

# Changelog

Join us on [3Delight Discord](#) to follow the development, ask us questions and get live feedback from the community.



We are still planning to offer these promised features, among others, in the medium term:

- Acceleration vectors support for Motion Blur
- Curved motion blur when using multi-segments
- Bevel shader, Curvature shader

**2.9.27 - 08 Mar 2023**

## 3Delight for Houdini

- Added density color ramp to vdbVolume shader.

**2.9.26 - 02 Mar 2023**

## 3Delight for Houdini

- Updated our Houdini 19.5 build version from 19.5.493 to 19.5.534.

## 3Delight for Katana

- Interpret VDB velocity blur as per second. This is how it is usually provided and how we interpret it in other plugins.

**2.9.24 - 18 Feb 2023**

## 3Delight Core

- Fixed indirect volume emission with light cache. Emission from volumes was not recorded in the diffuse light cache, which means it was missing from the final render.
- Improved behavior of multi-light shadow matte. Multi-light outputs are now scaled so their sum is that of the beauty shadow matte, assuming a light partition is used.
- Fixed VDB velocity blur scale. This fix will also improve advection time (ie. startup time).

## 3Delight Display

- Increased layer name field by 50% as they can get very long with multi-light and multiple AOVs.

## 3Delight for Maya

- Interpret VDB velocity blur as per second.

## 3Delight for Katana

- Interpret VDB velocity blur as per second

**2.9.23 - 10 Feb 2023**

## 3Delight Core

- Avoid breaking the Cryptomatte filters when using multiple importance sampling.
- Fixed depth/Z AOV filter validation.
- Upgraded OpenVDB to 10.0.1.
- Improved shadow matte performance when evaluating shadows from complex multi-layered objects. The number of transparent rays and rendering time were reduced significantly.
- Fixed subdiv rendering of unusual topology.
- Added subsurface contribution support for lights.
- Fixed prepass brightness with transparent surfaces.
- Disabled light CDF for multiscatter volume rays. It slows down rendering a lot when there are many lights in the scene and it doesn't do much for quality

### 3Delight for Houdini

- Add subsurface contribution parameter to lights.

### 3Delight for Maya

- Add subsurface contribution parameter to lights

### Shaders

- Fixed decay filter ramp issue.
- Added dlTiles - A 2D pattern for randomized tiles and bricks. (initial version).

**2.9.21 - 19 Jan 2023**

### 3Delight Core

- Fixed deep output of indirect volume incandescence. This would be most of what you see with multiple scattering as well as the contribution to other surfaces.

### 3Delight Cloud

- Added uploaded byte count to cloud render stats. This is the amount of data uploaded to sync a given cloud render, which might be 0 if the same scene is rendered twice in a row.

### 3Delight for Houdini

- Updated our Houdini 19.5 build version from 19.5.433 to 19.5.493.

**2.9.18 - 05 Jan 2023**

### 3Delight Core

- Upgraded OCIO (OpenColorIO) to 2.2
- Upgraded to OpenEXR 3.x
- Fixed the crash that occurred when using ACES 1.3.
- Fixed caching of alembic files in 3Delight Collective.
- Fixed curve rendering problem when transformation matrix contained a scaling factor.
- Fixed the issue of OCIO support for grayscale textures.
- Fixed motion vector AOV on curves.
- Fixed ptex (per-face texturing) lookup on face sets.
- Improved the way curve type is handled in Alembic procedural.
- UVs are now exported on curves in Alembic procedural.
- Fixed orientation of vdb motion sampling.

### 3Delight Cloud

- Fixed the bug in the cloud/collective progressive rendering feature.
- Exit cloud rendering when scene data fails to download.

### 3Delight for Houdini

- Added support of 3Delight VOPFX for python 3.9 version.
- Make the "smooth curves" into a proper override. This has priority over whatever the curves are defined as, and also overrides curve type inside alembic procedural.

### 3Delight for Maya

- Fixed crash of swatch rendering when using networkcache.write 1.

### 3Delight for Solaris

- Fixed translation of dlTerminal. All inputs of dlTerminal are now translated and it can be used without a MaterialBuilder too (only in Solaris).

### Shaders

- Added "show\_background" parameter to dlShadowMatte.
- Added metadata for displacement parameter type in Houdini
- Added spline support to the float ramp.

## 2.9.13 - 29 Oct 2022

### 3Delight Core

- Introducing a new motion blur algorithm for VDBs. Improvements are especially visible when rendering more extreme motion.
- 3Delight can now separate any indirect shading AOV (such as the "diffuse.indirect" AOV) into its shading and texture component (diffuse.albedo). This feature allows de-noising of the shading component and leaving the texture data intact. A compositing operation is then performed to rebuild the final image. This functionality is only available through NSI for the time being.
- Fixed a multi-threading issue on Windows computers with more than 64 cores. Some parts of the renderer were not able to use the total amount of cores available.
- 3Delight statistics are now saved compressed in EXRs. Renders with a large number of textures were causing EXRs to be larger than necessary because of the strings in the statistics.

### 3Delight Cloud

- Improved robustness and response time of 3Delight Cloud.
- Improved memory consumption of 3Delight Cloud renders.

### 3Delight Display

- Fixed color space problems caused by updating to OCIO 2.0
- Correctly save statistics to EXR files. These were sometimes truncated or unavailable.

### 3Delight for Houdini

- Fixed placement matrix position when creating texture/3d VOP
- Fixed 'pscale' support when using the Alembic procedural.
- Added parameters to better control points size. Users can now globally scale the points primitive or override it all together. This feature also affects points in Alembic procedurals.

### 3Delight for Maya

- Added support of "emit diffuse" and "emit specular" light attributes.
- Fixed installer for Maya 2022.4 on macOS.

### 3Delight for Katana

- Rendering sequences on the cloud using Katana batch is now efficient when using the `--reuse-process` command line parameter. This feature makes it possible to rendering many frames at the same time using only one submitting machine.

### Materials

- Shadow Matte (shadow catcher) can now render background environment (with 0 alpha).
- Added Occlusion AOV to DIHairAndFur.
- Added a Hair AOV to all packages.

## 2.9.0 - 21 Jul 2022

### 3Delight Core

- Vastly improved live rendering performance of changes to environments (up to x100 faster).
- Improved live render performance when many ray bounces are used (e.g. 10 bounces).
- Improved sampling of lights with low contributions. Lights with no contribution at all where generating hard to remove noise even with a high number of shading samples.
- Fixed support of local machine rendering in 3Delight Collective.
- Fixed a rare and random 3Delight Collective crash.
- Added support for CryptoMatte AOVs in Deep EXR output.
- The Deep EXR output now uses non deep format for AOVs that do not request deep output (e.g. CryptoMatte).
- Fixed the Toon AOV output. It wrongly included GI from other toon surfaces.
- Allow users to specify 3Delight Collective port. This is helpful in firewalled networks.
- Added importance sampled filter to the list of available filters. Images rendered using this filter are slightly more noisy but can be used with the Intel Denoiser to produce smooth images.
- Fixed 'nsidepends' when parsing UDIM textures.
- Upgraded OCIO to 2.1.1.

### 3Delight Cloud

- Improved performance of texture upload. Performance improvements are noticeable when large amounts of textures are used or if the textures are very large.
- Fixed cpu timing saved with the image statistics. It is now aligned with the actual minutes charge. The saved timing were off for very fast renders.
- Improved startup time of cloud renders for scenes containing a large amount of textures.

### 3Delight Display

- Added automatic monitor ICC profile detection. This allows for proper colour managed output.

- Fixed a visual glitch with the magnify tool.
- Fixed image corruption when saving an ongoing render.

### 3Delight for Houdini

- Fixed issue when using <aov> and <light> tokens in file output filename.
- Added background texture support in the environment.
- Added atmosphere support in viewport rendering.
- Export Rest attribute with curves.
- Added the possibility to override lights' display flag separately from objects.
- Fixed issue with multi-lights status when saving a scene.

### 3Delight for Maya

- Added missing emission grid attributes in the OpenVDB shader.
- Fixed a viewport display bug with the DIPrincipled shader.
- Fixed environment light visibility in Maya viewport.

### 3Delight for Cinema4D

- Fixed issue about finding OSL shaders directory which was dependent on the 3Delight installation directory.
- Fixed sequence rendering issue on cloud when frames were rendered one by one.

### 3Delight for Solaris

- Added material assignment support for facesets (GeomSubsets)

### Shaders

- Added ray types selection to DIConstant.

## **2.8.0 -16 Mar 2022**

### 3Delight Core

- Improved spherical particle sampling by two. This can have a non negligible impact on most scenes since spherical particles are used to render point lights.
- Vastly improved IPR performance with scene manipulation involving transforms. These manipulation are now up to 50 times faster.
- Fixed light contribution of environments (HDRi) into volumes.
- Improved light sampler in complex lighting conditions.
- Allowed refraction IOR to be less than 1 in glass. This affects all materials with refraction.
- Use network cache on NSI stand-ins.
- 3Delight display drivers are now part of the 3Delight library. This makes 3Delight installation more robust while also reducing the overall package size.
- Fixed a 3Delight Collective problem causing "renderd" processes to accumulate on render machines.
- Allow users to specify 3Delight Collective port. This is helpful in firewalled networks.
- Fixed a very rare crash when using the network cache and with multiple shaders referencing the same texture.
- Added an API access to 3Delight's network cache.
- Compress PNG images by default.

### 3Delight for Houdini

- Added support for "instancefile" attributes referring to VDB files. This effectively allows instancing of VDB files.
- Fixed sequence export for PNGs, and ignore multi-layers for PNG export too.
- Added shutter offset attributes to the Houdini camera.
- Fixed error message for unknown camera parameter when exporting standins.
- Added 'Processing Options...' button in the ROP. This button opens up 3Delight Display and show the Processing tab.

### 3Delight for Maya

- Allowed enabling multi-light rendering on a per-AOV basis. This means that one can output multi-light for one AOV (e.g. Diffuse) and no multi-light for all the others (e.g. RGBA, Specular, etc ...).
- Removed the "Environment" Scene Element. We now consider all environment nodes when rendering the scene. Note that 3Delight core will use the advanced light sampler on one of the environment, so using many HDRIs has the potential to add noise.
- Added ray contributions for diEnvironment.
- Allowed batch render to export using default nsi filename.
- Added 'Processing Options...' button to the Render Settings. This button opens up 3Delight Display and show the Processing tab.
- Removed max limitations for lights' contributions attributes.
- Fixed multi-light with incandescence light. This feature was producing too many layers.
- Ignored speed boost overrides for sequence rendering.

### Materials

- Added ray contributions weights to diConstant.
- Added "Reflect AOVs" in diPrinciples. When using DItoon, this allows to see outlines and toon shading in mirror reflection

## 2.7.8 -13 Jan 2022

### 3Delight Core

- Fixed long delays when using collective due to offline machines. Collective machines detection is now fast (less than a couple seconds) even when machines are non responsive.
- Fixed path resolution when rendering on machines using different operating systems or different 3Delight installation locations.
- Fixed resources leak when using collective. This caused stalls, and sometimes crashes, after successive collective renders.
- Fixed crashes when stopping collective renders.
- Passed bucket scanning order preferences to cloud renders.
- Fixed `renderdl -cloudspeed` parameter. It was not passing the provided parameter to 3Delight Cloud.

### 3Delight Display

- Added the Pinch zoom feature when using track pads.
- Fixed reading EXR files with two parts having incompatible headers.

### 3Delight for Maya

- Fixed batch rendering command when using the `-animate` parameter.
- Disregard [Processing](#) options when using the Maya batch render command (in favour of using options specified on the command line).
- Added back multi-light list instead of a single checkbox.

### 3Delight for Houdini

Supported Houdini builds: 17.5.460, 18.0.597, 18.5.759 (Python 2) and 19.0.455

- Added a camera resolution override option in the ROP.
- Generate ST connectivity information on subdivision surfaces. This allows for non-linear interpolation of texture on subdivision surfaces.
- Added visibility parameters to the AOV Group shader.
- Don't force CryptoMatte preview layer to 32-bits and honour user bit depth selection instead.

### 3Delight for Cinema4D

- Added support for R24, R25 on Windows and macOS.
- Added new DWAA-compressed OpenEXR image format.
- Added Attribute Read shader used to read Vertex Color and mogrph texturing information.
- Added support for cloner mogrph texturing for multi-instance mode.
- Updated Compositing tag to Geometry properties tag.
- Added Displacement Blend shader.
- Added multi-light table instead of checkbox and multi-light Render Options (Off, All, Selected).
- Removed cloud option from Render Settings. This is now in the [Processing](#) UI.

## 2.7.3 - 04 Dec 2021

### 3Delight Core

- Introduced a new sequence rendering API to NSI. This allows DCC plug-ins to use a standardized sequence export method.
- The NSI API now ignores 3Delight Display processing options unless specifically instructed to.
- Fixed the "Stop render" action when doing a collective render.
- Fixed environment variable expansion in collective renders.
- Added support for DWAA-compressed OpenEXR image format to all DCCs. See [Image File Formats](#) for more details.
- By default, all EXRs are now saved as Multi-Part EXRs.

### 3Delight Display

- Fixed various UI glitches in the Processing Panel.
- 3Delight Display can now load multi-part EXR files.

### 3Delight for Maya

- The plug-in can now be compiled without any dependence to 3Delight's internal libraries.

## 2.7.0 -19 Nov 2021

### 3Delight Core

- Added new options to render on your computer with more or less cores. This applies to all DCCs through a common [Processing](#) UI.
- The ability to select 3Delight Cloud from within all the DCCs has been moved to a common [Processing](#) UI (in 3Delight Display).
- Introducing [3Delight Collective](#): the ability to render a single image faster using several computers on your network.
- Added the `-display` option to `renderdl` (to eventually replace the `-id` one).

### 3Delight Cloud

- Added the ability to control 3Delight Cloud rendering speed by selecting more or less cores. See [Processing](#) and the new `renderdl` command line option `'-cloudspeed'` to that effect.

- Fixed cpu timing saved with the image statistics. It is now aligned with the actual minutes charge. The saved timing were off for very fast renders.

### 3Delight for Houdini

Supported Houdini builds: 17.5.460, 18.0.597, 18.5.696 (Python 2) and 19.0.383

- 3Delight Cloud ROP has been removed with the introduction of the new [Processing](#) UI. Existing Cloud ROP are still supported for backward compatibility.

### 3Delight for Maya

- The 3Delight Cloud "Renderer" has been removed and replaced by the new [Processing](#) UI. This might generate "*Unknown renderer\_3DelightCloud*" warnings when opening older scenes but no data will be lost.
- Removed bucket scanning options from the Preferences. These are now in the [Processing](#) UI.

### 3Delight for Katana

- Removed bucket scanning options from the Preferences. These are now in the [Processing](#) UI.

**2.6.25 -05 Nov 2021**

### 3Delight Core

- Added an "occlusion()" closure to the OSL compiler.
- Added an automatic occlusion AOV. Occlusion can now be rendered concurrently to beauty renders.

### 3Delight for Houdini

Supported Houdini builds: 17.5.460, 18.0.597 and 18.5.696 (Python 2)

- Added support for the "frame" parameter of the Alembic SOP. This fixes issues with time control when using the Alembic procedural.
- Fixed motion blur inconsistencies when using the Alembic procedural. Motion blur was sometimes ignored or shifted.

### Materials

- Added a "Geometry" tab to all 3Delight Materials. For now it only contains occlusion AOV distance control.

**2.6.21 -13 Oct 2021**

### 3Delight Core

- Fixed noisy renders when light linking is used. If you are using light linking in any package, please upgrade to this version.
- Fixed long BVH initialization times after multiple renders. This happened mostly on Windows but this fix also introduces a 15% BVH initialization speed improvement on Linux and macOS platforms.
- Fixed a precision problem with far away geometry.
- Fixed noise issues with spot/focused lights inside volumes.

### 3Delight Cloud

- Fixed a rare download slowdown when rendering very high resolution images (8K+).

### 3Delight for Katana

- Added hdnSI packages to the distribution. This will allow using Hydra viewer natively with 3Delight from inside Katana.

### 3Delight for Houdini

Supported Houdini builds: 17.5.460, 18.0.597 and 18.5.696 (Python 2)

- Added support for uniform deformation blur in the Alembic Procedural.
- Added support for SOP-level assignments on Alembic procedurals. This means that materials can be assigned on Alembic import. Materials assigned on export are not supported yet.
- Added "Volume Indirect" to the list of AOVs.

### 3Delight for Cinema4D

- Fixed an issue when using materials as inputs (e.g. on layered material)
- Removed cloud option from Render Settings.

**2.6.11 -14 Sep 2021**

### 3Delight Core

- Updated to latest version of OpenVDB libraries. This fixes a crash on Windows.

### 3Delight for Houdini

- Updated support to Houdini 18.5.672.

#### 3Delight for Maya

- Removed some dependencies with internal 3Delight libraries. This is part of an ongoing work to make 3DFM easier to compile for users.

#### 3Delight Cloud

- Fixed a rare "Aborted frame" issue with multi-light renders on the cloud.

### 2.6.8 -03 Sep 2021

#### 3Delight Core

- Fixed a crash with scenes containing instanced lights.
- Improved precision of geometries placed very far from the viewer. This fixes self-shadowing artifacts that resulted in noisy and darkened shading.
- Implemented light-linking for VDBs. This affects all DCCs.
- Improved sampling quality in complex illumination scenarios. This also solves visible, albeit rare, discontinuities in surface shading.
- Fixed a performance problem with subdivision surfaces and displacement surfaces that extend far behind the camera. Such geometry could slow down renders substantially. In an extreme case, it resulted in a 4X acceleration (and in a 4X cheaper cloud render for a specific client).
- Fixed path variables handling in `nsidepend` tool.

#### 3Delight Cloud

- Improved efficiency of sequence renders. We observed 5% faster renders on some sequences (without affecting the cost).
- 25% price reduction on 3Delight Cloud rendering service: it is now 2 cents per 32-core-minute instead of 2 cents per 24-core-minute.

#### 3Delight Display

- Fixed crash in Light Mixer when loading images with layers of different format.
- Light Mixer now only mixes compatible layers.

#### 3Delight for Houdini

- Fixed a memory leak during scene export. **This is a critical problem when rendering sequences and we recommend to upgrade.**
- Fixed camera's pixel aspect ratio.
- Added support for camera's changes in IPR.
- Automatically replace filename extension based on selected image format.

#### 3Delight for Cinema4D

- Automatically loading 3Delight shaders and materials using the corresponding OSL files. Unfortunately 3Delight shaders from old projects will not work anymore.
- Fixed camera's pixel aspect ratio.
- Added support for camera's clipping parameters.
- Added OCIO UI for color space parameters when it's set in 3Delight.

#### 3Delight for Katana

- Added Python 3 compatibility.

### 2.5.2403 Aug 2021

#### 3Delight Core

- Fixed a problem with sampling of motion-blurred light sources. Artefacts were visible with very fast moving lights.
- Improved multi-threading performance on short renders with many AOVs. Improvements up to 15% can be expected.
- Using the `.nsia` extension when exporting NSI files will now produce an ASCII output (binary encoding is the default with `.nsi`). This is supported in all plug-ins. Exporting ASCII NSI files is only recommended for debugging.

#### 3Delight Cloud

- Fixed sporadic authentication problems in 3Delight Display.
- Added a failsafe against lost connections during data synchronization. This very rare case made the upload process hang prior to render start.
- Fixed an issue with the 3Delight Cloud usage summary page of the website that showed 0 instead of the correct information. This happened for users with high usage (million+ minutes).
- Improved management efficiency of sequence rendering for very fast frames. Such sequences will finish up to 10% faster, but cost is unaffected.
- Improved efficiency of synchronization of UDIM textures. This fix may cause the re-upload of previously synchronized textures.

### 3Delight for Houdini

- Fixed wrong transform placement when using sub-networks.

### 3Delight for Cinema4D

- Added support for camera film offset.

### Materials

- Improve bump mapping efficiency. This optimization can lead up to 10% speed improvements in bump-heavy scenes.

2.5.20 14 Jul 2021

### 3Delight Core

- VDBs can now be rendered as mattes.
- Fixed precision problems that caused motion blur to be rendered incorrectly.
- Improved light sampler when dealing with flat and large emissive surfaces.
- Fixed DITextureLookup API when used on UDIM textures.

### 3Delight Cloud

- Fixed hanging and cancelled frames problems that happened intermittently.
- Sending many cloud renders at once from local farm managers (such as Deadline) now works robustly.
- Improved data compression on rendered images. This improves download performance by 25%.
- Katana batch cloud renders now shows proper project name and frame number in 3Delight Display.

### 3Delight for Houdini

- Transforming static VDB volumes in SOP now properly references the original VDB instead of creating a new VDB for each frame.

### 3Delight for Maya

- Added support for the Asset CryptoMatte AOV.
- Added color correction term to the VDB volume shader to match other DCC packages.
- Fixed a problem with multi-light output when lights were present in both light groups and sets.
- VDBs are now properly output in multi-light renders when they contain an emission grid.
- Got rid of spurious console error messages when using AOVs.

### 3Delight for Cinema4D

- Added Shadow Matte material.
- Fixed render sequence naming issue when rendering to 3Delight Display. Using the same name for all image sequences would result in their overridden when saved from within 3Delight Display.

### Materials

- Principled now outputs the Transmit AOV.
- DIProjection now supports Spherical and Cylindrical projections.
- Added DIFloat and DIColor shader nodes. They are useful to store and share constants in shading networks.

2.5.11 11 Jun 2021

### 3Delight Core

- shadow\_matte() closure now works with VDB volumes.
- Allow mixing of atmosphere (when used as interior volumes) and VDB volumes.

### 3Delight for Maya

- Added support for emission tint grids.
- Make Light Groups the only method to group lights for multi-light lights. Maya Sets containing lights will not be included in multi-light output anymore.

### 3Delight for Houdini

- Updating build to 18.5.596.
- Added support for 'pscale' attribute on curves.

2.5.10 08 Jun 2021

### 3Delight Core

- Implemented light contributions (specular, diffuse, hair) in HDR/environment lights
- Added support Shadow Mask AOV (implemented in all plug-ins).
- Added shadow\_matte() closure to the list of supported OSL.

### 3Delight for Maya

- Fixed a shutter position bug that caused misplaced objects in animation.
- Fixed a crash in the Material Viewer when visualizing materials not supported by 3Delight.
- Fixed the outline AOV. It was outputting a black mask.

### 3Delight for Houdini

- Light selection changes are now supported in IPR.
- Added support of camera lens distortion during viewport rendering.
- Fixed undo problems created by the Viewport ROP.
- Fixed render region loss when switching between camera tabs during IPR

### 3Delight for Katana

- Added Albedo and Crypto Assets AOVs to the list of supported AOVs.
- Added overscan support in the camera node.
- Implemented per-AOV output depth.

### 3Delight for Cinema4D

- Fixed filter width functionality on render settings.
- Fixed orthographic projection export.
- Fixed shader issue that did not have a default UV connection.
- Added Toon Glass material.
- Added missing AOVs (Toon Matte, Outlines, World space position, World space normal, Shadow mask).
- Fixed environment issue when connecting a texture through another shader.
- Fixed metal's thin thickness and ior parameters.

### 3Delight Display

- Improved startup time of the application. This removes a 2-3 seconds delay from the startup time.

2.5.8 18 May 2021

### 3Delight Core

- Improved floating point precision with very large scale scenes.
- Create any directory, including sub-directories, when exporting NSI files. This affects all plug-ins.
- Added a VDB visualization API to the core library. This is useful for plug-ins to rapidly visualise a VDB volume using points. Points are distributed using the density of the volume and are placed in such a way as to avoid moiré patterns.
- Fixed intensity and sampling of narrow spread area lights. **Caution: This will affect the lighting of existing scenes.**

### 3Delight Display

- Fixed a sign-in problem. If you have problems signing in your 3Delight Cloud account, please update to this version.
- Detect sign-in and sign-out events when multiple instances of 3Delight Display are open.

### 3Delight Cloud

- Improved rendering of sequences on very slow networks, especially WIFI and half-duplex network. 3Delight Cloud is now better at detecting these conditions and throttle renderings accordingly to maintain a steady, albeit slower, flow of renders.
- Fixed a crash during sequence rendering that could stop the rendering of long sequences.

### 3Delight for Houdini

- Updated support for Houdini 18.5.563.
- The alembic procedural is now able to work with SOP-level transforms. All SOP-level networks are supported. Instances are still required to use "Pack and Instance".
- Fixed a crash that happened when rendering sequences with a non working installation. The crash was caused by the "renderdl" executable not being found.

### 3Delight for Maya

- Honour *Lights to Render* in scene elements when using multi-light renders.
- Removed duplicate button in the Layers sections of the Render Settings.
- Fixed Spherical Camera export. The vertical axis of the screen was not properly scaled.

### Materials

- Improved sampling of the Toon closure when using transparency.
- Improved sub surface scattering algorithm on very thin surfaces seen at grazing angles. In these conditions the simulation gave results that were too bright.

## 2.5.1 - 28 Apr 2021

### 3Delight Core

- Added world space positions and normals to the list of AOVs (affects all plugins).
- Fixed 'NSI loading' statistics (as shown in the *Stats+* tab in 3Delight Display).
- Fixed a performance issue with invisible geometry that has displacement shaders assigned.

### 3Delight Cloud

- Implemented a pre-pass that can significantly improve cloud renders performance when using a large (200+) number of cores.

### 3Delight Display

- **Fixed a crash bug introduced in 2.5.0.**
- Render progress is now more precise.
- Fixed a rare (and random) crash bug.

### 3Delight for Maya

- Fixed aesthetic problems in the DIToon shader UI.
- Fixed *Shutter Efficiency* attributes on camera nodes. They were not affecting the shape of the shutter properly.
- Added world space positions and normals to the list of AOVs.
- Added support for Maya 2022.
- Fixed *Casts Shadow* errors when used in a DISet
- Implemented refraction and reflection contributions in all Maya lights.

### 3Delight for Houdini

- Fixed IPR issues when changing area light size.
- Pass correct time to alembic procedural. Alembic files containing an animation were sometimes offset in the timeline.
- **Improved support of Alembics:** they can now be rendered in a delayed manner. This can shrink exported NSI files significantly as alembic data can now be referenced instead of being included inside the NSIs.
- Added "phantom geometry" support in the Render Settings.

## 2.4.18 - 17 Apr 2021

### 3Delight Core

- Fixed an issue that broke opacity in AOVs when using certain combinations of shading samples and pixel samples.
- Improved detection of outlines on subdivision creases when behind a transparent layer.
- Added support for different grid sizes in VDB volumes. There is no more need to re-sample grids manually before rendering.

### 3Delight Cloud

- Better scheduling of sequence renders when the user reaches low credits. The system was allowing too many frames to start even if there was no chance for them to complete (due to not enough credits).
- Fixed a crash bug when stopping cloud renders. This usually happened when stopping the renders using the cloud panel in 3Delight Display.
- Fixed a very rare issue causing an entire sequence to stop rendering.

### 3Delight for Houdini

- Upgraded to Houdini 18.5.532

### 3Delight for Maya

- Fixed orthographic cameras IPR edits.
- Added Shutter Position to camera's attributes. This allows for motion blur position relative to the frame.
- Added *Casts Shadow* flag to *dISet*.
- Added reflection and refraction visibility control to light sources.
- Export Maya's point instancer using NSI's massive instancer. This improves render time and reduces memory footprint significantly.
- Fixed *NSI Set* subdivision flag when rendering in IPR (flag was not functional).

### 3Delight for Cinema4D

- Added *dIDistanceFade* shader.
- Added support for spline data type attributes on shaders.
- Added software argument for cloud rendering.

### Materials

- Added a color correction panel to VDB shader color grid.
- Added emission grid to VDB shader.

## 2.4.13 - 31 Mar 2021

### 3Delight Core

- Fixed infinite values produced by the renderer in situation where transparent materials are used.
- Fixed a performance issue with displacement when using IPR. This can make IPR at least x2 faster for medium complexity scenes.
- Improved 3Delight's "fireflies" removal algorithm. The algorithm removes small speckles produced by indirect lighting. This algorithm also allows for proper anti-aliasing of high intensity area lights.
- Fixed instance light crashing in very rare circumstances.
- Fixed sampling of transparency when using a large quantity of transparent layers. The issues were visible in the alpha channel as some pixels had wildly varying values.
- Fixed AOV and multi-light naming in Deep EXR files and removed useless alpha channels.
- Optimized GGX sampling when using 0 roughness. Performance improvement on glass are substantial in scenes where such material covers large portions of the image.

### 3Delight Cloud

- Cinema 4D renders are now labeled properly in the [Cloud Dashboard](#) and [Transaction History](#).
- Fixed wrong status indication in 3Delight Display for very rapid cloud renders. A finished render could still show "rendering" even when finished.

### 3Delight Display

- Avoid opening the sidebar when the current tool changes.
- Added "Sign in..." and "Sign out" buttons in the File menu (to sign in to your 3Delight account, which is needed to use 3Delight Cloud).
- Improved overall usability of the Multi-Light panel. Glitches such as wrong scrolling area focus, overly tiny click areas and inability to reset exposures to initial values have been fixed.
- Avoid an IPR update while dragging the crop region.

### 3Delight for Houdini

- Upgraded to 18.5.499.
- Added Light Decay attribute to light nodes.
- Fix an issue with prevented one sequence being exported to NSI using multiple machines. The static geometry file was overwritten from each machine.
- Enabled firefly removal algorithm by default.
- Fixed sequence Volume export. Only the first VDB was written out for the enquire sequence.
- Added a Viewport Render shelf button. It creates a Viewport ROP and starts the render. In case a Viewport ROP already exists, it will be used.
- Fixed a warning in Stand-in Export ROP (it was erroneously exporting cameras).
- Fixed problem when rendering directional lights and environments together (sometimes one of the lights would disappear from a render).
- Fixed a crash when using Viewport ROP.
- Improved light instances sampling quality.
- Fixed dITerminal atmosphere connection errors.

### 3Delight for Maya

- Improved IPR responsiveness when the HyperShade window is open. Selecting materials doesn't trigger re-renders in other IPR renders (e.g. in Viewport IPR).
- Fixed IPR rendering issue where only a part of the window is updated. This happened both in 3Delight Display and the Viewport.
- Fixed Camera's auxiliary field of view: it was operating in radians instead of degrees.

### 3Delight for Cinema4D

- Fixed camera issue when switching between panels during IPR.
- Added subsurface anisotropy for dISkin shader.
- Fixed issue related to incandescence texture parameter.
- Arranged slider bound values for 'bump intensity' attribute
- Fixed texture conversion of bitmap shader used on dIEnvironment.
- Added subsurface anisotropy for dIPrincipled shader.
- Fixed point light visibility issue.
- Made plugin compatible to be built on macOS.

### Materials

- DINoise is now available in Maya.
- Further improved transparency in dIToon when many translucent objects are stacked.
- Added [DINoise](#) procedural texture node.
- Added transparency to Toon material. This allows to see outlines through a transparent toon surface which in turn has its own outlines.
- Added incandescence to dIToon.
- dIToon shader can now detect outlines on the alpha channel of objects and has been augmented with a refraction/transparency section.
- Added [dIDisplacementBlend](#) utility.

## 2.4.1 -26 Jan 2021



Because of AOVs changes, scene containing custom AOVs will be broken. Reassignment of the AOVs will fix the problem.

### 3Delight Core

- Greatly improved sampling of cones and lights with small spreads. This also improves their sampling in atmosphere.
- Improve sampling of more complex light setups and animated area light intensities.
- VDB volumes now output their emissive contribution in the Incandescence AOV.
- Fixed IPR interruption problems when the render is already finished.
- Fixed crashes in Pre-Lit when the Pre-Lit AOVs were not output.

### 3Delight for Houdini

- Updated to production build **18.5.462**.
- Updated installation scripts so that the sourcing of `.3delight_bash` (or `.3delight_sh`) is no longer necessary for the functioning of the plugin.
- Incandescent light now supports SOP material assignments.
- Added tools to add and remove 3Delight properties to objects.
- Improved VDB/Volume usability by supporting the Render flag in VDB Sops. This means that both native volumes and caches can be present in the same SOP.
- Adding DIBoxNoise to the list of shaders.
- NSI temp files in sequence renders are now deleted immediately after each frame is finished (making disk space recovered more promptly).
- Reverted to conventional crop behaviour in IPR with 3Delight Display. The region outside of the crop will not be rendered anymore.
- Added support of the `_3dl_render_poly_as_subd` attribute on the SOP-level. This allows to mark meshes as subdivision surfaces in SOP.
- Added an albedo AOV.
- The UV AOV now outputs the correct UV attribute instead of the intrinsic UV coordinates of each geometry.
- Fixed AOV Groups when connecting the same node to multiple AOVs.
- The Bypass flag can now be applied to the head material.
- Fixed a crash bug when rendering empty particles meshes.
- Fixed regressions introduced in 2.3.11 that was causing instability and crashes.
- ROP's Matte objects (in Scene Elements) are now rendered even when not present in Object's to Render.
- Matte objects can now be defined using bundles.

### 3Delight for Maya

- Added the Albedo AOV.
- Updated DICarPaint material UI.

### 3Delight for Cinema4D

- Added albedo AOV
- Fixed loading issue of VDBs.

### 3Delight Display

- The ESC key doesn't stop renders anymore. To stop a render one can use the Shift+ESC key.
- Fixed instability introduced in 2.3.12. Various crashes happening during renders and in image browsing have been fixed.
- Avoid clearing previous image when re-rendering.

### Materials

- Improved realism of dICarPaint.
- Fixed thin film behaviour of dIMetal: it now matches all other shaders.
- dIAttributeRead has gained some intelligence (finally): it can guess the underlying data type from its output connections.
- Improved thin film interference in both DIMetal and DIStandard. Depending on the index of refraction of the thin film and the base layer, a visual artifact in form of ring was sometimes visible.
- Improved quality of DIDisplacement shader on polygonal geometry.
- Added missing opacity factor to DIToon.
- Fixed shadow opacity in dIStandard.
- Fixed a visual glitch in dIMetal when coating IOR was larger than thin film's IOR.

## 2.3.11 - 31 Dec 2020

Happy New Year everyone. If you are looking at this change log, you have probably helped a lot in the past few months, we thank you for that.

### 3Delight Core

- Fixed a very rare problem appearing when rendering volumes.
- Improved sampling quality that plagued scenes when very intense area lights are hidden from view by blockers.
- Improved speed in the range of 5% to 20% on very dense scenes (e.g. hair with 2 millions curves and more). This is accomplished through improved BVH traversal.
- Added a new Processing API to the 3Delight library allowing third party developers to connect to cloud and fetch information.

### 3Delight for Houdini

- Added support for dIDisplacement shader. The shader can used inside the Material Builder.
- Fixed banding problems when using the 3Delight Viewer ROP.

- It is now possible to connect volume shaders to objects. This means that one can connect a dlAtmosphere shader to a bounding geometry. Note that geometry has to be transparent in order to see the volume inside. This also work with instances.
- The atmosphere in Scene Elements can now use the Material Builder (consistency).
- Fixed environment light automatic texture conversion to TDL.
- Added support for Houdini's Sky light. It uses the Hosek+Wilkie sky model. Note that 3Delight's sky doesn't need an additional directional light for the sun as it is able to properly sample the sun embodied in the sky map.
- Implemented the Debug flag for pattern/texture shading nodes.
- Fixed a Houdini crash when doing several interactions with 3Delight Display.
- Added support for orthographic camera in Viewport ROP.
- Fixed depth of field issues in the Viewport ROP (it was always enabled).
- Fixed the V component on curves. It is not necessary to use a dlAttributeRead shader to fetch the V texture coordinate anymore.

### 3Delight for Cinema4D

- Fixed the issue of materials not being loaded when 3Delight was installed on a different drive from Cinema4D.
- Updated some of 3Delight for Cinema4D shaders (dlPrincipled, dlHairAndFur, dlToon).
- Fixed toggle selection issue on Render Settings output group.
- Fixed texture conversion for Cinema4D Bitmap shader

### Materials

- All shaders with support of SSS now have an additional anisotropy permeate. This allows more realistic rendering of many media, including skin (which has strong forward scattering phase function).

## 2.3.7 30 Nov 2020

### 3Delight Core

- A new configuration parameter in [3delight.config](#) allows for control over OCIO UI in Texture and TriPlanar shaders.
- Implemented OCIO and ACES-cg support in the core, including [tdlmake](#) and all plug-ins.
- Reduced the size of TDL files by 15% by using the more efficient ZSTD compression.
- Fixed toon outlines numerical issues with far-from-origin subdivision surfaces.
- Fixed crashes with outline detection on creases (when using the dlToon shader)
- Fixed a problem with [licutils](#) command: it was returning an invalid [hostid](#) when bluetooth (and other temporary connections) were used.

### 3Delight Cloud

- Statistics are now output correctly when using "render! -cloud -stats ...".
- Improved handling of sequence renders with low credits: frames are less likely to be started when they have little chance of completion due insufficient credits.
- Fixed a problem with [variable substitution](#) and cloud renders: rendered images were wrong when substitution affected output file names.
- Some pre-processing to optimise speed is now enabled for any render using less than 200 cores on the cloud. This affects quality and is necessary to have cloud render identical to local renders.

### 3Delight Display (in the context of 3Delight Cloud):

- Fixed image's statistics (as shown in the **Stats** tab) when using cloud renders:
  - Real (wall clock) render time and the ETA during render were off.
  - CPU time in 24-core minutes was incorrect. It now matches the cost as show in *Transaction History*.
  - The total number of cores now matches the correct count shown in *Transaction History*.
  - The **Stats+** tab now shows timing in real (wall clock) time, exactly as for local renders.
- Fixed progress when using 3Delight Cloud sequence renders. Only the first image of a sequence was showing progress.

### 3Delight for Maya

- Added support for offsetParentMatrix feature (Maya 2020).
- Added visibility flags to the NSI set.

### 3Delight for Katana

- Allow defining AOVs with a customAOVs.txt file.
- Expression used to set the image file name on DISettings is now correctly forwarded to RenderOutputDefine instead of copying the value.

### 3Delight for Houdini

- Update the 18.5 support to the latest production build (18.5.408).
- Added a Viewport ROP that allows rendering directly to Houdini's OpenGL viewport.
- Volumes can now be rendered directly (this is still work in progress)
- Added support for [AOV Groups](#). This feature allows for better handling of custom AOVs (such as easily sharing AOVs between many materials).
- Textures and patterns can now be assigned to objects for debugging purposes.
- Renamed "Vdb Volume" to "VDB Volume".
- Improved support of placement matrix (`makeiform`): it can now be fed with input data such as attributes read using `dlAttributeRead` VOP.

### 3Delight for Cinema4D

- Implemented support for additional options in the Overrides group of Render Settings.

- Fixed OpenVDB's transformation matrix.
- Added 3Delight Standard Material.
- Added 'Toon Base' AOV layer.

### 3Delight for Solaris

- Fixed crash when camera is looking through a light.

### Materials

- Added silhouette outlines to the dIToonGlass shader.
- Added support for a toon\_matte AOV in the dIToon shader. It allows for control on the three first toon regions in comp.
- Improved dlStandard compliance with aiStandard: both specular and SSS components are now closely matching aiStandard.

## 2.3.0 - 30 Oct 2020

### 3Delight Core

- Vastly improved sampling of instanced light sources. Users can now render unlimited numbers of lights while benefiting from the memory savings of instanced geometry.
- Fixed an issue with AOVs being mixed up when using a large number of layers.

### 3Delight for Houdini

- Fixed sticky Export button when exporting sequences.
- Fixed UV export on curves.
- Correctly named Multi-Light AOVs and incandescent light AOVs both in EXR and 3Delight Display
- Fixed light source visibility related to their Display flag
- Automatically add a placement matrix to all 3D patterns (implemented by supporting Houdini's native makexform shader).

### 3Delight for Katana

- Fixed material assign change in live render.

### 3Delight for Maya

- Fixed a delay in IPR updates when changing the timeline.

### 3Delight for Cinema4D

- Added missing .oso dlPrimitive shader.
- Fixed an error regarding multiple-defined parameters. While R23 is not supported yet, the project can now be built without errors.
- Fixed a bug related to the object's freeze transformation matrix.
- Added missing Depth of Field toggle. DOF can now be enabled from 3Delight Camera Tag.
- Fixed an error which was causing 3Delight Materials not build properly.
- Adjusted material's preview parameters to improve swatch update time.
- Fixed Spot Light intensity issue based on the chosen decay rate.

### 3Delight Display

- Fixed loading of EXRs with floating point layers.
- Fixed AOV layer naming for multi-layer EXRs.
- The Follow Last Render feature is now sticky and isn't disabled when navigating through the thumbnails.

### Materials

- Fixed dlSkin specular component's energy conservation.

## 2.2.9 - 2020-10-9

### 3Delight Core

- Fixed AOV names in EXR files. This affects the usual AOVS (Diffuse, Specular) and the light names when using the multi-light feature.
- Improved sampling of volumes and atmospheres. This removes fireflies without unnecessarily clamping the total perceived light.
- Fixed a performance problem with procedural nodes.
- Fixed per-instance overrides of attributes on instances when a priority is applied (this NSI feature is only used in Houdini at the moment).

### 3Delight Cloud

- Fixed a bug which caused corruption in rendered images. This happened only when rendering simultaneously to file and 3Delight Display.

### 3Delight for Houdini

- Fixed Display flag functionality for lights during IPR.
- Scene lights are no longer exported in the Stand-Ins.
- Updated to latest productions builds (18.0.597 and 18.5.351).
- Fixed "Lights to Render" toggle.
- ROP: the Image Layers section has been simplified and a new **Output** section has been added. They work together for a simpler UI.

### 3Delight for Maya

- Removed 3Delight building dependencies from the plug-in. This is a work-in-progress work to allow moving to CMAKE and achieve a faster development rate.

### 3Delight for Cinema4D

- Fixed warning messages for non-existent parameters of 3Delight Shaders.
- Added new [Output](#) group of render settings.
- Changed output to file only, when exporting to NSI. It was outputting to 3Delight Display too.

### Materials

- Toon material now have priorities for all outlines. Users can now decide which outline is on top of others.
- The reflection of dIStandard is now nearly identical to aiStandard.
- Added volumetric refraction to dIStandard.
- Toon shader effects (both outlines and shading regions) can now be rendered though glass-like materials.
- Added a [dIToonGlass](#) shader which works well with dIToon and allows for coloured IOR-based transparency.

## 2.2.0 - 2020-9-15

### 3Delight Core

- License error messages moved from "Info" to "Error". This is particularly important for Maya as Info messages didn't show in the Script Editor.
- Fixed artifacts with shadows on polygonal objects.
- Fixed a crash in VDB rendering.
- Fixed glitches when rendering curves in scenes with a small scale.
- Improved rendering of polygonal surfaces with self-shadowing features. This solves abrupt changes in illumination and unnatural shadows.

### 3Delight Cloud

- Fixed a stall when rendering sequences from 3Delight for Houdini and from 3Delight for Maya on windows systems.
- Fixed a lag with the dashboard (in 3Delight Display) when rendering sequence on a very slow internet connection.
- Fixed rendering of fur when using the Yeti plug-in.

### 3Delight Display

- Fixed a crash when stopping an IPR session.

### 3Delight for Houdini

- Updated production build to 18.0.566 and added support for the 18.5 beta branch.
- Added missing toon AOVs.
- The installer now automatically downloads VS c++ dynamic library if needed.
- Added experimental scene view rendering mode.

### 3Delight for Katana

- Allow materials to be anywhere in the scene graph.
- Fixed 3Delight Cloud renders when using Monitor. Only 3Delight Display was working as a framebuffer.

### 3Delight for Cinema4D

- Add support for Custom AOVs.
- Fixed tint dropdown for toon shader. The user will be able to use textures as well for this parameter.
- Fixed gradient export. This has to be adapted to 3Delight osl shader. (Linear, None and
- Fixed texture mapping for dITexture shader.
- Updated Toon's shader width parameters (have values from 0 to 10) to adapt Cinema4D scaling. Although on OSL shader the same values as before are being used (0 to 0.1) to maintain the output logic and osl shader's limit.
- Added support for Multi-instances.

### Materials

- Added medulla control to Hair & Fur shader. This allows to render more realistic fur for creatures that have a solid core in each fur strand (wolves, deer, etc).
- Introducing dIStandard, a shader meant to mimic aiStandard and Autodesk Standard.
- Introducing refraction controls do dIPrincipled.
- Toon shader can now detect outlines on arbitrary textures and on object IDs. It can also detect edges on creases (including open creases) and on a geometry attribute called "outlineN". This adds extra flexibility to draw outlines on smooth surfaces.

## 2.1.19 - 2020-7-30

### 3Delight Core

- Introducing a new multiple scattering algorithm for GGX surface. This algorithm fixes the high intensity regions at grazing angles and correctly renders color saturation at high roughness.
- Fixed a performance issues with volume overrides.

- Improved memory usage in the case of very large amount of curves. On a particularly heavy scene, the memory usage was improved twofold.
- Fixed rare crash when using toon shader.
- Added ability to output AOVs separately for direct and indirect components of the light path.
- Improved renderdl progress formatting when the output is redirected to a file.
- 10% performance improvements on Windows system.
- Fixed a crash in 3Delight outlines.

### 3Delight for Maya

- Added direct lighting components to the AOV list.
- Added a basic Stand-in import node. Stand-ins exported from Houdini can be rendered.

### 3Delight for Katana

- Added direct lighting components to the AOV list.
- NSI Archives are now loaded as multi-threaded procedurals. This can greatly improve performance of scenes with a lot of such geometry.

### 3Delight for Houdini

- Now runs on production build 18.0.532.
- Added support for *Line* lights.
- Added support for heightfields (Terrain FX).
- Fixed AOV naming problems with direct/indirect components.
- Fixed output of the N attribute on curves. Outputting this attribute will render curves as strands instead of cylinders.
- Fixed various IPR crashes introduced in 2.0.14.
- The vdbVolume shader now has proper ranges for its parameters.
- Fixed rest/rnml attribute handling. This bug was introduced in 2.0.12.
- Don't include auxiliary variables in multi-light. These variables are the same for all lights.
- Added support for velocity blur to SOP-level and OBJ-level instancer.
- Enabled IPR updates during playbar time drag.
- Added direct/indirect AOVs for diffuse and reflection components in the AOV selector.
- Added a control for spot light radius. This allows rendering of softer shadow edges at a distance.
- Fixed a problem that caused lights to get dimmer behind glass and in volumes.
- Adding dlFacingRatio to utility shaders.
- Added support for timeline scrubbing in IPR.
- Added Stand-in export in the ROP. Stand-ins can be loaded using the object instancer and s@instancefile. Stand-ins include materials and can be rendered in Maya and Katana.
- Added support for camera's screen window parameters.
- Fixed projection maps on spot lights.
- Collapsed material groups for better layout.
- Multi-light export has been improved: lights can now be grouped together into one layer by placing them inside a bundle.
- Automatic creation of dlTerminal inside dlMaterialBuilder.
- Added 3Delight tab on instance object.
- Warned the user about mismatched build and run-time Houdini versions.
- Fixed SOP-level assignments with empty materials.
- Fixed file extension for deep EXR files (was wrongly named ".deepexr").

### 3Delight for Solaris

- Fixed macOS version, it was not rendering any geometry.
- Fixed a crash with the instancer. This fixes [J Cube's Esper Room](#).
- Fixed support of disabled materials.
- Implemented motion blur for all geometric primitives. This includes point instancers and instancers of instancers of ...
- Added support for UsdSkel.
- Added support for primvars in point instancers.
- Added render quality settings (samples, ray depths) and object visibility settings.

### 3Delight for Cinema4D

- Added Stand-in export command.
- Added conversion of Cinema4D Material to 3Delight Material.
- Updated dlToon material UI for dlToon material and added support for drawing outlines (Silhouettes, Folds, Creases). Also added Physical layered link on this material (Can mix it with other materials).
- Added new AOVs for direct and indirect lighting.
- Updated light sources parameters value (Use float slider and some values have now Max or Min limit.)
- Fixed Export to NSI file command.
- Added Stand-in import node. Stand-ins exported from Maya and Houdini can be rendered. (Node scale must be adjusted since Cinema4D uses meters by default while Maya and Houdini use centimetres).
- Changed Multi-Scatter value of VDB's shader from checkbox to float value.
- Fixed Cinema4D crash when not finding the VDB directory provided.
- Added 3Delight Camera Projection type functionality.
- Fixed texture mapping for Gobo light filter.
- Updated the way of materials' assignment when creating them from the shelf.
- Added support for 3Delight Random Material.
- Added Light creation functionality for Area-Light types (square, circle etc.) on 3Delight Menu.
- Fixed a bug with IPR updates.
- Fixed Cinema4D crash when closing the project without aborting rendering.
- Fixed Interactive rendering for OpenVDB objects.
- Fixed issue regarding OpenVDB volume scaling (Volume size would not changing according to it's bounding box.)
- Changed Subsurface scale lower limit to 0 for dlPrincipled and dlSkin shader.

- Added 3Delight preferences menu EditPreferences3Delight.
- Fixed Camera matching problem on Cinema4D Viewport.

### Materials

- The Principled material now behaves properly at grazing angles.

### 3Delight Display

- Fixed toolbar customisation bug on macOS.
- Updated support for OCIO. This fixes many problems with color spaces and allows correct rendering of color spaces that have multiple LUTs.

## 2.1.5 - 2020-6-16

### 3Delight for Houdini

- Fixed a bug with geo lights in IPR. They were not correctly rendering source geometry.
- OBJ-level instancer can now instance using the `s@instance` attribute (and using many different objects). This functionality was oftentimes broken.
- Fixed instancing and IPR when source geometry is invisible. This was a regression since 2.1.4.
- Fixed disappearing geometry problems with some simulations. This was caused by mismatching geometries in motion blur rendering. This fix will render the geometry without motion blur instead of not rendering at all. The right solutions for users is to use motion vectors in such simulations.
- Faster scene export when SOP-level material assignment are used. This is particularly noticeable with large meshes and primitive attributes.
- Improved IPR: copying, renaming and duplicating objects is now supported.
- Added *Casts Shadows* parameter on OBJs.
- Added ability to disable atmosphere and switch volumes to single scattering in the *Overrides* section of the ROP.
- Fixed a crash during IPR when saving a scene.
- Started to link VOP's help button to 3Delight documentation.
- Added *Color Space* selection to texture files.

### 3Delight for Katana

- Fixed ramp UIs in all affected shaders.

### 3Delight Display

- Fixed very long loading times when using large OCIO libraries (e.g. ACES 1.2.0). This was causing problems when launching renders from our plug-ins as 3Delight Display wouldn't open fast enough.

## 2.1.1 - 2020-6-4

### 3Delight Core

- Important acceleration in multi-scatter volume rendering: the pre-pass is now at least x5 times faster and the main render is about 10% faster. This means that, depending on the scene, volumes can render up to x2 times faster.
- 3Delight now accepts shader connections between incompatible OSL data types.
- Improved quality of Toon shading. Some faint artifacts could appear when texturing toon regions.
- Accelerated the Pre-Lit algorithm by x5 in high complexity scenes (e.g. fur and hair).
- Fixed quality issues with bump maps and normal maps (black spots).
- Fixed "speckles" when rendering deep refractions.
- Added documentation for `-cloud` option to `renderdl -h`.

### 3Delight for Houdini

- Build against Houdini 18.0.460 and 17.5.460.
- Some temporary files for COPs support were deleted too soon. Fixed.
- `vdbVolume` now works in Material Builder.
- Shaders are now created in a smaller for factor.
- Added support for ROP scripts.
- Added support for motion vectors on curves.
- Added `dITerminal` node to be used inside the Material Builder node.
- Avoid descending into TOPs, DOPs and SOPs to look for geo. This has a significant impact on scene parsing performance. This also fixes spurious simulations during scene parsing.
- Improved shaders menu.
- Fixed incandescence light.
- Fixed ROPnets when relative paths to objects were used.
- Fixed camera's crop: it was inverted in the vertical direction.
- Implemented geo lights.
- Added support for Disk particles: particles with a N attribute attached will be considered as a disk.
- Fixed a visibility issue with OBJ instances: the instanced object can now be hidden without breaking the instancing.
- Including `dIFloatToUV` shader to be used alongside `dIRamp`.

### 3Delight for Cinema4D

- Added 3Delight Texture Node (dlTexture)
- Added support of Sequence Render for OpenVDB and Texture node
- Placed 3Delight Material menu under root of Create menu in material manager.
- Added support for Cinema4D hair and instance object.
- Added Primitive Attribute shader for reading primvars.
- Fixed lightGroup crash-bug when no lights were added on the set upon its creation.
- Fixed rendering issue of instances generated by Cinema4D cloner object.
- Added support for shader connection to all attributes of Environment shader.

### 3Delight for Maya

- Added support for Maya 2020. Oldest support is now for Maya 2018.
- Added support for Anamorphic DoF through the Lens Squeeze Camera attribute.
- Fixed swatches rendering.
- Fixed UI of the DIToon shader.

### 3Delight Display

- Fixed background image rendering. Some images were not properly scaled.
- Improved thumbnail rendering performance.
- Fixed a (rare) crash happening on 3Delight Display launch.

**2.0.6 - 2020-5-1**

### 3Delight Core

- Added ability to render anamorphic DoF

### 3Delight for Houdini



Starting from this version, 3Delight for Houdini includes 3Delight for Solaris. This means that our Solaris plug-in ([hdNSI](#)) can now be updated more frequently than Houdini's updates.

- Implemented a much more evolved IPR mode. Users can now do most scene manipulation procedures (creating shaders, objects, connection, etc.)
- Hid the render mode menu in 3Delight Cloud ROP
- Added dlSolidRamp shader.
- Sequence renders on 3Delight Cloud are now tagged as batch instead of interactive renders. This affects cores usage as specified for the spending rates in the [online cloud settings](#).

### 3Delight for Katana

- Fixed a Python exception.

### 3Delight for Maya

- Added support of the *Lens Squeeze* camera attribute. This allows to render anamorphic DoF.

### 3Delight for Cinema4D

- Added missing 3Delight shading components and auxiliary variables of AOV Layers.
- Fixed light filters placement for Area Light an light normalization units.
- Added support to some of 3Delight shaders (Ramp Texture, Solid Ramp Texture, Box Noise Texture amd Triplanar)
- Added support for gradient parameters of 3Delight materials. (Only 3Delight shaders' gradient were supported)
- Added support for some of 3Delight materials (Toon Material, Layered Material where connection to other materials is supported)
- Implemented AOV export to non-multilayer files.
- Re-implemented JPG output with image layers. Now it works with automatic filename expansion.
- Added multilight file output, both multilayer and separate files. Also changed multilight UI to a single toggle to export all lights as multilight.
- Fixed faceset connection and outputting a message if no face is being selected.
- Updated 3Delight shelf. New materials and light sources are added.
- Fixed JPG output of multilight passes.
- Fixed a bug on cloud rendering regarding the upload of texture files.
- Added lightgroup functionality for multilight rendering.
- Added a default material (dlPrincipled) with default parameters attached to NSI root. All objects will now have it as a default shader, matching C4D workflow.
- Fixed a bug with scene traversal for nested generators.

### 3Delight Display

- Fixed a crash when stopping renders.

### Materials

- Transparency is now properly handled in AOVs for all materials.
- Fixed a bug in dlUV shader tiling.

### 2.0.3 - 2020-4-15

- Improved sampling quality and speed for non-quad area lights and lights that uses the "spread" parameter.
- Improved light sampling speed by about 5%.
- Detect 0 valued displacements. This could improve rendering speed in scenes where this occurs. In one production case, a x2.7 speed increase was observed.

#### 3Delight for Solaris (hdNSI)

- Fixed materials.
- Added support for Ramp parameters
- Added support for VDB Volumes.

#### 3Delight for Houdini

- Built against Houdini 18.0.416 Production build.
- 3Delight parameters are now properly assigned to OBJs in subnets. As a side effect, this fixes various problems with Alembic cameras.
- Improved parameters presentation in OBJ UI.
- Fixed UI in the following nodes: `d11Ramp`, `vdbVolume` and `d1ColorCorrection`.
- Added support for projection maps in spot lights.
- Vastly improved spot light sampling quality in addition to fixing a bug that made spot lights shine backwards.

#### 3Delight for Katana

- User AOVs, defined in `d1AOVGroup`, are now listed in the AOV Selector.
- Removed the "Duplicate AOV" button. The current workflow has no need for such a feature.

#### 3Delight for Cinema4D

- Fixed shader name for environment light (`d1EnvironmentShape.oso` `d1Environment.oso`)
- Changed Render Settings layout. 3Delight Cloud has been removed as a separated render settings and instead it is now being added as an option of 3Delight renderer. Also the render command button was removed from render settings.
- Created a separated file for error handler implementation so it can be reused for both viewport and i-display renders.
- Brought back numeric edit fields for area light size which seems to be removed in the latest version.
- Fixed bug with two-sided area lights. Cylinder lights were not rendered correctly when two-sided is disabled.
- Removed temporary debug outputs which were used to test different parts of the plugin.
- Implemented custom material preview for 3Delight materials.
- Disabled 3Delight error messages for viewport rendering. Since the viewport rendering routing is also used for material preview, the error messages would constantly appear on the console as soon as one or more 3Delight materials were present in the scene.
- Fixed materials dropdown menu. Skin shader was added twice, whereas metal shader was missing.
- Improved loading speed of custom material preview.
- Implemented NSI export command.
- Changed the directory from where we access `uvCoord` osl shader (as the default one was in Maya plugin). This avoids the need to install the Maya plugin to access the shader on Cinema4D.

#### Materials

- `d1RandomColors` now works with ... colors! It previously needed a color *connection*. Connections are of course supported as well.

### 2.0.0 - 2020-3-26

- Introducing a new IPR rendering algorithm, which is both faster and smoother.
- Rendering speed of empty regions have been greatly improved.

#### 3Delight for Houdini

- The Multi-Light UI has been deprecated and replaced by a single toggle. There is a new grouping scheme that will automatically create light layers from any *bundle* that contains at least on light. Lights that are not in any bundle will be output in their own layer. [This change might generate Houdini warnings when loading older ROPs.](#)
- Added a new light type: [The Incandescent light](#).
- Ensured that OBJ nodes nested in *objnets* also receive 3Delight attributes.
- Fixed a major performance problem with motion blur when velocity vectors were used.
- Fixed crashes when loading some of the shaders.
- Fixed default values for many of the shaders (Ramp, Box and Worley Noise).
- Added missing `d1LayerMaterial` to the list of shaders.

#### 3Delight for Katana

- Added build date information on plug-in initialization.
- Implemented export arbitrary attributes on Curves.
- Implemented export Custom XGen attributes.

#### 3Delight for Maya

- Added support for multiple UV set. This is accessible through the `d1UV` shader.

#### 3Delight Display

- Fixed crash that happened when stopping an IPR session.

#### Shaders

- Added support for color grids in the vdbVolume shader. The color grid multiplies the scattering color in the shader.
- Added the dUV shader to control various UV tiling and fitting parameters.

#### 1.8.17 - 2020-3-13

- Fixed a bug with SSS and live rendering. Firsts iterations of the live rendering were showing inconsistent colours.
- Spatial volume overrides now work when the camera is contained inside such volume.
- Got rid of a harmless, but annoying, automatic texture conversion error that reports a "bad magic number".
- Live rendering of displacements has been improved substantially. There was a very noticeable slowdown in many IPR manipulations (e.g. camera movements) when displacements were present. This slowdown has been fixed. This fix affects all supported plug-ins.

#### 3Delight for Houdini

- Implement OBJ-level instancer.
- Implement *Scene Elements Matte Object* to tag objects as mattes.
- Improved export speed (and memory use) of NSI when VDBs are present. Export times can be as much as 10 times faster.
- Added support for "op:" textures (COP nodes).
- Fixed motion-blur problems related to instances.
- Fixed detail material assignments on instances.
- Added the necessary flags to the vdbVolume VOP so it is correctly listed as a material in Houdini UI.
- Default velocity grid in the vdbVolume shader has been changed to "vel".
- Ignore Speed Boost Overrides when exporting NSI files.
- Added missing motion blur attributes to Camera objects.
- Improved usability of the Select ROP tool: when only one ROP is present, select it automatically. If there are no ROPs, create one.
- Multi-Light light selection now searches for VDBs at the current time.

#### 3Delight for Maya

- Fixed motion blur on Yeti nodes.
- Fixed Image Sequence for File and dTexture Node.

#### 3Delight for Katana

- Fixed XGen support on Windows with Maya 2019.

#### 3Delight Display

- Removed annoying suffix that was added automatically to file names, regardless of usefulness.
- Added an in-application "stay on top" option for 3Delight Display's main window (menu Window).
- "Loop" play mode is now remembered as a preference between sessions (menu Navigate > Loop).

#### Shaders

- Fixed default color parameter of the dTexture shader. It was not working properly when texture was not specified. It was just putting the default colour outside of the UV range.
- dTexture: added a *Default Color* parameter. The colour is used when outside of the UV range or when there is no texture specified.
- dToon now has a "Physical" parameter in which any of the physical plausible materials (Principled, Metal, ...) can be plugged to obtain a mixed look of toon and physically based rendering.

#### 1.8.10 - 2028-2-28

- Fixed a source of cracking when using displacement shaders.
- Added motion vector AOV. Exporting this AOV automatically removes motion from the scene (so that applying the motion vector AOV to the rendered image produces the right result).
- Alpha channel has been added to the Toon outlines AOV.

#### 3Delight for Houdini

- *Starting with this version, the plug-in is only compatible with 18.0.391 production build an up.*
- Fixed memory leak. Rendering a scene was holding resources permanently.
- Added support for creased edges (using the creaseweight attribute).
- 3Delight Cloud renders now show correct frame numbers and project names in 3Delight Cloud Dashboard and Transaction History.
- All instance attributes are now properly exported, not only Cd.
- SOP-level material assignments are now working in instances.
- Removed useless Maya OSL nodes.
- Fixed material assignments with relative paths.
- Added the following OpenGL attributes to 3Delight materials: `ogl_diff_rough`, `ogl_metallic`, `ogl_emit_intensity`, `ogl_spec_model`.
- Improved support for Ramps: the default values are now properly read. This affects shaders such as Worley Noise and Toon.

#### 3Delight for Katana

- Fixed the types of output variables P and N. They were declared as colors instead of points/normals.

- Added support for `smoothcreasecorners` attribute on meshes. Allows to disable 3Delight's advanced smoothing algorithm.

### 3Delight for Maya

- Added light source icons to the toolbar. Creating light sources from 3Delight's toolbar will set quadratic decay automatically.

### 3Delight Display

- Fixed a crash when loading images larger than 4GB.

### Shaders

- dlToon shader has now a *Physical* plug in which a PBR material such as Principled can be plugged. This allows mixing Toon and PBR-like effects while retaining the outlines.
- Added a *Default Color* parameter to dlTexture. It allows specifying a constant color when no texture is provided.
- dlDistanceFade shader, which is meant to change the size of the outlines in the dlToon material depending on distances, now can change the width of the outline relative to field of view. It means that zooming in on outlines will make them appear larger.
- Removed the *Width Fade* parameter from the UI. That parameter is meant to be plugged with dlDistanceFade, not modified in the dlToon shader itself.
- VDB Volume shader now has a *Multiscatter* slider instead of a checkbox. This slider controls how deep the light penetrates inside the volume but doesn't affect reflectiveness.
- Toon shader now have a "Region" outlining option. It automatically outlines regions enclosed by hard edges.
- Improved Height-Blending in Tri-Planar shader.

## 1.7.32 - 2020-2-12

- Added manifest side car to CryptoMatte files.
- In all packages, exporting CryptoMatte ID now automatically enables CryptoMatte (the checkbox enabling the feature have been removed).
- Fixed an IPR bug: in very rare cases, a transform change was ignored by the renderer.
- Fixed problems with environment edits in Environments.
- Fixed reflection ray depth counts: internal reflections (inside glass for example) will count towards refraction depth. This allows artists to just change refraction depth without increasing the reflection depth of the scene.
- Slightly more efficient processing of empty space during rendering.
- Improved multi-threading in the display system.
- Fixed a problem with negative values in OSL shaders. Plugging negative values into shading components (such as diffuse and specular) was producing wrong images.

### 3Delight for Houdini

- Added support for the *Display* flag in Scene Elements section of the ROP.
- Fixed toolbar placement and added a Select ROP tool.
- Fixed various problems with 3Delight properties creations.
- Diffuse color in 3Delight material now affect the OpenGL view.
- Exporting animations to NSI files takes much less space now as static geometries are exported only once for the entire sequence.
- NSI files are now output in a binary format that takes less space than the ASCII encoding.
- Avoid recursing into SOP primitives when building NSI scene. This was causing useless (and harmless) warnings.
- Instancing of many primitives at once is now supported.
- Added support for dlTexture node. This node automatically reads texture coordinates and uses them to access the texture file. (No further uv connections are necessary.)
- Added support for `@pscale` attribute on particles.

### 3Delight for Katana

- Work in progress for the 3Delight Toon workflow and Toon Shading, including: new Toon AOVs. Outlines on AOVs can now be created using the dlAOVGroup supertool.

### 3Delight for Maya

- Fixed export of Nref attribute (normal reference).

### 3Delight for Houdini

- Added a shelve icon to create 3Delight for Houdini ROPs
- Added support for "rest" geometry.
- Added all 3Delight Shaders to the package.
- Fixed a crash with cameras not having a Render SOP.
- Added support for "Cd" attribute on instances.
- Added missing "Relighting Multiplier" and "Relighting Reference" AOVs. Those are needed for the PreLit Workflow.
- Fixed a potential crash with motion blur (corner case).
- Fixed a crash with the AOVs dialogue.
- Added support for Velocity blur on particles and meshes.
- Made the plug-in compatible with all 18.x Houdini versions.
- Fixed another OBJ inheritance problem with sub-components.
- Added a 3Delight Shelve toolbar.
- Now using lower render priority when rendering using Houdini UI.
- Added labels with useful Houdini and 3Delight version numbers in Debug tab.
- Added version comments to the NSI stream in export mode.
- Added spread parameter to disk lights too.
- Added 3Delight-specific parameters to environment lights.

- Fixed a problem with certain kind of hierarchies.
- Disabled frame buffer output in export mode.
- Ignore Display flag; use *Objects to Render* instead.
- Completed Spatial Overrides feature.
- Implemented all object visibility flags (i.e. "Render Stats").

#### Materials and Shaders

- TriPlanar node has new tile removal feature to remove the repetitive patterns generally appearing in tiled textures.

#### Materials

- Added dFloatToColor and dFloatBlend utility node
- Made dTriplanar work well with displacement maps.
- Added dIRamp node.
- Fixed a problem with the geometry of the spot light casting shadows on objects. This only showed when the radius of the spot light was large enough.

#### 1.7.17 - 2019-12-21

- Fixed visual glitches rendering of large curves.
- Fixed crash in long NSI curves with many segments.
- 3Delight will not attempt to auto-convert empty texture files during rendering.
- Improved sampling of very narrow spot lights in volumes.
- Improved light sampling in cases of thin and long area lights.
- Fixed a glitch with the GGX BRDF when index of refraction = 1.
- VDB motion vectors grid can now be of different resolution than the density grid.
- Improved performance of the first passes in live rendering when subdivisions and displacements are present. This can improve the speed of these passes by a factor of 2.
- Ignoring badly specified "ids" to point particles. This fixes a problem with our integration of Multiverse.

#### 3Delight for Houdini

- Implemented primitive-level material assignments.
- VDB volume were exported many times for VDBs with multiple grids. This was causing wrong and slower renders.
- Added 3Delight properties to newly created Lights.
- Fixed a problem with 3Delight light properties appearing in the wrong location.
- Fixed erroneous export of the width attribute on curves.
- Fixed crashes with sequence rendering.
- Stopped render when exiting Houdini. This was causing a crash.
- Added missing 3Delight's "PreLit" parameter to lights.
- Disabled the IPR toggle in export mode, since it's going to be ignored.
- Fixed build for Houdini 17.5.
- Added a user friendly "Attribute Read" node that can read any Houdini attribute (point, vertex, primitive, detail).
- The "Render" button is renamed to "Abort" during a render. Pressing "Abort" stops the render.
- The "Render" button is renamed to "Export" when a user chooses to export an NSI instead of rendering.
- Fixed crashes when stopping a sequence render.
- Don't include 3Delight Display "feedback data" in exported NSI files. That information is only meaningful in Previews renders. NSI files exported with this information could hang indefinitely when rendered using renderdl.
- Better UI presentation in the Debug section.
- dPrimitiveAttribute now appears in the list of Houdini shaders.
- Fixed dPrimitiveAttribute. Users can now fetch geometry attributes and use them in a VOP context.
- 3Delight surface shaders are now properly tagged as Houdini materials. This allows for proper material selection in various widgets.
- vdbVolume shader now has a functioning "Grids" tab.
- Implemented velocity scale in the vdbShader.
- VDB file nodes now appear as a light in the Multi-Light section. This means that emission coming from effects such as fire and explosions can be separated in their own channel.
- Live rendering sessions can now be started from 3Delight Display.
- Added support for 3Delight Display's crop region. Note that in a live session, the crop region becomes a "region of interest" and can be resized or move interactively (offering a functionality similar to the "follow mouse" feature in similar software).
- Fixed output of Houdini point attributes. This includes UVs and Normals.
- Completed work on 3Delight's camera attributes. This includes depth of field attributes and various projection attributes.
- Added support for smooth curves.
- Fixed texture inversion in the "t" axis.
- Preview renders now use a circular bucket pattern.
- Installation is now done with the use of Houdini's *packages* feature instead of relying on "houdini.env". Any traces of 3Delight in that file, done in previous installations, should be discarded.

#### 3Delight for Maya

- Added Lights and Materials to the 3Delight Menu.
- Fixed crash when removing an object in IPR.
- Added Material selection to the 3Delight Menu.
- Added support for constant radius in particles.
- UI auto generation for OSL shaders now supports the ram widget.
- Improved the file sequence UI in the VDB node.
- Added support of constant particle radius.
- Put a soft min/max, instead of a hard min/max, on light's exposure attribute.
- Renamed "Volume Overrides" to "Spatial Overrides". In addition, shapes tagged as spatial overrides now draw in wireframe.

### 3Delight Display

- Fixed loading of EXRs.

### Materials

- Added a "Color to Float" attribute to all packages.
- The Color Variation node now works on particles who have the "id" attribute.

### 1.7.0 - 2019-11-21

- Rendering of empty space is x2 times faster.
- Fixed live rendering crashes when deleting shaders.
- Implemented support for disappearing particles during a motion range.
- Fixed visible glitches at the center of particles.
- Fixed problems with the quantize() closure and transparent rays (toon shading).
- OpenVDBs now take 10 times less memory when multi-scatter is enabled. This is mostly apparent when rendering large amount of VDBs (e.g. a cloud cover). This also makes such renders 10-15% faster.
- OSL's getattribute() now has a looser type checking. For examples, vector primitive variables can be read into a color shader variable.
- Introduced experimental support for volumes in pre-lit scenes.
- Substantially improved sampling of spot lights. This also improved the sampling of the "focus" parameter. This also affects sampling of such features inside volumes.
- Better sampling of disks. This also affects sampling such primitives inside volumes.
- The GGX BRDF now does multi-scattering for the reflection component. This means that rough surfaces will not exhibit darkening anymore.
- Fixed quality problems with SSS.
- Introducing *Attribute Bounds*. A powerful feature to assign attributes to a region of 3D space.

### 3Delight for Maya

- Fixed Yeti support.
- Fixed connection of float attributes into float[2] attributes in shading networks.
- Proper handling of partially connected uvCoord attribute.
- Added support for per-face material assignments.
- PFX geometry now renders using smooth curves by default.

### 3Delight for Katana

- Added support for arbitrary attributes on instance array.
- Improve primitive attribute support (point attributes and array attributes were not working properly).
- Use the `finalizeRuntime()` call with the aim of improving memory usage.
- Make preview render without DSettings to have alpha.
- Fixed DIOpenVDB behavior with filename expression.
- Don't error if Network Material node is not found.

### 3Delight for Houdini

- Added support for both deformation and transformation blur.
- Added the *Render Polygon as Subdivision* on geometry. This allows for rendering polygons as smooth subdivision surfaces.
- Debug: allow exporting of NSI stream to a file instead of just to stdout.
- Added depth of field parameters, and supporting functionality, to Houdini's camera.
- Added focus and contributions attributes to Houdini lights.
- Added support for motion blurred particles.
- Introducing (as part of the 3Delight package) an early beta version of our upcoming 3Delight for Houdini. It will work with both Houdini 17.5 and Houdini 18.0.
- VOPs can now be defined in a `matnet` SOP.
- Improve scene parsing performance.
- Added support for subdivision meshes.
- Fixed normals computation.
- Added support for relative paths in *Objects to Render* and *Lights to Render*.
- Added support for light's *Render Light Geometry*.
- Work-in-Progress live rendering allows for modification of lights, cameras and shader parameters.
- Added support for tube lights.
- Added support for light area scale.
- The plug-in now honours the display flag.

### 3Delight Cloud

- Through improved efficiency, batch rendering costs is reduced by up to 50%. For reference, HD frames from [this movie](#) were rendered at about 40 cents per frame (5-10 minutes render time using 100 cores on average).
- Faster (i.e. cheaper) start times on very large assets (such as the Moana asset).
- **Milestone:** in the past two weeks, clients used more than 500,000 cores to render thousands of production images.
- Improved general stability of the system, especially during sequence rendering.
- Fixed performance problems on Windows during Sync (computer could become unresponsive because of sustained load).

### 3Delight Display

- Fixed core count statistics in 3Delight Cloud dashboard.
- Allow reading of incomplete EXR files.

- Fixed issues with the Mixer tool. One problem made it difficult to obtain the same image after a re-render.

#### Materials

- Accelerated renders of 3Delight Glass material with embedded volumes. Such setups will render up to 35% faster.
- Added [Solid Ramp](#) 3D texture.
- Added Color Blend Multi utility nodes to blend up to 8 materials together.
- Added Tri-Planar shader.

#### Hydra Delegate (hdNSI)

- Use latest USD release.
- Implement cylindrical lights.
- Improve USD Preview Material.
- Add texture support to Dome Light.
- Make lights invisible to camera.

#### 1.6.0 - 2019-8-25

- Minor fix to the GGX BRDF when both reflection and refraction are used at the same time (does not affect standard 3Delight materials).
- Improved random walk SSS on sharp geometric details.
- Introducing a new **random walk** subsurface scattering algorithm. The algorithm allows for richer rendition of the subsurface effect and replaces the now deprecated dipole approximation and all its variants. To switch back to the old dipole approximation algorithm, please define the following variable: RANDOMWALK\_SSS 0
- Fixed a crash bug with NSI Procedurals.

#### 3Delight Cloud

- Fixed missing buckets problems.
- Fixed TGA texture support.
- Fixed problems when rendering scenes with duplicated OpenVDB files.

#### 3Delight for Maya

- Making PFXs smooth curves by default.
- Fixed the Viewport2.0 rendering of 3Delight shaders.

#### 3Delight for Katana

- Fix DIOpenVDB behaviour with filename expression.
- Don't create a NetworkMaterial node inside a ShadingNode when using the 'S' 3Delight menu (when creating new shading nodes).

#### 3Delight Display

- Improved reading of EXR files (EXRs with non standard channel naming were not read properly).

#### Materials

- Principled material now uses the new subsurface algorithm.

#### 1.5.0 - 2019-7-12

- Improved time to first pixel in many scenarios:
  - Significantly improved startup times when a very large amount of textures is present. For a large asset with 2000 textures we reduced the time to first pixel by 20%.
  - Improved the NSI API for multi-threading operation. This will positively affect the time to first pixel of multi-threaded exporters such as Katana. An improvement of 20%-50% is to be expected for multi-threaded exporters that can saturate the NSI API.
  - Fixed startup time in multi-camera renders which contained a large amount of instances. This problem was causing important slowdowns in multi-camera renders. After this fix, there is no difference in time to first pixel between single camera and multi-camera renders.
- Cubic curves are now rendered smooth to sub-pixel accuracy.
- Fixed a corner case crash with subdivision surfaces.

#### The Nodal Scene Interface

- Introducing the "procedural" node for dynamic loading of procedurals in a multi-threaded fashion.
- Adding a public API to query OSL shaders (`ShaderQuery.h`). This allows application linking with 3Delight to query OSL shaders without the need to link with the OSL libraries.

#### 3Delight Cloud

- PTEX textures are now efficiently rendered on the cloud.
- Optimized upload of assets. Large scene can see a x2 improvement in initial scene synchronization.
- Optimization of scene loading and initialization significantly reduces the cloud renders cost for large assets. On Disney's Moana asset we see 30% price drops on batch renders a 50% price drops on interactive renders.
- Optimized thread usage on sustained syncing tasks. This was causing some machines to be non-responsive.
- Fixed a bug where renders wouldn't receive all the buckets even if the render is "completed".

### 3Delight Display

- The Thumbnail View is now standard Qt widget. This adds some free features such as "rubber band scrolling" and better Drag & Drop.
- Improved design and content displayed in the image info's "Stats" tab.

### 3Delight for Maya

- Added a complete and easy to use [Custom AOV](#) system.
- 3Delight Principled and 3Delight Metal materials now have a good VP2 shading.

### 3Delight for Katana

- Disallow creation of shading nodes in locked groups.
- 3Delight Display now properly communicates colors to Katana when using the Light Mixer Tool.



3Delight for Maya has been made [open source](#).

### 1.4.0 - 2019-5-27

- Fixed UV interpolation problems on seams of subdivision surfaces.
- Made the sampling pattern (for anti-aliasing) varying in time. This is the best behaviour for most scenarios (animation, stereo rendering, etc).
- Improved multithreaded performance on light scenes (up to 5%).

### 3Delight Cloud

- Added documentation with performance measurements - see [Cloud Rendering Speed](#).
- In 3Delight Display, the sync progress shown in the image view is now synchronized accurately with the progress shown in the dashboard.
- Fixed a potential problem with Abort renders (jobs wouldn't abort on rare occasions).
- Fixed a hanging problem with cloud renders started by `renderd1` on Linux systems.
- Improved statistics stored with the image: texture statistics are now shown properly and CPU time matches closely the 24-core minutes charge.
- Project name now shows correctly for sequences on the 3Delight Cloud dashboard (3Delight Display).
- Fixed a problem where 3Delight will not receive the image correctly after scene synchronization (the Sync wheel would hang until user stops the render).

### 3Delight for Maya

- Added a user friendly AOV system. Artists can now output matte and texture AOVs easily.
- Fixed a crash bug in sequence rendering.
- Optimized Environment node drawing.
- Added support for Texture Reference objects (#7338).

### 3Delight for Katana

- Scene parsing is now fully multi-threaded. Speed improvements are scene dependent; simpler scenes gaining 30% and larger ones parsing up to x4 times faster.
- 3Delight Cloud is now available out-of-the-box in Foundry's Katana (through an option in the preference dialog). It allows artists to launch interactive renders on the cloud (Batch not yet supported).
- Connect shaders to terminals in NetworkMaterialGroup (in Katana 3.2 and higher).

### Materials

- Fixed a problem with the glass shader when the camera is inside the volume defined by the enclosing geometry. In some situations the volume scattering simulation would disappear.
- Fixed soft max and hard max in Worley Noise (UI improvement).
- The *White Hair* parameter in the Hair & Fur shader now works on Dye color too. It was previously only applied to color produced by melanin levels.
- Made a slight optimization in the Hair & Fur (5%).

### 1.3.28 - 2019-4-20

- Fixed 3Delight's depth output. It was incorrect in live rendering as well as in Multi-Camera rendering.
- *Prelit* renders now produce a "relighting\_reference" AOV which contains all the elements together. These AOVs are accessible in both Katana's and Maya's *AOV Selector*.
- Fixed bugs in *Prelit* renders which made some surfaces appear brighter than they should.
- Faster *Prelit* renders by a factor of x2.
- Fixed crashes with 3Delight's automatic tangents generation. This affected assets that used anisotropic materials.
- Improve quality of tangents generated by 3Delight.
- Fixed automatic texture conversion for textures lying on Samba mounts. This affected Linux systems only.
- Fixed a memory leak. The leak was too small to cause any real issues.
- Fixed crashes in 3Delight's OSL `getAttribute()` implementation.

- Fixed the Z output (AOV). It was showing a wrong uniform value.
- A more powerful `quantize()` closure now accepts separate color data for each auxiliary AOV. Needed for the infinite number of controls desired in the toon shader. The major downside is this uses more memory now. But we can now have separate quantized colors for each detected outline.
- Better alpha on outlines.

### 3Delight Cloud

- Fixed problems with memory consumption during the Sync phase.
- Improved overall performance when rendering long sequences.
- Fixed crashes with multi-threaded scene export in Katana.
- Improved upload speeds during the *Syncing* stage. Transfers can go as much as x10 times faster.

### 3Delight for Maya

- Now showing the 3Delight -> AOV section in the *Hypershade*. It is now possible to add AOVs that output attributes set on objects. AOVs are shown automatically in the AOV Selector.
- Fixes to array connections in *HyperShade* now allows artists to connect to color arrays (e.g. Ramp shader).

### 3Delight for Katana

- Added Multi-Camera functionality. This allows artists to render multiple-views simultaneously.
- Fixed filename tags in DISettings. The `<light>` tag was not functional for example.

### Materials

- Improved Hair shader *Specular* parameter behaviour: it is now more linear across the entire range.
- Implemented `gettextureinfo("exists")`.
- `plusMinusAverage` (from Maya) is now supported for floating point input/output.

## 1.3.19 - 2019-3-25

- Rendered DeepEXR files now contain 3Delight statistics.
- `quantize()` closure can now output quantized AOV components as well (specular, diffuse, etc.)
- NSI objects can now be tagged as contributing or not to the `quantize()` closure.
- Avoid sending incomplete buckets to *3Delight Display* and files when stopping a render.
- Introducing the `quantize()` closure to OSL. This allows quantization of local illumination for stylistic effects (e.g. toon shading).
- Fixed CPU usage overload during preview renders. 3Delight was taking all the available CPU power and this was making the machine sluggish on Windows.
- Fixed an instancing bug that could result in a crash when using instances of instances.
- Fixed a bug on Windows with automatic conversion of textures that are larger than 2GB. These textures were converted unnecessarily at each render.
- Fixed a problem with displacement on instances (displacement would appear as bump, #7378).
- Adding `renderdl --callprocedurals` to expand any NSI procedurals present in a give `.nsi` file.
- Fixed a crashbug that can occur if a render is aborted during the the initialization phase of the renderer. This mostly affected *Maya* renders (#7377).
- **Implemented a substantial memory optimization for OpenVDB volume rendering. Memory savings are up to x8.**
- **Critical performance optimization for extremely large scenes (millions of primitives or instances). This problem affected startup time in such scenes.**

### 3Delight Cloud

- Fixed a problem with sequence rendering that stopped image rendering.
- 3Delight Display's *Cloud Dashboard* now shows a project and frame indicator when necessary.
- 3Delight Display's *Cloud Dashboard* now shows completed renders in a subdued shade.
- 3Delight Display's *Cloud Dashboard* now shows the average number of cores used for completed renders.
- Better behaviour of the "sync wheel" in 3Delight Display for very short renders.

### 3Delight for Maya

- Fixed a crash in Material Viewer when modifying shader parameters.
- Fixed a problem with Material Viewer that made objects appear black.
- Introducing distortion capabilities to the camera.
- The `quantize()` closure now accepts an array of up to 8 points to specify the quantize regions.
- Improved OSL's `concat()` function performance (x20 faster).
- Fixed a problem with custom plug-in registration.
- Fixed live render problems with nodes such as `place3Dtexture`. Adding such a node during a live rendering session was not working properly (#7052).
- Fixed a UI problem in the Render Settings: the currently active resolution and aspect ratio were not shown.
- Silenced a warning about `particleCloud` shader.
- `__3DFM_OSL_PATH` and `__3DFM_USER_OSL_PATH` can now contain a list of paths separate by either a semi-colon or a colon. Using the semicolon is preferred on Windows as it allows for a user friendly editing using "Edit Environment Variable" functionality.
- The `dlopenVDBShape.filename` attribute is now tagged as "usedAsFilename" so that it appears in Maya's *File Path Editor*.
- Thanks to newly available displacement capabilities, the *Material Viewer* can now show displacements created by 3Delight shaders.
- Allow for custom export delegate for dependency nodes.
- Support array of numeric attributes (including strings) on shading nodes.

### 3Delight for Katana

- **Vastly improved memory usage when using array instances.** For large scene users will see a x4 improvement.
- The transform on the instance array location was not used. Now fixed.
- Removing and adding an instance array location in live render caused the sources to be permanently removed. Now fixed.
- Fixed live render crash.
- Support live render operations on the Render Working Set.

#### NSI – The Nodal Scene Interface

- Faster parsing of double precision floating points in the NSI stream.
- Introduced a special encoding for double precisions matrices for fast read.
- Introducing a new **instances** node to efficiently describe a very large number of instances.

#### Materials

- Fix Overlay blend mode in `dlColorBlend` shader.
- 3Delight's OpenVDB volume shader now allows density re-mapping using a ramp widget. Both Maya and Katana benefit from this feature.
- Displacements can now be rendered directly from the surface material and are easily interchangeable with Bump mapping. This improves usability as it allows artist to develop the look of an asset in the most logical place: the surface shader. Creation of separate displacement nodes is not necessary both in *Maya* and *Katana*.

#### 3Delight Display

- The `i-display` command now accepts the `-metadata` flag to print any metadata attached to images rendered with 3Delight. For now, this amounts to rendering statistics.
- Fixed thumbnail view glitches with dual monitors.
- Optimized how images are transferred to 3Delight Display.



This release contains a 3Delight Display which is incompatible with previous packages.

#### NSI – The Nodal Scene Interface

- Introducing a procedural API to NSI. An interesting design feature of this API is that NSI procedurals do not have to pre-link with any rendering library, making NSI procedurals *truly* rendering agnostic.

### 1.2.16 - 2019-2-1

- Optimized OSL optimization step for very large groups of shaders.
- Fixed bad values in *CryptoMatte* output when using half data types and floats.
- **Fixed a major performance issue with instancing: scenes with millions of instances suffered from very long startup time.**
- Fixed a bug with image intensity when using very low shading samples.
- Fixed the Blackman-Harris filter in 3Delight.
- The *Relighting Multiplier AOV* now contains proper alpha (for *Prelit* workflow).
- Overall improvements to the *Prelit* output. Some regions of the *Relighting Multiplier AOV* appeared too bright previous to this fix.
- **Fixed a potentially serious performance problem on Window platform which could make renders several times slower than they should. The main symptom is a very low CPU usage when rendering larger scenes.**
- Fixed a crash bug with displacement on Windows.
- Fixed stack trace output on Windows. The stack trace now contain more meaningful information, helping us pinpoint potential problems more rapidly.
- Reduced OpenVDB memory usage when the same OpenVDB is re-used.
- macOS packages are now properly signed. Installation won't mention an "unknown publisher" anymore.
- Floating point textures compress x2 better when optimized.
- 20% faster displacement in scenes with a lot of displacement. This also improves time to first pixel.
- Fixed normal interpolation along curves (it was not smooth).
- Fixed crashes and hangs at the end of renders affecting Windows packages.
- The path tracing algorithm can now deal with *Prelit* materials as described in: [Prelit materials: light transport for live-action elements in production rendering](#)



Environment maps were flipped in the X direction prior to version 1.2.0. This affects both *Katana* and *Maya*.

#### 3Delight Cloud

- 3Delight Display window opens much earlier for cloud renders. This allow the "sync wheel" to show up earlier and provide more information to the user.
- 3Delight Cloud renderer in Maya is now visible to all users.

#### 3Delight for Maya

- Fixed handling of invisible objects feeding instancers.
- Updating UI for *Matte* and *Prelit* attributes.
- Allow a `dIset` to be used as a group for Multi-Light output.
- It is now possible to render many frames simultaneously using 3Delight Cloud. This is possible by setting a frame range in the render settings and selecting 3Delight Cloud as a renderer.
- Fixed OpenVDB crashes when a file can't be read.

- Fixed a crash bug when using OSL lens shaders.
- Batch renders are now using the horizontal bucket order instead of the spiral. This means that files save on disk will contain complete row of pixels early during the render process.
- Added ability to write custom OSL shaders that have message based parameter. For example, connecting a Maya camera to a string parameter now works (the shader will receive the name of the Camera's transform).
- Added Prelit workflow. This means *Prelit* attributes on objects and sets as well as a new AOV : "Relighting Multiplier".

### 3Delight for Katana

- Always use local material for live render updates.
- Default filter is now Blackman-Harris as is to provides a nice balance between definition and softness in a variety of situations.
- Updating UI for *Matte* and *Prelit* attributes.
- Fixed dISet AE template.
- Export arbitrary attribute with `pointcloud` geometry.
- Added support for `pointcloud` geometry type.
- Export all arbitrary attribute along with geometry. Shaders can now access these attributes using the `dIPrimitiveAttribute` shading node.
- Added support for Curve primitives. Linear and Cubic (b-spline and camtull-clark) curves are supported.
- Fixed slowdown issues happening on Katana 3.1.
- Fixed rare exception on `DISettings` creation on Windows machines.
- Added a *Prelit* attribute in the Visibility section as well as a *RelightingMultiplier* output variable.

### 3Delight Display

- Fixed renders that were sometimes sent to the wrong image.
- Improved light mixer performance when using many layers.
- Fix display problems when the device pixel ratio is not an integer (more usual for high resolution such as 4K displays).
- Fixed magnifier tool when looking outside of the image region.
- Fixed crash with OCIO profiles.
- Live renders from Maya now respect the crop window as a *priority window*. In other words, this is the "follow mouse" feature for live renders.
- Fixed a performance issue on macOS when using sRGB color space.
- The mouse scrolls wheel can now be used to zoom in/out the image.
- A multi-touch trackpad can now be used with two fingers to pan the image and zoom in/out (pinch to zoom).
- Fixed Re-Render when renders are started from Katana.

### Materials & Shaders

- Solved a problem with the bias parameter in SolidFractal shader.
- Introduced a projection node for camera and planar projections.
- Fix an orientation problem in `place3dTexture`.
- Fixed a problem with `dIPrincipled` when backfacing to the viewer.
- Fixed shadows from Glass shader when using scattering. Shadows appeared opaque.
- `dIPrimitiveAttribute` shading node can now read integers and `float[4]` attributes.
- The Glass shader is now significantly more powerful as it allows rendering of absorption and scattering of light inside the medium. This shader can now be used to render, e.g. realistic volumes of water.
- Fixed IOR controls in Glass shader.
- Fixed a crash when using `getAttribute( "global:..." )` inside OSL shaders.

## 1.1.12 - 2018-11-1

- **Implemented multiple scattering in volumes.**
- Introducing PreLit workflow to easily integrate real footage into VFX shots.
- Fixed a crash during live renders when the main camera was deleted.
- Further improvements to displacement algorithm (mostly rare corner cases producing cracks).
- Improvement to 3Delight's geometric displacement algorithm. This important enhancement removes cracks due to difficult topology.
- Improved license management; 3Delight now communicates less often with the license server.
- Fixed many cases of cracks in displacements (mostly visible near screen edges (#7256)).
- Completion of recently introduced PTEX support. Quad polygonal meshes and non quad-polygons are now supported.
- Fixed PTEX for clockwise winding meshes (currently affects KATANA only).
- Preserve user's `3delight.config` file when re-installing the software on macOS packages.
- Fixed hard edged shadows appearing on polygonal surfaces.
- Automated texture optimization is now handled directly by 3Delight (see [Handling of Textures](#)) and offers better error reporting.
- UDIMs render about 8% faster.
- Fixed a performance issue in OpenVDB rendering. Scene with relatively large amount of textures (hundreds of megabytes) will have an acceleration between x2 and x3.

### 3Delight Cloud

- Fixed support of UDIMs on the cloud.
- Fixed 3Delight Cloud renders that sometimes could hang for very short renders.
- 30% faster syncing (upload) for models and shaders when using 3Delight Cloud.
- 30% faster startup (time to first pixel) when using 3Delight Cloud.
- Fixed rendering of VDB volumes on 3Delight Cloud when renders are started from a Windows platform.
- Fixed 3Delight Cloud issues when rendering high resolution images (eg. 4K) with several AOVs. The problem was sudden "jamming" of the application during rendering.

### 3Delight Display

- Improved performance when receiving high resolution renderings (>2K) and while in the *Contact Sheet* mode.

- Fixed Re-Render feature when renders are started from Maya.
- Changed hotkey for *Zoom to Fit* functionality to "=".
- Small presentation improvements in the Cloud tab (with links to the users' online account).
- Fixed the minute usage shown in the Cloud tab. It was underestimating the total usage.
- The "rendering" state in the cloud tab was sometimes overridden by "parsing". Fixed.
- The content of the sidebar can now be scrolled when the window is too small.
- When using the Loupe tool, a single click on the image freeze the Loupe view for a couple of seconds.
- Improved reliability of the progress indicator for Syncing stage when using 3Delight Cloud.

### 3Delight for Maya

- Added a mechanism for plug-ins to register attributes in the 3Delight section of Maya nodes.
- Fixed classification with auto-loaded shading nodes.
- Added multiple scattering option to Volume shader.
- Fixed dlAtmosphere and dlColorVariation look in the *Channel Box* editor.
- Improved presentation of 3Delight for Maya shading nodes in the Node Editor.
- Fixed issue where the Attribute Editor would show wrong attribute values after selecting a new node in some cases.
- Refined the UI of some of 3Delight for Maya shading nodes.
- Fixed a limitation with the Free 3Delight<sup>NSI</sup> preventing simultaneous renders in different Maya views.

### 3Delight for Katana

- Added multiple scattering option to Volume shader.
- Fixed ROI.

### OSL Shaders

- Revisited the bump mapping implementation in Skin, Metal and Glass. It is now inline with Principled.
- Substance transparency is now a float.
- Lambert shaders now uses the same default values as Maya.
- Added a "Open GL" normal map orientation option to 3Delight Principled material.
- *Transparency* has been replaced by single-channel *Opacity* in 3Delight Principled.

## 1.0.12 - 2018-9-21

- Fixed timing statistics in relation to the "other" category.
- Fixed non-deterministic renders. Using different number of threads was not producing exactly the same image.
- Fixed visible intersection artefacts when using subdivision surfaces and sub surface.
- Introduced partial PTEX support.
- Fixed an issue in the rendering core affecting instances organised in hierarchies (#7212). This issue caused objects to be clipped.
- Faster render stops during the synchronisation phase of 3Delight Cloud renders.
- Corrected `renderdl -h` output.
- Improved accuracy of ray intersection to remove various "bias" problems. (Issues #7179 and #7216).
- Removed various legacy include files from package.
- Fixed rendering of OpenVDB volumes with 3Delight Cloud.
- User friendly error messages for 3Delight Cloud error conditions.
- Fixed minor memory leak.

### 3Delight Display

- Improved status reporting in the [3Delight Cloud Dashboard](#) dialog. Also, sequences are now listed as un-foldable items.
- More consistent alignment of values with using the picker (using the "P" key).
- Better presentation of the cross in the Loupe tool. It is now precisely centered.
- Fixed support of .3DL color space file format.
- Cloud renders now receive progress and statistics exactly as local renders.
- Added a progress indicator for 3Delight Cloud scene synchronisation.
- 3Delight Display has a new application icon and an updated *About* dialogue.
- Fixed various issues with the loupe tool, including the zoom factor to be consistent across screens of varying DPI (including Retina displays).
- [The sign in condition is remembered upon exit and start of 3Delight Display.](#)
- Added Sign In tab in 3Delight Display's sidebar. This will work only for users registered for beta testing 3Delight Cloud.

### 3Delight for Maya

- Removed the texture directory workspace option as this is now handled directly by 3Delight (see [Handling of Textures](#)).
- The workspace UI has been removed as it is now empty.
- 3Delight Glass now show transparency in the VP2 viewport.
- Added a Volume AOV.
- Fixed 3Delight Display on Retina displays when started from Maya. The issue was causing the doubling of pixels.
- Fixed Abort button behaviour for Cloud renders. It was non-responsive and sometimes resulted in the application to crash.
- Fixed Material Viewer. Viewing and editing of both shaders and environments are supported.
- All 3Delight<sup>NSI</sup> error messages are now shown in the *Script Editor* instead of the terminal. This is particularly important on macOS and Windows where the terminal is not always available, making error messages not shown at all.
- Improvements to the templates generated for auto-loaded OSL shaders.
- An NSI file export now has the same scene output as a batch render. This means frame buffer and overrides options are not exported in the NSI file.
- [Fixed dlMetal presets \(Presets menu in the Attribute Editor\).](#)
- Updated URLs for Help and updated About dialogue.
- Removed obsolete icons.

### 3Delight for Katana

- Removed the texture directory preference as this is now handled directly by 3Delight (see [Handling of Textures](#)).
- Added a volume AOV.

### OLS Shaders

- Improved documentation for supported shaders.
- Added 3Delight Principled material. To become the standard material across all plug-ins.
- Added support for Volume AOV both in Atmosphere and OpenVDB shaders.
- Added *3Delight Car Paint* and *Random Material*.
- Added *Random Color* utility shader.
- Added *Flake* 3D texture shader.
- Added a *Facing Ratio* utility shader.
- Added a *Worley Noise* and a *Flake 3D Textures*.
- OSL shaders can now declare a classification string. This is in preparation of an automated way to create *Maya* shading nodes directly from OSL shaders. This string has no effect in Katana.



3Delight Material is being deprecated and replaced by 3Delight Principled. The later provides all the functionality provided by 3Delight Material, plus the ability to render metals, with less parameters and better usability (such as better parameter ranges, better naming, and better UI).

The 3Delight Material is still part of the package for backward compatibility.

### **1.0.0 - 2018-8-31**

- 5% to 15% faster rendering, depending on the scene.
- Fixed a problem with refractions (GGX BRDF) causing noticeable darkening.
- Fixed an error on linux when using 3Delight from python.
- Update of the first passes of a live render are now much faster (up to x2 times faster).
- Faster time to first pixel for scenes with large emissive meshes. Scenes with millions of light sources could start as much as x10 times faster.
- Added support for rendering VDB velocity from three float grids instead of a vector grid.
- Fixed some live render crashes related to instances.
- Fixed VDB emission.
- Added new python binding to NSI.
- Fixed changes to camera shutter in live render.
- Improve performance of sky shader.
- Fixed performance of displacement after a change in live render.
- 3Delight Display has a new Sidebar with a new Light Mixer UI and a new Loupe tool.

### 3Delight for Maya

- Improved VDB rendering speed in viewport.
- Add support for Maya's Light Editor. This includes ability to output a light group as a multi-light layer.
- Add *Color Blend* utility node. This node has a similar functionality to the Layer Shader.
- Better support of Light Linking. Light links to sets and shading groups are now supported.
- Fixed a problem with instanced objects when each instance has a different shader.
- Support Maya's built-in UDIM tag, including support for UDIM tiling on file node.
- Improved UI for all materials and shaders.

### 3Delight for Katana

- Instantaneous opening of VDB files, even large ones.
- Fixed a crash with some VDB files.
- Draw lights behind the selection too instead of in front (usability suggestion by Matthew Bennett).
- Multi-Threaded scene export and scene export optimization.
- Find OSL shaders without Katana Resources.
- Various fixes to XGen loading.
- Do not link with Katana's Python libraries anymore. Those are not needed.
- Implement automatic conversion of textures into TDLs (mip mapped tiff files).

For strings defined inside `res/strings_xx/description` returns `"StrNotFound"`.