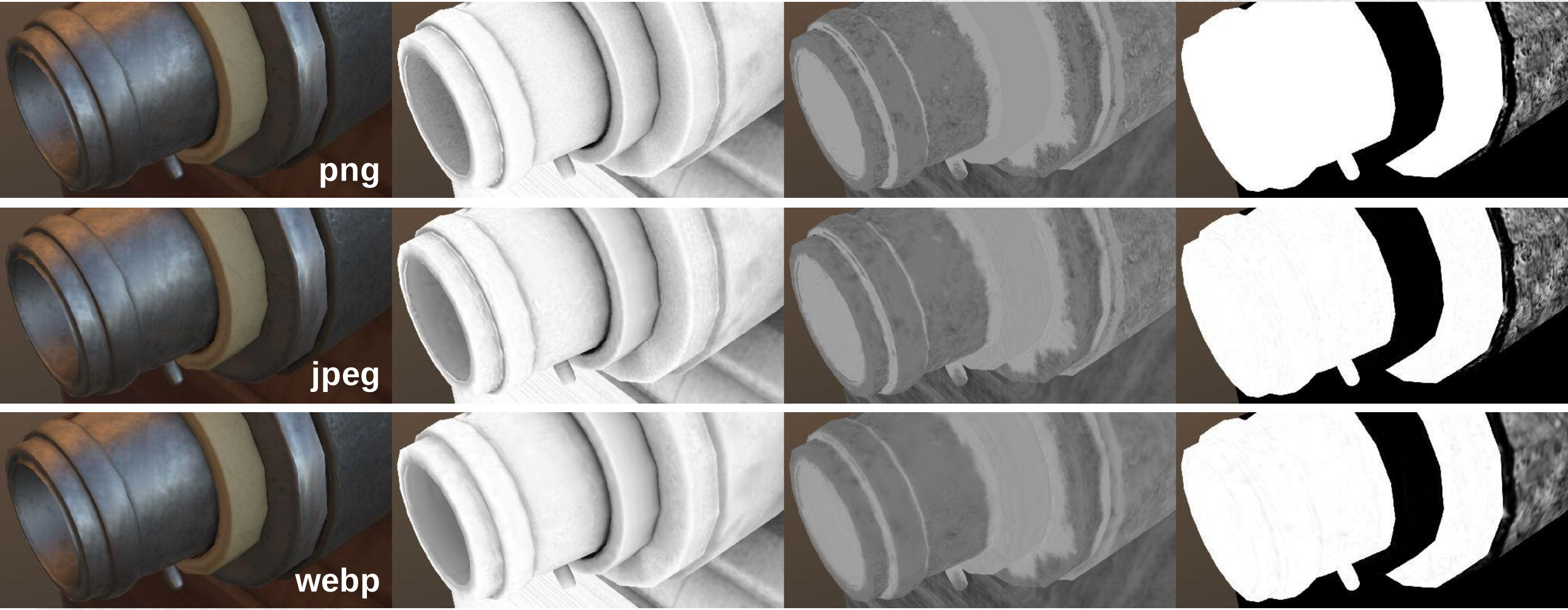
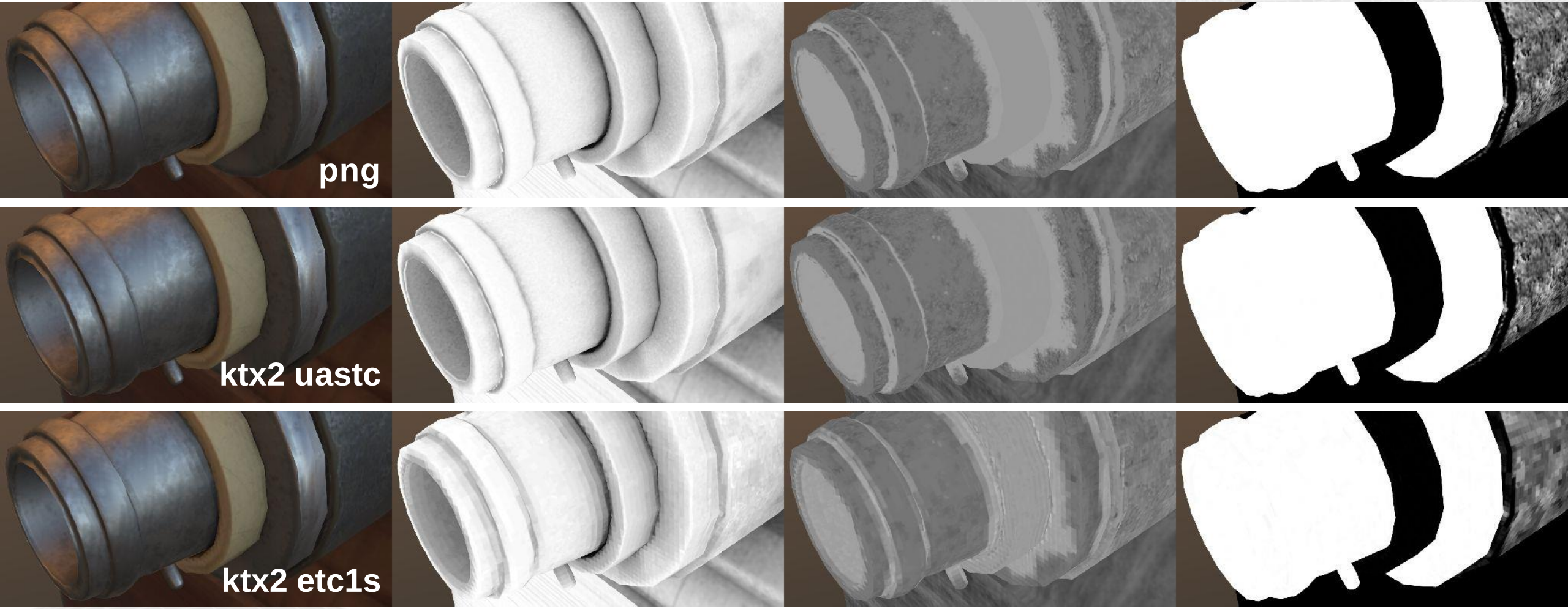
Lossiness: Occlusion-Rough-Metal for Single Models



2048 x 2048
24 bits per pixel

png	file size: 2.84 mb	memory: 21.33 mb
jpeg	file size: 0.68 mb	memory: 21.33 mb
webp	file size: 0.32 mb	memory: 21.33 mb

Lossiness: Occlusion-Rough-Metal for Multiple Models



2048 x 2048
24 bits per pixel

png	file size: 2.84 mb	memory: 21.33 mb
ktx2 uastc	file size: 4.00 mb	memory: 4.00 mb
ktx2 etc1s	file size: 0.40 mb	memory: 4.00 mb

Strengths & Weaknesses

- Lossless
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- Lossy
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Alpha Channel

PNG	JPEG	WEBP	KTX2
Lossless	Lossy	Very Lossy	Lossy
Large (depends)	Small	Tiny	Medium
Uncompressed on GPU	Uncompressed on GPU	Uncompressed on GPU	Compressed on GPU
Alpha channel	**No alpha**	**Alpha channel**	**Alpha channel**
Best support	Best support	Extension required	Extension required

When do you need an alpha channel?

1. Alpha_Coverage (Blend, Cutoff)
2. Sheen sheenRoughnessTexture
3. Specular specularTexture
4. EXT_lights_image_based (RGBD)
5. MSFT_packing_normalRoughnessMetallic

Rendering Support

▪ Lossless	▪ Lossy	▪ Very Lossy	▪ Lossy
▪ Large (depends)	▪ Small	▪ Tiny	▪ Medium
▪ Uncompressed on GPU	▪ Uncompressed on GPU	▪ Uncompressed on GPU	▪ Compressed on GPU
▪ Alpha channel	▪ No alpha	▪ Alpha channel	▪ Alpha channel
▪ **Best support**	▪ **Best support**	▪ **Extension required**	▪ **Extension required**

Which renderers support WEBP and KTX2?

Babylon.js	**WEBP**	**KTX2**	(6.6.1)
Cesium	**WEBP**	**KTX2**	(1.106.1)
Filament	~~**WEBP**~~	**KTX2**	(1.36)

glTF Sample Viewer	**WEBP**	**KTX2**	(1.0.10)
model-viewer	**WEBP**	**KTX2**	(1.36)
Three.js	**WEBP**	**KTX2**	(r158)

Overall Takeaways

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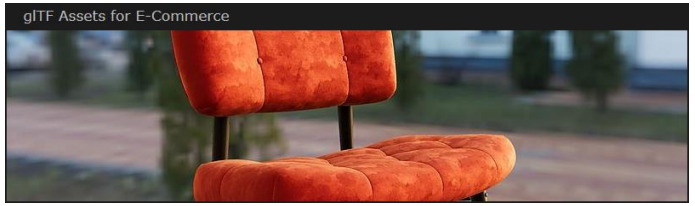
2. Multi-Asset? KTX2 for everything
3. Translation? PNG for everything



https://ericchadwick.com/gltf

Many thanks for your attention!

Questions?