ARNOLD TO RADEON PRORENDER CONVERSION REPORT

Version 2.4, 15 February 2019 (all reports)

This report summarizes results of tests made to convert Arnold nodes to Radeon ProRender nodes.

- **Software**: Maya 2018, Arnold 3.1.2.1, ProRender 2.5.245
- **Hardware**: Ryzen 1700x, i5 7500, i7 6700k

SUMMARY

For the report, **108** Arnold nodes within **7** node groups has been tested in total. The results of conversion are as follows:

- CONVERTIBLE: **26 nodes** (**24%**), see details
- PARTIALLY CONVERTIBLE: **17 nodes** (**16%**), see details
- NOT CONVERTIBLE: **46 nodes** (**43%**), see details
- RESEARCH IS NEEDED: **19 nodes** (17**%**), see details

This week, we focused on bug fixes and additional nodes and materials. We adjusted emissive weight values in the ProRender Uber material to slightly better match Arnold emissive. New nodes and materials are aiBlackBody, aiToonShader, aiNegate, aiSqrt, and aiComposite.

To fix some issues, we came up with a formula for converting all Maya standard lights to ProRender Physical lights. We also plan to add this formula to ai area light in the near future. 2d bump and ai 2d bump nodes strengths were adjusted to better match results.

Currently, we are researching Displacement strength values and how to get better conversion results.

REPORT DETAILS

In this report:

HISTORY

v.1.0 - first version.

v.1.1 - aiStandartSurface support.

v.1.2 - displacement, bump2d conversion.

v.1.3 - aiSkyDomeLight and aiAreaLight support.

v.1.4 - Opacity reverse node, rotate IBL and aiPhysicalSky support.

v.1.5 - aiPhotometricLight support.

v.1.6 - Fix ies light position; aiStandartVolume, aiMixShader, aiFlat, aiSky, aiAdd, aiSubstract, aiDivide, aiMultiply support.

v.1.7 - Fix bug with channel converting, fix bug with creating extra materials.

v.2.0 - Rewritten to python, update material conversion.

v.2.1 - aiMath nodes support, aiImage and aiFacingRatio conversion support, aiAmbientOcclusion material conversion support, Improve metalness, coat, subsurface and normal map conversion in aiStandartSurface, improve displacement conversion, fixed issue with group of lights, fixed issue with unassigned materials with shadow catcher

v.2.2 - Fixes for aiSkyDome intensity, fixes for Maya 2d bump not being converted to correct ProRender Bump or Normal nodes, fixed thickness Values and color when converting aiStandardSurface material using Coat, added aiColor convert utility node, converts to Maya RGB to HSV and HSV to RGB utility nodes, added conversion of aiShadowMatte to ProRender shadow catcher, added aiFog and aiAtmosphere to ProRender Volume material (note a user may have to do some changes in Volume material to get correct results), added aiCarPaint to ProRender Uber material with exceptions of Flakes.

v.2.3 - aiVectorMap conversion support, aiCellNoise and aiNoise conversion support, aiStandartSurface cameraMap conversion, Volume materials update, aiBlackbody conversion supports, aiCurvature conversion support, Maya Ai atmosphere to object with RPR Volume material.

v.2.4 - aiStandard emissive to Uber emissive now converts with less weight values, Vector map now converts with correct connection for displacement, aiBlackBody now converts to RPR Arithmetic nodes, aiToonShader now partially converts to Uber material, Maya standard lights now convert to ProRender Physical lights, 2d bump and ai 2d bump now converts with correct strength levels, aiNegate now converts to ProRender Arithmetic nodes, aiSqrt now converts using ProRender Arithmetic nodes, aiComposite now is partially convertible using ProRender Arithmetic nodes.

SCRIPT LINK

The latest version of the conversion script: download script.

KNOWN ISSUES

The following JIRA issues affecting the conversion process were identified:

- RPRMAYA-965 Artefacts when rendering Adaptive displacement
- RPRMAYA-952 Wire Frame material and random color node (jitter node)
- RPRMAYA-931 Maya Projection node gives incorrect render results
- RPRMAYA-920 Add Min, Max, Mod, Floor and Abs operations into RPRArithmetic node
- RPRMAYA-919 Add support for Clamp node (or make a new node)
- RPRMAYA-918 (Standard nodes) Several standard nodes work only with maps
- RPRMAYA-893 Passthrough brdf node is needed
- RPRMAYA-887 CarPaint material
- RPRMAYA-693 Hair support via xgen
- RPRMAYA-329 [Core] Artifacts when using Displacement
- RPRTOOL-115 [Arnold] Maya Ai triplanner and Ai UVtransform can be converted to Maya Projection node
- RPRTOOL-101 [Arnold]Maya AI Layered shader convert to RPR blend material
- RPRTOOL-99 [Arnold]Maya AI Ambeint Occlusion can be connected to RPR Passtrhough node
- RPRTOOL-68 [Arnold] Lights gets converted with Incorrect brightness

Currently, we are having issues when adding aiLightMesh to RPR Physical light mesh type. Andrey says it is something in the API. We also have issues with IES lights not showing when more powerful lights are in the scene (this is an old issue with in the plugin). We also have issues on the plugin side with some Maya standard nodes, such as Maya RGB to HSV and HSV to RGB where we lose texture data when rendering.

For Car paints, we won't be able to get the exact results without some kind of Flakes generator (work around would be users will have to create their own custom flakes textures. We are also running into some issues with Layered materials, in Arnold aiLayeredMaterial uses weight for each layers 1,2,3,4 and so on. The problem is our Blend material uses weight for 2 layers input 1, and 2.

For Displacement conversions we are having a lot of issues on the plugin side with really bad render results on anything lower than 4 subs. When rendering displacement with Arnold, users can have 1 polycount objects with iterations set to 1 and still get clean results with no artefacts.

COMPLEX SCENES

Scene 1

Happy Buddha scene.

Happy Buddha scene using SSS material. For SSS, users may have to tweak the backscattering attributes to get a similar result. aiStandard material uses SSS without backscattering settings.

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 2

Porsche car scene.

Porsche car scene with metal and roughness maps, aiSkyDome light, and aiShadowMatte material. With some Adjustments like Ray depth settings, the glass material gives closer results. Shadow matte now gets converted to the ProRender Shadow Catcher material. Added the New feature aiCarPaint to the scene. Ray Depths may need some tweaks to get the same results as glass materials.

At the moment, there is no way to convert aiCarPaint flakes. Current work around is that users will have to create their own custom texture map for flakes. We also have a plugin issue regarding Refraction, Transparency and Shadow Catcher.

This is a very old issue we've had for a long time in the plugin:

- RPRMAYA-73
- RPRMAYA-887
- RPRMAYA-891

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 3

Rifle and Pistol scene.

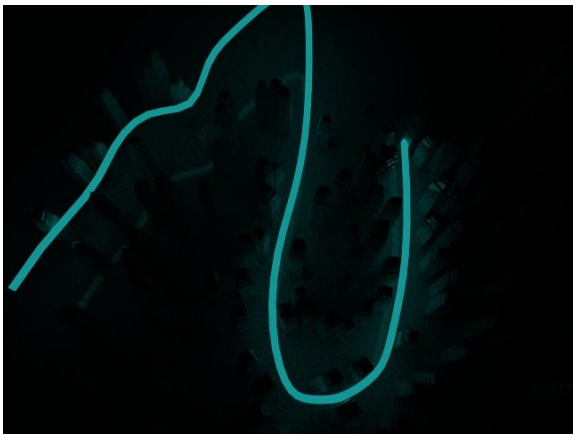
Gun scene: using the newest addition of Arithmetic nodes. aiAbs, aiAtan aiDot, aiPow and aiTrigo, alongside with aiDivide, add subtract and Maya standard Multiply/Divide node.

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 4

Emissive city scene.

Simple scene with emissive materials lighting the entire scene.

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 5

Laptop scene.

Emissive with Ramp nodes and Texture maps using aiStandard surface shader. Lighting setup is with aiSkyDome with IBL image.

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 6

Interior room scene.

Interior room using aiSky, aiSkyDome, Maya directional light with some Materials and textures aiStandardSurface Shader.

Tweaking Tone mapping in ProRender slightly helps with the brightness issue. But there's still a main issue that we are not converting the intensity brightness for all lights correctly.

We have an issue with in the plugin for some time were more powerful lights override IES lights in the scene. Work around is that users can slightly increase the intensity of ProRender IES lights.

- RPRMAYA-216
- RPRTOOL-79

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 7

IES test scene.

Scene using Photometric lighting with multiple IES lights.

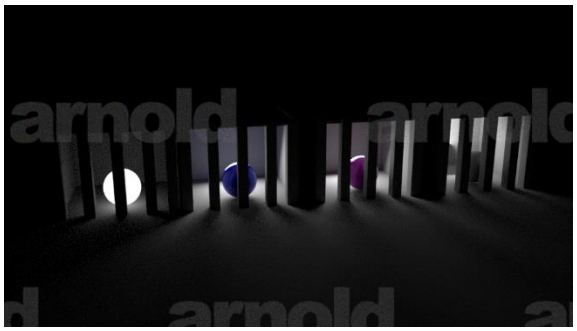
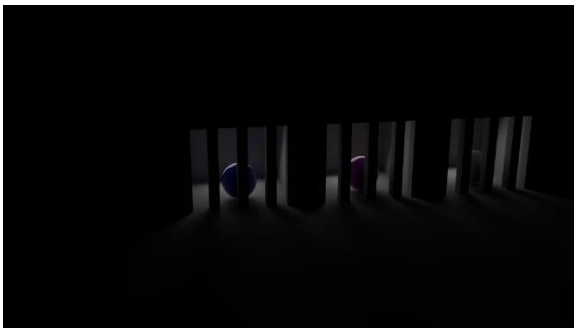
Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 8

Light test scene.

Scene with aIStandard surface materials using SSS skin preset and Procedural math nodes like aiAdd, subtract, multiply and divide. We made some minor changes to the scene replacing aiFlat color to aiStandardSurface with emissive (the reason behind the change is that the official build 2.5.245 1.321 does not have RPR flat color node).

ProRender Flat color is not present in build 2.5.245. It works correctly in the latest master build 2.5.255.

Arnold	Radeon ProRender v2.4
	
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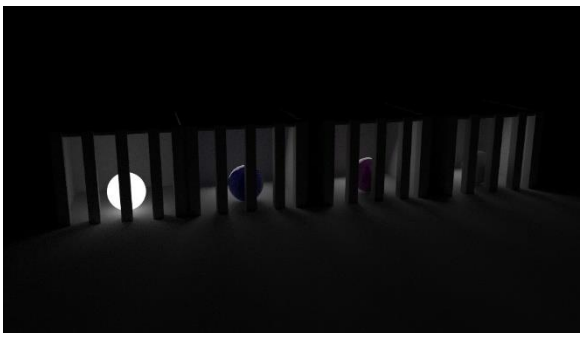
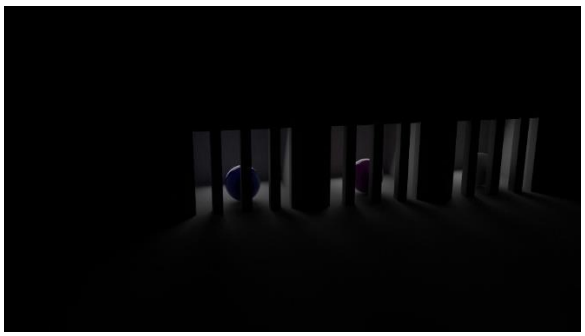
	

Scene 9

Dragon Scene.

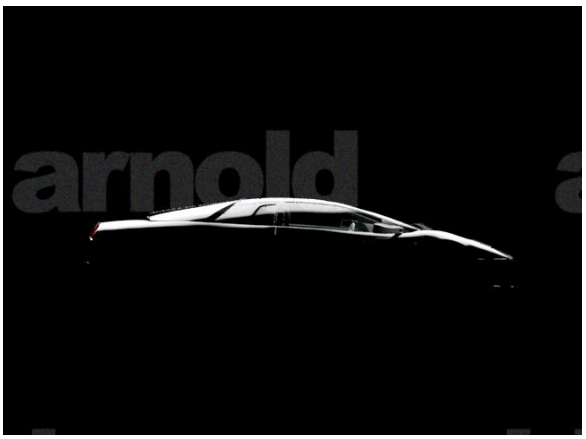
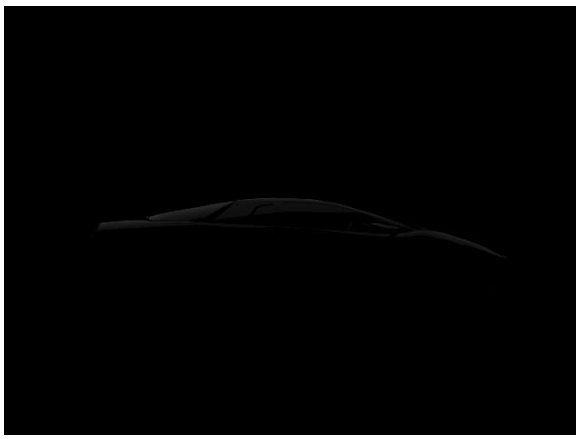
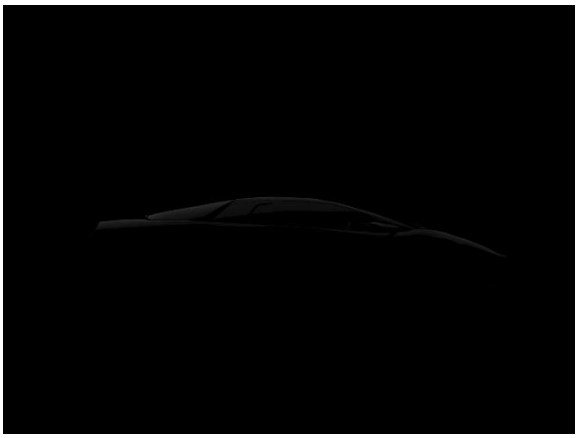
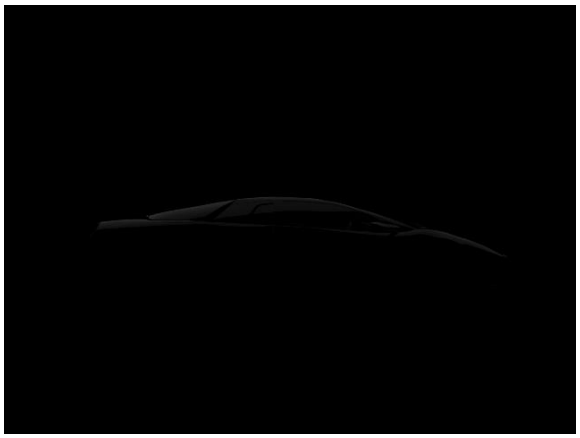
Dragon using aiImage, ai2dbump, aiSkyDome, as well as TIFF and TGA file types.

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 10

Car-Side scene.

We use a formula to convert Maya standard lights to ProRender Physical light. We'll be adding this formula to aiStandard area light as well, as it should give better results, RPRTOOL-68.

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 11

Car-Rear scene.

Light conversion error/invalid RPR parameters.

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 12

Car_Top scene.

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 13

Mercedes scene.

Using aiNormal and aiImage files nodes. A combination of emissive, metal, and glass materials. Added to the scene a new feature – aiCarPaint material.

Currently, there is no way to convert aiCarPaint flakes. A work around is that users will have to create their own custom texture map for flakes.

- RPRMaya-887

Arnold	Radeon ProRender v2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 14

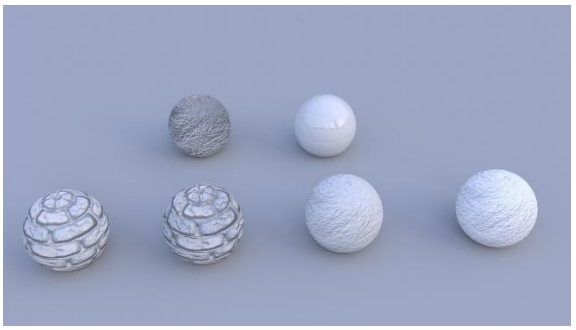
Bump scene.

Bump and displacement scene using aiNormal, maya 2d bump, ai2dBump, and Displacement to SG node.

Looking to improve displacement as we did with 2dbump nodes. But will have some issues due to the way ProRender displacement gives bad results with artefacts.

Arnold displacement gives clean results no matter what polycount is: an object can have only 1 face 1 subdivision in displacement, and it will render with zero artefacts. We cannot replicate this because of the way our displacement works in ProRender, we can only transfer the values over to the material. For anything lower than 4 subs, users will have to increase the subdivision level to 4 or higher, and possibly increase the polycount of the object.

- RPRMAYA-329
- RPRMAYA-965

Arnold	Radeon ProRender v2.4
	
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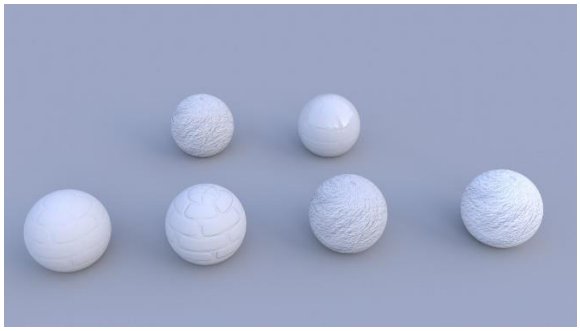
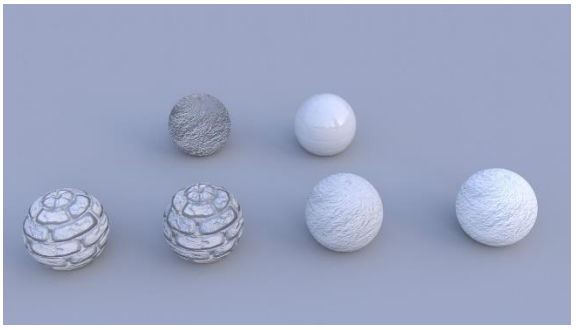
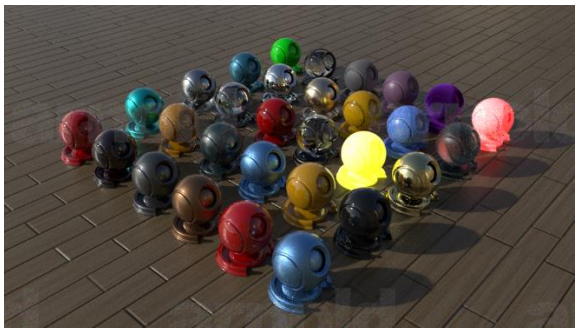
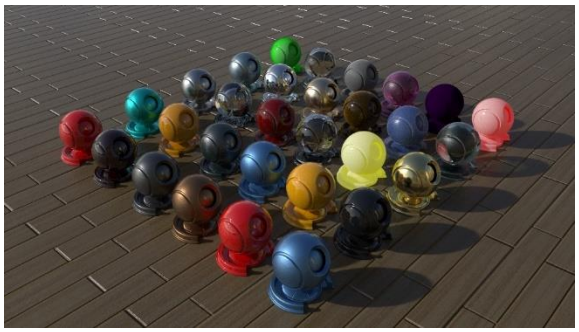
	

Scene 15

Complex materials scene.

Material test scene using aiCarPaint and aiStandardSurface. Variety of different material setup from SSS glass and emissive materials. Bump values with 2d bump and ai 2d bump were improved to get better results.

Arnold	Radeon ProRender v2.4
	
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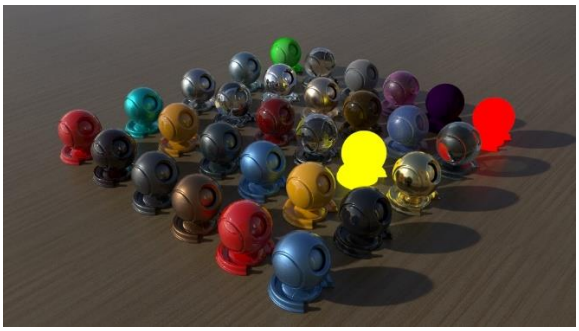
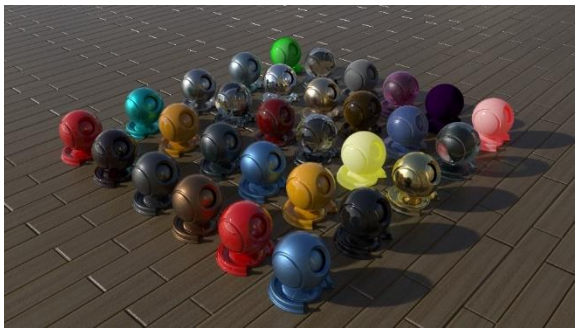
	

Scene 16

Curvature Mustang scene.

Car scene featuring the aiCurvature utility node. Using ProRender Ambient Occlusion node. (Note that users may have to tweak the RPR AO node to get best results).

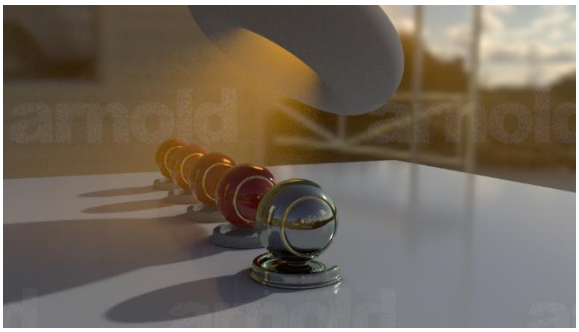
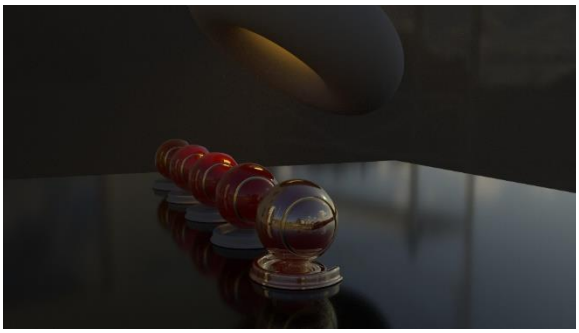
Arnold	Radeon ProRender v 2.4
	
Radeon ProRender v2.3	**Radeon ProRender v2.4**
	

Scene 17

Volume scene.

We are struggling to fully convert this. Mostly due to the way Arnold handles aiAtmosphere and aiFog, they are classified as an environment that can be used with Filters. It will be almost impossible to get a 100 percent match going from an environment fog that can mask an area for IBl to an object with volume material.

- RPRTOOL-127

Arnold	Radeon ProRender v 2.4
	
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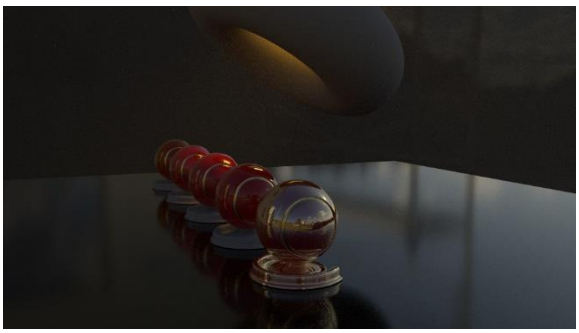	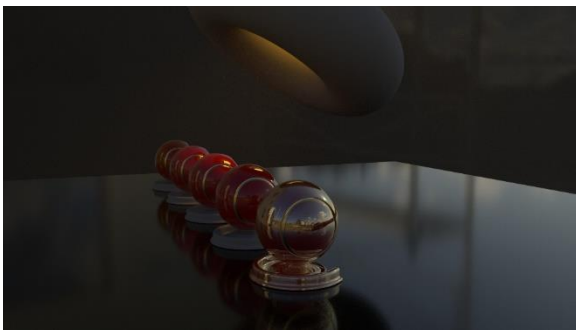

TEST REPORT LINK

For detailed comparison of rendered scenes, see Test Report. The report includes 169 scenes.

Note that this is still the Alpha version of the report. The render process was run on two machines, with AMD and Intel CPUs.

CONVERSION STATUS BY NODE GROUP

Node Group	Total Nodes	Convertible	Partially Convertible	Not Convertible	Research is Needed	Details
Environment	4	0	4	0	0	Link
Files	5	5	0	0	0	Link
Filters	4	0	0	4	0	Link
Lights	4	0	3	0	1	Link
Materials	16	3	4	5	4	Link
Textures	7	1	3	1	2	Link
Utilities	68	17	3	36	12	Link
Total	**108**	**26**	**17**	**46**	**19**	Link